

Care About Water in Curitiba, Brazil: Educational and Environmental Practices at School

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Abstract

This article aims to give relevance to environmental school practices as an extension of school curriculum for student's values appropriation. Emphasis was placed on the actor network theory, in an interdisciplinary way, about water consumption, flavored water, to grow plants and care about River Barigui, in Curitiba, Brazil. Two basic pedagogical resources were explored: a game to care about river water and strategies to increase consumption of drinking water. First, a board game was designed to pass ideas on disposal and pollution of drinking water in this Brazilian River that crosses vertically the whole west side of Curitiba's city and a section is behind the elected school. As a vital food, specially, water must be preserved clean and not be contaminated by disposal of frying oil in domestic sewage, which causes severe pollution. This specific poisoning element is subject of the municipal company of water campaign. Second, practices were made to flavor drinking water with herbs and fruits without sugar and carbon dioxide, elements that harm human health. The students and teachers understood the proposals between curriculum subjects and need of practices to fix contents. Positive testimonies about the reproduction of practices in the family and at school ambiance in order to care about water made the activities meaningful. Knowledge values appropriation in a collective group was fructiferous. Teachers and students evaluated positively the empirical network created by the water activities that brought together classroom culturally processes, curriculum contents and academic contents.

Keywords: water, education practices, environment, Curitiba, Brazil

1. Introduction

"Water and air, the two essential fluids on which all life depends, have become global garbage cans". Jacques Yves Cousteau (Note 1)

This paper discusses the importance of the relationships between university and elementary school curriculum for environmental, cultural and educational practices that can modify discussions about drinking water consumption and care about urban rivers (Curitiba, 2006; Brazil, 1998). It is assumed that the act of drinking and eating are social actions "with a sense capable of generating new values and sustainable ways of life" (Ribeiro et al., 2017, 186). On the planet there are 1,360,000,000 cubic kilometers of water available for use by mankind. This total is divided between drinking water and salt water. Only 2.8% of this volume corresponds to fresh water, with 76.78% of this percentage in the solid state, and 11.07% in the subsoil (Federman, 2009).

Therefore, the surface waters that can be captured and treated for use, in forms of ponds, rivers, springs, waterfalls are 12.14% of the total of 2.8%. However, only 0.34% is water without contamination, suitable for immediate human consumption (Federman, 2009: 32-33). "Water can be an important vehicle of biological and chemical agents potentially harmful to man when there is a lack of attention and effective treatment, endangering the health and well-being of a community". (Assunta et al., 2016: 64) (Note 2).

The pedagogical actions analyzed in this paper took place at Center for Integral Education Professor Lauro Esmanhoto, during the academic course entitled "Topics in technology and society: educational, cultural and

environmental practices for the constitution of knowledge", offered by the Postgraduate Program in Technology and Society (PPGTE) of the Federal University of Technology: Paraná(UTFPR), in spring 2017.

Ingestion of water can occur through food, liquids and beverages, allowing the body's water balance. However, water, the main constituent of the physical constitution, has the ability to hydrate the body, eliminate toxins, and regulate temperature and intestinal transit more properly than sweetened beverages. "*El inicio de la sed tiene lugar a través de mecanismos fisiológicos y relacionados con la percepción*" (The beginning of thirst takes place through physiological mechanisms and related to perception) (Iglesias Rosado *et al.*, 2011: 29). The drinking desire is related to the body physiology, which does not store water and so needs to recover its daily losses.

With the growth of the food industries after World War II, traditional home food standards, as the use of natural vital food in cooking preparations, have weakened. Especially ready drinking that led people to the consumption of beverages made with the use of additives foods and sugars (Ribeiro *et al.*, 2017).

