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GEOTECHNOLOGIES AND PROACTIVE EDUCATION IN THE AMAZON REGION: AN EXAMPLE

Geotecnologias e Educação Proativa na Amazônia: Um Exemplo

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ABSTRACT

At a world level, the teaching method still prevalent in educational systems consists in the pouring of knowledge from the source, the teacher, to the student, the semi-inert receiver. The "*Magister dixit*", as it is known, literally means "as told by the master". Putting it in less emblematic terms, education consists in providing the learner with an autonomous development, based on a learning structure that promotes knowledge acquisition through the student's involvement with significant situations. It is paramount the understanding that education comprises two distinct stages: teaching, the professors' job, and learning, which is accomplished by the student whenever they are properly stimulated and supported. Such a goal can be achieved by a "Proactive Education" that prioritizes learning. Therefore, this work reports learning practices experiments by using geotechnologies for the promotion of Proactive Education conducted in the southeast region of the state of Pará. The environmental knowledge thus acquired and diffused by those young people in direct and organized contact with the risks, potentialities, opportunities and threats that exist in their environment promotes their inclusion in the physical, biotic and socioeconomic reality in which they live.

Keywords: Geotechnologies, Environmental Learning, Social Collaboration, GIS, Proactive Education, Amazon Region.

RESUMO

A Educação pode ser imaginada como uma moeda e, como tal, comportando ensino e aprendizagem em suas faces geminadas. O método de ensino ainda prevalente nos sistemas educacionais, em nível mundial, consiste no verter de conhecimento da fonte, o professor, para o aluno, receptor semi-inerte. É o clássico "*Magister dixit*", em português, "dito pelo mestre". Em termos menos emblemáticos, educação consiste em propiciar o desenvolvimento autônomo do educando, com base em uma estrutura de ensino patrocinadora de uma aprendizagem derivada do envolvimento do aluno com situações significativas. Por essa razão, deve ficar claro que a educação é um processo que compreende duas fases distintas: a) ensino, tarefa dos professores e administradores; b) aprendizagem, a ser executada pelo aluno, segundo estímulos e apoios que lhe sejam propiciados. Tal objetivo pode ser conseguido por uma "Educação Proativa" priorizadora da aprendizagem. Assim, este trabalho relata experimentos de práticas de aprendizagem para a promoção da Educação Proativa conduzidos na região sudeste do estado do Pará. O conhecimento ambiental assim adquirido e difundido pelo jovem em contato direto e organizado com os riscos, potencialidades, oportunidades e ameaças existentes em seu ambiente e por ele e seus colegas levantados, promove sua inclusão na realidade física, biótica e socioeconômica em que forçosamente vive.

Palavras-chave: Geotecnologias, Aprendizagem Ambiental, Colaboração Social, Sistemas de Informações Geográficos, Educação Proativa, Amazônia.

1. INTRODUCTION

As an introductory element to the present text, it should be informed that its conception derives from the perception that the following components are in accelerated evolution: a) Geotechnologies, namely the geoprocessing and its capacity of transforming georeferenced data into spatialized information; b) communication, i.e. the knowledge sharing based on the access to general or oriented networks and the use of portable equipment; c) geolocation, the basic element of georeferenced data, along with; d) Digital Cartography and Remote Sensing, with their ability to portray, analyze and record environmental data (XAVIER-DA-SILVA, 2009).

Taking action when perceiving these facts means being part of the world. Any environmental investigator, including beginners, is increasingly dependent on reliable information that must be obtained from the countless instantaneous and multi-originated sources of environmental data. To attend this unavoidable and eventually useful situation, this text aims to demonstrate the use of Geotecnologies, particularly Geoprocessing, on the generation and analysis of environmental data as a learning and investigative procedure.

1.1 A Pedagogical and Circumstantial View

Education could be imagined as a coin that has teaching and learning for its two sides. Putting it in less emblematic terms, education consists in providing the learner with an autonomous development, based on a learning structure that promotes knowledge acquisition through the student's involvement with significant situations. These situations could be presented to them in class or, preferably, be perceived and worked out by the students themselves.

In the case of the environmental sciences, the apprentice must be brought into contact with the environmental reality, replete with knowledge within their physical, biological and socioeconomic aspects, thus promoting their geoinclusion (XAVIER *et al.*, 2011; XAVIER-DA-SILVA & MARINO, 2012) as an inquiring and entangled entity in the investigated ambience.

For this reason, it is paramount the understanding that education comprises two distinct stages: a) teaching, the professors' job; and b) learning, which is accomplished by the student whenever they are properly stimulated and supported. Such a goal can be achieved by a "Proactive Education" that prioritizes learning, as it will be subsequently demonstrated.

The diversified human habitat, whenever directly, correctly and efficiently used as a basis for the verification of its beneficial or harmful aspects, is a source of essential information for an adequate education that is modern and in accordance with the technological resources already available to and in use by young people.

1.2 Education *versus* Knowledge Generation

A respectful educational entity must have the environmental knowledge regarding its surrounding. In direct terms, it should have a

reasonable and comprehensive knowledge about the physical, biotic and socioeconomic aspects in effect, a knowledge that must be progressively and neatly organized.

How to achieve this goal? Contrary to what is currently the case, schools, as well as any other educational entity, should create an up-to-date environmental memory regardless of their territorial scope. At these days, this environmental memory has been only precariously organized, in some cases, through commendable individual efforts.

Such a resourceful entity becomes, at a small cost, a constant generator of valuable environmental data due to its territorial comprehensiveness, even over strategic zones, and numerous themes. Since it is being generated by students, this data will be up-to-date and fairly unbiased. Once organized and stored on the Internet for ample sharing among students, teachers and researchers for the many possible analyzes, this data reveals the nature and scope of environmental problems related to the inhabitants of that geographic area.

For education professionals, this information allows the creation of zoning guidelines for the application of resources according to a specific interest or to the gravity of the environmental situation identified.

This dynamic educational structure of proactive education contrasts with the sporadic efforts that, promoted at various levels of spatial and temporal scope, focuses on introducing students to environmental problems. These efforts are generally carried out as initiatives involving campaigns, missions, visits, conciliation attempts, and may even involve minor political aspects and, sometimes, high costs when mobilizing a large number of participants, such as during the identification and follow-up of epidemic outbreaks.

Regrettably, the aforementioned initiatives have ephemeral informative and decisive effects. They are usually relegated to the background memory of young ones and adults alike, and simply forgotten for lack of follow-up, monitoring and control activities.

A comparison must be made in order to avoid any misrepresentation, whether voluntary or not, of this proposal. It is necessary an organized setting of the environmental knowledge in the minds of young people. This knowledge is plural by nature. Consequently, its fixation cannot be precariously produced by sporadic and non-recoverable actions.

Knowledge of the local environment can and should be reported by the students themselves. The installation of a proactive education, as previously stated, has a natural consequence: school memory assembly, which can then file the entities and important events that eventually occur.

Bearing in mind the example of motivation for combating epidemics, it should be noted that its demonstrative aspects are generally restricted to the prophylactic campaigns occasions. Evidently, an environmental information generation system, based on a proactive education, would certainly not fail as a consultation source on occurrences of diseases and other related aspects reported by students, considered the information has been properly stored on the environmental information system. These systems facilitate the organization and selection of data concerning given incidents, dates, places of occurrence, and number of participants, all of it being, in principle, traceable, making it possible to generate maps and charts of historical sequences.

Finally, and of the utmost importance, it is worth remembering that the aspects related to the epidemic event of the example, like any other negative or positive aspect, will be made public and available through the Internet.