A survey in Mexican public schools points to the difficulties of providing clean drinking water for students and staff. The presence of sugary drinks, with artificial flavor, brought from home or sold internally and snacks are seen all over de schools. In addition, the recommendations of the "Comité de Expertos de Bebidas de la Secretaría de Salud" (Beverage Expert Committee of the Ministry of Health) are focused on:

- 1 Provides clean water for school communities;
- 2 Reduce availability and access to sugary drinks;
- 3 Limit the supply of beverages to natural juices, skim milk and drinking water.

Rivera *et al.* (2008) argue about the nutritional disadvantages resulting from changes in color and taste in beverages. "Therefore, beverages with or without calorie-enriched foods should not be considered equivalent to foods rich in micronutrients. In the case of enriched caloric beverages, their consumption may further increase the already excessive calorie intake in the Mexican population "(Rivera *et al.*, 2008: 231).

1.1 Purpose of This Study

The objective of the paper is to give relevance to the environmental, cultural and educational small practices expanding knowledge of consuming and taking care of water. Two main viewpoints were presented to care about water: an urban river to provide water and habits to drink water. The actors' challenge, in Curitiba-PR, Brazil, was to care about water we drink and use it in many ways: wash clothes, dishes, shower, and others. The university and elementary students and teachers applied two didactic resources in this scenario: exercises, practices, games and dialogues in the classroom. These small actions carried out in a public school came from the relations between university and school community, in a disciplinary and interdisciplinary context, according to the institutions partnerships and time. We agree with Rossiter *et al.* (2007) in the three dimensions of teacher-student relationships. "First, school nutrition policy can alter the types of foods available in school [...]. Second, teachers are important role models for children and youth and can promote valuable nutrition information through their own daily food practices. Third, teachers are authority figures in the classroom, with the potential to provide knowledge about healthy food practices, to a large number of students from a variety of socioeconomic and cultural backgrounds" (2007: 695).

The knowledge appropriation process about environment and culture of water uses started with small projects for elementary school students in grades 5-6, outline with theory and actions to increase the understanding about caring about the water, natural element in life, and to emphasize its importance for the survival of life in the Planet Earth. It was hypothesized that academic and elementary school knowledge are positively correlated through disciplines referrals and equally important information about external curricular projects, taking into account that we have local perceptions about drinking and using water.

2. Projects, Materials and Methods

The academic students and teachers, before going to school, first developed interdisciplinary workshops projects, and specific organized to deal with socio-environmental issues and to improve educational potential in school in urban area. A very different sort of initiatives using the actor network theory was applied to leverage social learning. The culture practices of dialogue, participation, mobilization, subjective and intersubjective, in school and at the university were privileged. They developed appropriate environmental practices to young students that took place in their daily school activities during two months.

Methodology in its essence was to measure qualitative field notes. The authors of this paper were the human actors responding to the non-human practical activities, realized in the neighborhood of Pilarzinho borough in the city of Curitiba, Paraná Brazil. The growing knowledge overview of practices was based on some concepts

of the Actor-Network Theory (ANT), originated from the Science and Technology Studies (STS). The idea to combine subjects and objects, humans (municipal government, teachers, students) and non-humans (technologies, texts, costs), that could be used as network to trace academic and school relationships.

The theory rejects determinism, reductionism and a linear model of scientific and technical changes, and is committed to reveal aspects of how ANT influenced social studies of technology. These studies started in the sociology of science and technology and spread to other academic disciplines. From Michel Foucault, Bruno Latour and Michel Callon, public intellectuals, emerged its popularity, are they are very important scientists actors-network to “open the black box” of science and technology elements. Darryl Cressman (2009: 2) says that “one person’s use, or reading, of ANT may differ considerably from others” because there are so many actors and so many cases within a network in the processes constructions. Science and Technology Studies after 1980 assumed a priority also for Michel Serres, Madeleine Akrich, John Law, Wiebe Bijker (Lemos, 2013: 34).

The challenges were to have a physical space in the classrooms, in the classes’ schedules, acceptance in the proposed themes, and finally allowance of the teachers and students to interfere. After, the actor’s network builders (authors’ paper) interact with the institutional school direction, especially with the pedagogical coordination to get the acceptance of their projects, it was possible to give meaning to conversations, projects texts, technologies, humans people, and distribute the roles.