Therefore, this is an action aimed at the democratization of acquired knowledge. Facts submitted by students will directly inform about the current environmental situation. The environmental knowledge thus acquired and diffused by those young people in direct and organized contact with the risks, potentialities, opportunities and threats that exist in their environment, and that has been identified by them and their colleagues, promotes their inclusion in the physical, biotic and socioeconomic reality in which they live.

This collective activity allows the ranking of the best individual or schools' contributions, or even groups of schools, turning into a highly stimulating and easily organized action through the use of a Geographic Information System (GIS). Such systems are designed to support decisions by providing the storage, retrieval and analysis of

environmental data, which are notorious elements for the decision-making process.

Ultimately, it should be taken into account that the condition of a compromised citizen, aware of their rights and duties, depends to a large extent on this knowledge, which can be systematically acquired and disseminated at the school and by the school through a Proactive Education. Knowing in order to plead is a synthesis of this vision of how to generate and disseminate knowledge and form citizens.

1.3 Education *versus* Technology

The individual-centered view presented above is, in a sense, in line with the national effort to equip schools with computational resources. Furthermore, it should be noticed that the two aforementioned initiatives, the physical preparation of learning centers and the emphasis on learning methodology, although praiseworthy per se, are absolutely integrated.

In the Brazilian case, digital and social inclusions are pursued by various government agencies, including the Federal Government (COMUNICAÇÕES, 2016).

The appropriate association between Geoprocessing and education is paramount, and it can and should be the natural path following the digital and social inclusion through the cognitive insertion, GEOINCLUSION, of young people in their own environment.

This objective could be achieved through progressive gains in knowledge, organically and gradually inserted into the students' minds in an educational process in which they participate both individually and collectively, since the acquired knowledge can be available, if properly stored, for easy and wide consultation on the Internet.

The free-use Geographic Information Systems could be the element for storage, retrieval, updating and dissemination of the acquired data (occurrence records) and information (knowledge gains).

Like other similar programs, the Monitoring and Control Platform - VICON/SAGA (http://www.viconsaga.com.br) presents itself as a user-friendly open-source solution that operates on a low-cost-equipment basis. Its features, as well as its role in supporting the promotion of Proactive Education, will be explained in the case study presented later in this article.

Concurrently with the dissemination of all environmental knowledge thus acquired, which must be then organized and made accessible in an open communication network, it is important to note that the individual-level benefit, the citizenship, solidified by the learning fulfilled in each student's mind, becomes part of the collective knowledge. The said knowledge should be universally shared through a living and dynamic educational process executed by actors, the students, a resource constantly renewed and engaged within the school network's units.

2. TRANSFORMING THE TEACHING AND LEARNING PROCESS: FROM THE CLASSIC "*MAGISTER DIXIT*" TO THE PARTICIPATORY AND "PROACTIVE"

At a world level, the teaching method still prevalent in educational systems consists in the pouring of knowledge from the source, the teacher, to the student, the semi-inert receiver. It is the traditional "*Magister dixit*", or "as told by the master", a Latin expression that can be used when trying to construct an argument referring to an unquestionable authority.

Educators must not take it personally and are kindly asked to reflect upon it. This methodology was consolidated about 2,300 years ago in Ancient Greece. Today, the teaching and learning processes are being conducted carelessly based upon unknown and biased sources deliberately made available over the Internet.

Should the utilization of computers and smartphones be prohibited on education process? Should the use of television, GPS or Internet data and information be discouraged or any other technological advances that may come to light? That is unquestionably not the case: the resources of generation, transmission, storage, retrieval, analysis and dissemination should be used in favor of the education, especially in terms of student learning.

Assuming a more hands-on approach, one could picture high school students using digital cameras or cell phones to register environmental situations they consider to be of interest (freedom to create information). Those records are then brought to school and screened, without any major alterations, by those responsible for the information system in use.

In continuity with the digital inclusion initiated by their cameras, students will be able to input and store the data generated by them in the system, including explanatory recordings and other additions. Thereafter, they will learn, through direct and effective participation, important contemporary knowledge, such as organizing databases and managing information systems, as well as some communication techniques.