It is impossible to omit failures and successes regarding bureaucratic procedures and negotiations between university and school, and teachers and documents required by the Municipal Education Department - Curitiba-PR. To review and discuss different contributions, in relation to the accounting research, “the importance given by Latour to inscriptions and material and quantitative objects, as well as Foucault’s interest in devices and apparatus associating material and immaterial components, were of great interest for researchers trying to provide a social sense to accounting practice” (Chiappello & Baker, 2011: 153).

Mapping interactions, the networks became larger enrolling new connections with themes and school projects. A timetable with the schedules and delimitation of classes for the proposal of the educational practices were set up by the school unit, in the morning, with the consent of the regent teachers. Each workshop lasted approximately one hour and twenty minutes, and eight distinct groups of 20 students participated of it. The students could learn by making conceptual connections relating to areas as Natural Science, Geography, Mathematics and Language. They covered broad range of practical and relevant technological subjects, facilitating collaboration among students and teachers. All tasks were recorded directly; through photographs, videos and notes.

3. Literature Review

In the school institution there are innumerable materials or didactic resources that contribute in many ways to the teaching and learning process and the curricular contents. These resources, and powerful and influential actors, are nothing more than material technical objects - black or white boards, desks, chairs, tables, electronic devices such as radios, televisions, computers – that are strategies to enroll others ways to work in classrooms and at school, more broadly. Within this context, the teacher, a human actor, can explore different needs, demands and indispensable characteristics to establish the necessary connections between heterogeneous actors that will be part of networks of building knowledge.

John Law (1992, 382) gives an example about a situation in a classroom with a teacher, students and a projector. They are in the same analysis level. The transparencies mediate the communication between the public and the teacher. Many situations are possible: the students ignore the teacher; or to bluster the podium and take the control. Humans and non-humans interact: “But they don’t, and while they don’t the projector participants in our social relations: it helps to define the lecturer-student relationship. It is a part of the social. It operates on them to influence the way in which they act”.

Justesen & Mouritsen (2011: 175) speaking about the interaction between contract and accounting explains how the non-human and human networks are full of meaning to society and technology: “The contract gets changed due to the knowledge created by accounting calculations. This change reflexively influences the contract and the relationship between the parties”. The relationship between firms and contracts became dynamics in the senses of unpredictability and diverseness ways to negotiate. Towards to these human and non-human relationships transformation, Bacci & Patata (2008: 219) separate three aspects for educational research: “in the subjectivity of the teacher-researcher, which is, in his individual dimension; in the constitution of the teachers’ collective and in group articulation; and, finally, in the whole context in which the research is being constructed” (Note 3).

Individual and collective view, and the context must be studied says Law (1992). At the core of actor-network theory, a network is as an actor uncertain, not finished. “In the methodology detailed thus far, it seems obvious

that technology cannot be presupposed as an autonomous thing that exists outside of the social world. Technologies contain a variety of political, social and economic elements as well as science, engineering, and the particular histories of these practices” (Cressman, 2009:9).

The actor-network social and the technical universes do not reify or obscure methods. The differences among them are the material for studies and explanations. Cressman (2009:6) eliminates the two dashes “power and the size” of any study of organizations because these aspects intervene in the comprehension of how it is performed the sociotechnical world. “What is needed is an understanding of technology from the inside, both as a body of knowledge and as a social system”. John Law (1992) says that the theory deals with the effects of the interaction between

At school, each one holds and performs specific functions and / or actions, with a role of equal relevance within the Network to which they belong. There are the education workers (teachers, directive staff, cooks, clerks, general service aides) who are responsible for the operative use of objects, and the school daily routine. Human and non-human, therefore, present themselves in a hybrid way in reality and configure themselves as Actors of a Sociotechnical Network. In other words, the actors that integrate a network are not only human, as pointed out by Peci and Alcadipani (2006: 148) (Note 4). “The idea is that society is made up of humans and non-humans, subjects and objects. In everyday life, humans and non-humans are never dissociated. They form, together, networks that constitute what we call real. Each action we perform is associated, or is mediated, by non-humans who also act, presenting, as well as humans, capacity for action”.

The variability in the school space, with the actions, vocations, visions, hierarchies and mediations which collectively operate with human and non-human actors, is an Educational Sociotechnical Network. The knowledge built is a process with melted heterogeneous relations and materials. In interaction with the different areas, the actors concentrate efforts from the complexity of factors to create new practices and demystify materials and methods (Law, 2009). Also, among the non-human actors is the notion of sustainability, referring to the context of the river and its geographical boundaries. This viewpoint involves social networks and forms of solidarity, partnership and cooperation among public and private agents.

3.1 Urban Waste and Water Care Actors

Large amounts of fertilizers and pesticides, growth of algae, called eutrophication, chemical industrial processes, sewage running directly into rivers, strange smells coming up through your water pipes and rubbish thrown directly into rivers are some examples of water pollution and decrease of oxygen levels that affects the possibilities of marine life. We need to participate in movements against groundwater pollution, especially coming from the industrial process. Education actions and the more environmentally friendly they are, changes this real problem and reach out to people and government representations.

The polluted water threatens the human consumption of drinking, washing or cooking. It also asphyxiates fishes and insects, harm birds, animals, and plants’ life, and cause illnesses. As cities expand, the populations must learn how to prevent water pollution, and for so, it is important to know how we create this embarrassing situation. The contaminated water with natural elements like sodium needs to be filtered or boiled before used. “In the past, human waste was deposited naturally in natural systems but with increasing populations, the load of human waste has far exceeded the natural systems absorption and cleansing rate. Therefore, without modern sanitation systems to help relieve the natural systems, these systems, including water, degrade” (Duraiappah, 1998: 2175).

Unfortunately, in Brazil, the major people are not aware of their own consumer acts at home and outside of their borough in the sense to cooperate to diminish rivers’ contamination. They don’t realize how important is to get involved with their communities, to establish a network to prevent and change their concepts. What we need to start getting involved is to set up groups for talking, learning new skills and share information. After this introduction, the actors feel stimulated to get together, to mitigate exclusion, to plan particular issues in short and long term to improve a variety of ideas for the local area. Debates and discussions led to sustainable actions.

For example, if each one dumps few pieces of trash in rivers, soon they accrue in a big amount of rubbish. While we created this, the collective impact will require more money and care from the sewer systems. Moreover, “big shots are only little shots who kept on shooting”, said Dale Carnegie (Note 5). To clean them immediately is the solution. There are many initiatives to reduce the huge amount of waste. Whether big or small, to keep it tidy, and also the neighborhood streets and sidewalks, mean river springs saved from pollutants. We can organize cleanup days for our close rivers.

Respect and protect the water regulations are primordial attitudes, and also depend on a number of interrelated factors to make available to us. If we're concerned about it, we can take care of rivers calling the water company if we suspect sewage system is in need of repair and prevents the water becoming polluted. Get in touch with the municipality if people pour harsh chemicals down the sink or toilet because the risk to get back around. The garbage disposals are also a buildup of bacteria when disposed of inappropriately. The best way to transform this material is a composting pile in the yard or garden. It is like to recycle for the environment and to avoid pollute groundwater sources.

Hand out information to our students (and neighbors) of safer water practices is gently teach them about environment, cultural and how to contribute not to build up garbage or store chemicals. We can also try to start a recycling program to separate properly the materials. The sooner we face this big issue, the sooner we become an active part of the fight to access cleaner drinking water.