The generation of masses of environmental information will thus be initiated at the periphery of the information/education system, erecting a local database to be shared on the Internet.

At the same time, the data allows the real-time monitoring of the functioning of the school system (pedagogical, administrative or research levels) or any other researches being conducted within it.

Evidently, the teaching-research-administration symbiotic relationship can and should be stimulated among the participants of the communication network being created. It should be emphasized that, since it is interconnected, this system immediately makes the information available at the Internet for emulations, comparisons, even merit ranking, for example, such as competitions among schools.

Considering today's prevailing technologies, namely communication networks, and the digital inclusion of high school students, this project could acquire any dimension. It is a structure of gradual construction, a path that, once triggered, would follow its own dynamics. In this structure, environmental information is generated, collected and analyzed, and it could then be stored and updated by the schools participating in the network, with the possibility of limiting the number of members.

In honor of Aurenice Cardoso's "Slide of Discovery" (CARDOSO, 1963; FREIRE, 1985), the phrase "path of discovery" is created for this dynamic and integrated procedure of research and teaching. It is a "Proactive Education" initiative, since, as in illiteracy, one cannot exercise true citizenship without knowing the environment in which one lives, that is, being an environmental illiterate.

Overall, this procedure of research, storage and dissemination of knowledge produces conscious citizens, who are free to criticize and constructively contribute based on all the acquired and available knowledge.

At present, the inclusion of young people in their environmental reality, be it the physical (e.g. climatic, hydrographic, geomorphological), biotic (e.g. fauna, flora, epidemics, diseases, agricultural and livestock pests) or socioeconomic aspects (e.g. quality of life, products' economic circulation, access to information and communication), through direct and indirect knowledge, continues to be the foundation for true citizenship. It is a concept of environment as a comprehensive and complex entity, composed of these and other physical, biotic and socioeconomic factors.

This comprehensive concept enlightens the perception of the environmental aspects that must be known and investigated. Such a perception ultimately leads to the assertion that no one can exercise their rights over something they do not know. The adoption of a Proactive Education's perspective is a virtuous initiative for training young people in the generation, storage and functional and comparative analyses of environmental information concerning their environment, their homeland and their planet. This fully applicable proposal, while perhaps neither the only one, nor the best way of promoting citizenship, is clearly one of the options.

3. STAGES FOR THE IMPLEMENTATION AND PROMOTION OF PROACTIVE EDUCATION

The following stages constitute the fundamental steps for the implementation and maintenance of the Proactive Education's infrastructure (XAVIER-DA-SILVA & MARINO, 2011).

1. Contact with participating entities and/or sponsors. Proposals regarding the nature and operation of the interschool environmental information network.

2. Classification and integration of the environmental data to be disseminated. Contact with school management and other entities initially chosen to belong to the interschool environmental information network.

3. Database modeling. Dimensions and scope. Specific mapping and identification. Definition of forms and fields. Data filtering

according to spatial, temporal and taxonomic dimensions. Potential and opportunities, risks and local threats.

4. Development of an innovative high school application aimed at achieving citizenship awareness among young people, including those living in the most deprived areas. It is based on the collection, through data forms, and organization of knowledge specific to the physical, biotic and socioeconomic facets of their environment. This knowledge will then be collected and disseminated through the Internet by the innate and pre-existing educational entities, i.e. schools. As a tangible suggestion, each participating student could be asked to present at least one positive and one negative environmental aspect, justifying their choices and, if possible, presenting drawings, photos and texts for storage in the system.

5. Setup of the platform at schools. Selection of schools with equipment and facilities conditions for the network; elucidative lectures at schools and other entities; equipment and personnel allocation. Creation of a detailed form proposal containing fields identifying possible types of environmental aspects to be observed.

6. Teachers and technicians, after identification and selection, are trained to monitor the input of data generated by the students and to guarantee the network operational conditions and its chain of command, particularly the preparation of reports and answers to inquiries.

7. Follow-up of the environmental information system installation at the participating schools. First interactions and competitions.

8. Operational tests of the horizontal (lateral) and vertical (chain of command) information flows. Supervision of the type of content produced by the network's members in order to avoid the deliberate publication of inappropriate material. Continuous training in installation and support programs.

9. Experimental deployment of the information network; monitoring and correction of improper use.

10. Promotion, in the same initiative, of digital and social inclusion, the latter mainly through financial support, with the addition of the environmental inclusion of young people, namely geoinclusion, since it is primarily spatial. These inclusions promote knowledge gain (information) about the environment in a direct, timely, organized, dynamic, available and efficient way.

4. CASE STUDY APPLIED AT THE AMAZON REGION

An experiment recently carried out at the Federal University of Western Pará, called Citizenship Agenda, presented some noteworthy results (XAVIER-DA-SILVA & MARINO, 2011; COMUNICAÇÃO/UFOPA, 2016; UFOPA *et al.*, 2016).

Its main goal was the conveyance of the concepts, methods and techniques associated with the generation and storage of large masses of environmental data. This initiative is entirely able to support the consequent dissemination of the acquired knowledge.

The project has generated a collection of scientific, technical and administrative knowledge. This knowledge base, which is latent in any educational system, can support the kind of innovative experiments proposed here as Proactive Education, and has already been the subject of an international publication (XAVIER DA SILVA *et al.*, 2011; XAVIER-DA-SILVA & MARINO, 2011) as a possibility exposed in programmatic terms. The project results are available on the Vicon SAGA Platform, accessible through http://viconsaga.com.br/agendacidada.

4.1 Steps of the Proactive Education Experiment

More recently, new experiments of practices for the promotion of proactive education have been conducted in the Southeastern region of the state of Parᾶ. High school students of the Federal Institute of Pará (IFPA), from the Conceição do Araguaia campus, were subjected to innovative learning practices.

The following stages illustrate the chronological activities for the preparation, execution and dissemination of the results, involving 60 first-year high-school students from the Federal Institute of Pará in the city of Conceição do Araguaia.

4.1.1 Preliminary Workshop (Day 1 – Morning)

As the process initial stage, a preliminary workshop was undertaken as an oral presentation to the students participating in the activity (Fig. 1). Its purpose was to instruct them about the data collection activities to be carried out in the field.

The students were given total freedom of choice with respect to what they would report, with no suggestion or imposition of subjects to be addressed during their field activities. They had complete freedom to portray only what interested them the most.

Events and entities were classified by the students as beneficial or harmful, justifying their opinion. They were instructed to fill in a basic form in order to classify the subject.

Each student had been informed that all their collected material would be published on the Internet and, therefore, have their names related to that topic. This initiative created a "filter" of sorts, avoiding the occurrence of any excesses (obscenity, extreme violence, etc.) concerning the contents covered.

Fig. 1 - Instruction workshop to data collection activities.

4.1.2 Field Data Collection (Day 1 – Afternoon)

The next step was the data collection in the field. The task was performed in small groups of three to four students who freely roamed around the city (Fig. *2*), so that each student collected at least two environmental records.

Fig. 2 - Data collection activity performed in loco by high school students of the Federal Institute of Pará - Conceição Araguaia Campus.

A lesson learned by the organizers was that, in order to avoid a high concentration of records about the city's popular attractions, during the Preliminary Workshop students should be instructed to work within specific areas, selected from a predetermined zoning. For the experiment conducted in Conceição do Araguaia, the city had been previously zoned in 8 sectors, as shown in Fig. 3. Hence, an approximately equal number of groups were designated for each sector.

This zoning had been established in agreement with the local coordination, respecting criteria such as the distance from the Institute and the students' safety.

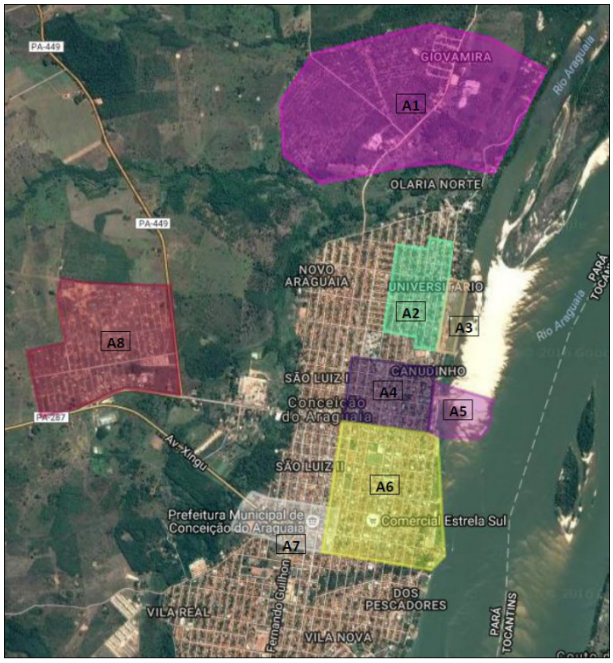

Fig. 3 - Sector division of the city of Conceição do Araguaia for the groups' collection activities: A1 – Giovamira | A2 – Universitário | A3 – Universitário (Orla) | A4 – Canudinho | A5 – Orla do Canudinho | A6 – Centro | A7 – Prefeitura Municipal | A8 – Loteamento Jardim Araguaia.

4.1.3 Data Insertion on the Platform (Day 2 – Morning)

After the collection activities, the students used the Institution's laboratory infrastructure to insert the data on the VICON/SAGA Platform.

Fig. 4 - Laboratorial activity of data input through the VICON Platform.

Regarding this written-records-based stage, it is noteworthy that the Vicon SAGA Mobile (Fig. 5) application is already in the publication final stages on Google Play Store.

This tool will eliminate the present step, since the students would be able to fill out the forms directly from the application on their smartphones, with the possibility of including photos, videos and audios. It provides users the capability to create records on field, using device resources such as camera, recorder and GPS sensor. Even without Internet connection, the application allows users to create records and store on device. Whenever connection is available, records are immediately uploaded to server, and made available for visualization by any user connected to the Internet.

Fig. 5 - Vicon Mobile Application: fulfilling and submitting forms directly from a smartphone, including photos, videos and audios.

The application also operates offline, since all data is stored in the device itself. Once the user reaches a connected area, the records are automatically sent to the Vicon SAGA Platform server and, therefore, are made available for consultation.

4.1.4 Presentation/Discussion of Results (Day 2 – Afternoon)

At last, in a new workshop, following mainly an oral exposition format, teachers and students accessed the results of the data collection and debated their topics of interest. This usually covers typical GIS functionalities, the generation of thematic maps, the export of data in different formats (e.g. maps of various formats, tables, statistics, graphs) to be then analyzed and processed. Fig. 6 depicts project's records overlaid in Google Earth application.

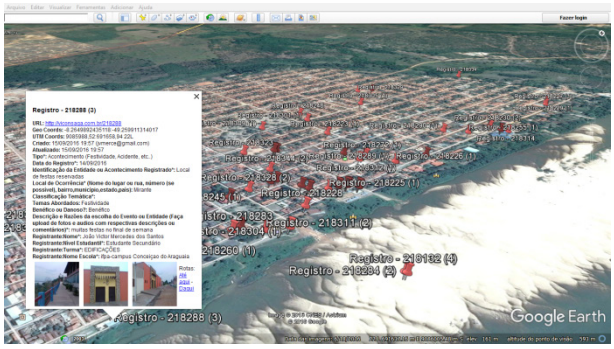

Fig. 6 - Records overlaid in the Google Earth application.

4.2 Experiment Results

After two days of activities with the students, the 113 collected and registered records were instantly published on the Platform and, therefore, immediately made available for consultation by any citizen connected to the Internet.

The results of this collaborative collection of data and information are presently available. They can be accessed at http://viconsaga.com.br/ifpa.

New workshops can be continually held with the purpose of elaborating and maintaining a cumulative and up-to-date collection regarding the environment in which the student is inserted.

This collection also makes it possible critical and evolutionary analysis (positive or negative) regarding the students' most frequent

topics of interest (e.g. basic sanitation, social and economic conditions, tourist attractions, festivities, etc.). By replicating data collecting campaigns, time series of great value for future projections on prospective scenarios can be generated.

5. BENEFITS AND CONSIDERATIONS FOCUSED ON THE LEARNING PROCESS

For being focused on the education's fundamental part, represented by the learning process executed by the student, the Proactive Education allows the implicated educators to monitor the generation of valuable and low biased environmental data. The data would be then analyzed by them and, eventually, converted into didactic material or the object of pedagogical or sociological publications.

The proactive teaching practice produces citizens able to demand their rights, however in a well-mannered way and based on their own and collective learning, and to fulfill their duties regarding the environment. The cultural dissemination of citizenship awareness is particularly relevant to qualify a significant part of the population for the proper defense and use of their environmental resources, which is currently in a remarkably unstable state.

This initiative may contribute significantly to the reconciliation of three conflicting paradigms: economic development, quality of life and sustainability. This challenging conciliation must be supported by a widespread public awareness concerning the occurrence and importance of real or hypothetical activities and conflicts. Such awareness cannot be imparted to the young students in time, that is, at school, simply by reading reports and having Socratic discussions, no matter how high-level they might be.

The environmental reality with its dilemmas, along with the easy and disseminated access to the technologically advanced tools, enhances the traditional teaching. Eventually, those dilemmas may come along with possible amplifying and accelerating initiatives to gain information, as in the present case, and its properly supervised dissemination. It is up to educators and coordinators to judge the value and the opportunity of using these initiatives in an ethical and intelligent way, without further delay.

5.1 Impacts on the Different Participative Levels

Among the agents composing the chain of command and the circulation of information, particularly in attendance with the open data law (Law number 12,527/2011), the following possible impacts could be mentioned according to their coverage levels:

- **Individual:** formation of conscious citizens, the primary objective;
- **School level:** creation of a shared dynamic memory;
- **Municipal:** low-biased information about good and bad situations in each school composing the communication network and, consequently, in the entire school network;
- **State:** surveillance (i.e. verification of isolated or joint occurrences of interest) and control (i.e. checking the frequency of favorable or undesirable situations and the creation of corrective experiments) of municipal education systems, which are state school network's components;
- **National:** surveillance and control of the state high school education systems. Besides, municipal issues and potentials can be pointed out by their best sensors: students practicing true citizenship;
- **International:** application of a high-diffusion pedagogical methodology.

The democratic horizontal circulation of information generated and stored in schools deserves highlighting. By sharing each school's collection of information, the expansion of environmental knowledge is allowed in other areas, encouraging positive emulations, constructive criticism, comparative analyses and supporting experience exchanges among the network members in a dynamic and expandable manner.

Any educational system, be it at the federal, state or municipal levels, comprises large contingents of professionals. Personal and institutional contacts of great social value are created in these systems.

Once the plethora of data processing equipment and the digital processing and dissemination of information through

communication networks have been put into use, the resulting structure deserves attention for its potential to perform highly relevant social functions.

6. NOTEWORTHY ASPECTS

Arguably, the civilizing role described in the previous section lies with the educational system, that is, the student's structured insertion in the environmental reality.

This form of insertion, which can be called "Geoinclusion" or the student's "Environmental Inclusion", contrasts with the participation individually chosen by them in the so-called social networks. In general, these networks provide contact with a certain social value, particularly for young people, but they also act as an energy drain, most of the time, because of their multifaceted nature.

Adopting a possibly conservative view, this situation is disorganized and could lead to a collective state close to the undesirable condition of maximum entropy.

Attention to the fact that the physical and conceptual conditions for carrying out these citizenship-driven activities are already available in the Brazilian educational system, namely:

a) The administrative means and qualified personnel, represented by the schools and their teachers, support elements and students;

b) Technological resources, such as data processing and, in particular, Geoprocessing, along with the use of data capturing instruments and the communication networks already installed throughout the national territory;

c) Ongoing programmatic governmental proposals aimed at digital inclusion in the form of the distribution of devices throughout the country, just as social inclusion is being implemented through scholarship granting for the population's economically disadvantaged portion. In this aspect, it should be emphasized that Geoinclusion or Environmental Inclusion is the natural path following the modern life's digital and social inclusion.

Summing up what has been previously exposed, schools will provide students with digital cameras, although many already have them on their mobile phones, so they can record aspects of the environment in which they live.

During this ludic-pedagogical activity, environmental records concerning entities and events will be collected in the form of images, videos and explanatory texts, practically avoiding any bias: a centenary church, floods, an insect plague, a procession, a festivity, some peculiar street, a voting process, to name a few.

This documental compilation, after subjected to minor screening, will constitute the school's dynamic memory, considering that the constant renewal of students will keep generating new environmental records. This memory can be stored in a georeferenced information system which is also the generator of a network that congregates other schools and related entities.

In conclusion, regarding the methodological and operational aspects of this initiative, it can be affirmed that:

- Comparative analyses revealing similarities and differences in spatial (among schools), chronological (different occasions, considering a school or group of schools) and taxonomic (different records of same-type events, e.g. variation in the way of celebrating a holy date) may constitute data sources for historical, sociological or economic investigations, among other uses, such as those of strategic/military nature.
- Competitions stimulated by periodic contests among schools can promote and increase the exchange of information, not just data, which are simple records of occurrences. The exchange of these knowledge gains, contextualized by their geographical distribution, could potentially foster the generation of systematic classifications of the social, economic, historical or strategic aspects found in that geographic region.
- It should be reiterated that, in agreement with the recent federal legislation on open data (SCHULZE, 2011), information obtained through public financial resources must be available on the Internet, a matter of great importance for the full exercise of citizenship;
- In addition to the desirable horizontal circulation, the chain of command/communication between the Ministry of Education and remote schools is maintained. The thorough knowledge of the progress of a modern and citizenship-

driven education will be able to permeate this chain, reflecting each school and the whole group participating in this Proactive Education initiative.

7. FINAL CONSIDERATIONS AND CONCLUSION

This paper, even though addressing many relevant aspects of Proactive Education, still needs to be complemented by further investigations:

- The environmental diversity of the pilot group of schools being chosen, to guarantee a significant range of environments types within the geographic area covered by the network;
- Specification of the following estimates: costs, implementation time, financing sources and remuneration forms of the communication network installation;
- Appropriate equipment dimensioning and use plan for the existing installations, considering not only their use in the pilot, but also later on, during possible system expansions;
- Definition and training of the technical and teaching staff responsible for system maintenance.

Finally, it could be stated:

- This is an innovative, low-cost and highly-demonstrative initiative that serves a variety of social, administrative, and pedagogical interests, promoting the association of new technologies and the development of young citizens.
- It contributes directly to the knowledge gain regarding environmental situations of interest by generating and managing data essential for the formation of citizens and potential environmentalists, operating in the Geoprocessing area, among other areas of knowledge.
- It provides access to plentiful and non-biased material on physical, biotic and socioeconomic aspects of different environments.
- It assures consistency with high educational and technical objectives, while fulfills and consolidates the government goals concerning digital, social and environmental inclusions.

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