It is important to establish a scale of priorities to find alternative solutions to the problems of school communities. A traditional problem that demands reflection on information and experiences, besides changes in behavior, is the relation between drinking water and garbage that comes from consumption. The twenty-first century industrialization is full of objects with short life cycle and is commercialized all over the world. This makes people feel stimulated to improve their comfort conditions and enjoy the luxury of abundance. The Earth Planet is marked by the environment degradation due to population growth and the increasing demand for natural resources and waste production. "Environmental degradation can occur naturally, or through human processes. The largest areas of concern at present are the loss of rain forest, air pollution and smog, ozone depletion, and the destruction of the marine environment" (Etuonovbe,2009:2).

The use and care about water is directly related to environmental degradation and waste generation. The excess of waste produced in the Planet, and disposal everywhere, has been one of the central problems faced by large urban centers. This has been affecting the quality of water in rivers and lakes. To recognize that we are learning to diminish-generation, to reduce discrepancies, to reuse and recycle solid waste is essential upon our ignorance in the field. But, as actors of a network, we have to advance. At least, in Brazil, there is a National Policy of Solid Waste (PNRS) since 2010. Reality is multifaceted, but some cities are working to get a proper management of solid waste. Understanding the world, the policies and planning management can often do little, but combined with people's approach to find a logical end-point, everything can be put to practice (Brazil, 2010).

Since the event entitled Rio 92, a conference promoted by the United Nations on Environment and Human Development, dealing with the wholes, adopted that the humanity future is common. The approach is valid nowadays, but the planetary environmental destruction, pollution, climate change and consumerism have only grown up. All these situations have been recorded as unsustainable and claim for care and preservation measures. "On planet Earth, there are innumerable and intensely increasing human interferences in natural cycles, resulting in a series of environmental problems of degradation of the biosphere, which have harmed the life of living beings on the planet, including humanity itself. Such problems are due to human behaviors that are inappropriate to the environment and need to be changed, such as the inadequate disposal of domestic effluents and solid waste" (ONO, 2012: 45) (Note 6).

3.2 Cooking Oil Disposal

Presently, according to the Brazilian Association of Vegetable Oil Industries (ABIOVE), less than 1% of the cooking oil that is used ends up being reused. In 2014, Bras Iia, Federal District, The Brazilian agriculture enterprise (Embrapa Agroenergia) and the environmental sanitation company (Caesb), with resources of a Brazilian Innovation Agency (Finep), installed a plant to transform the frying oil into biodiesel. The main objective of this initiative is to reduce its volume dumped in the sewage network. "It is desirable to expand the use of the frying cooking oils discarded, almost totally, generating burdens for sanitation companies and polluting the waters" says the Association (ABIOVE, 2016:6).

The waste pickers are very important workers in this process. Their participation is in all sectors: services, commerce and industry. There are Industrial Programs, situated in many places in the country (Bahia, Paran á Cear á and Sao Paulo) to collect this cooking oil as a raw material for producing energy: the biodiesel. "The increase in the share of biodiesel in the Brazilian Energy Matrix by the gradual increase of the obligatory mixture, it can follow the schedule: B7 (2016), B10 (2019), B15 (2025) and B20 (2030)" (ABIOVE, 2016: 2).

Assuming that the consumption of fried food has grown, also in industrial food, the incorrect generation and discard of residual cooking oils represents a socio-environmental and economic problem for the Brazilian nation. The water pipes become clogged, the groundwater contaminates, the plants and fishes die, and the costs for maintenance are 25% more expensive. Rabelo & Ferreira (2018) found that in the city of Goi ánia-GO, located on

the central plateau, the oil and fat disposal of establishments such as restaurants, bars, snack bars and residences was 2,601,928.2 liters per month. The impact of those volume moved the government and an enterprise to create a Program entitled “olho no óleo” to collect this material. The establishments must register themselves and call on a specific number (115) to ask to pick it up. For residents, to keep the oil out of your sink, the best is store the oil in plastic bags or sealable containers. There are collecting points to drop it for recycling, and get credits in the water bill. This logistic exists also in other Brazilian cities (Ecoleo, 2018).

In mid-2016, the water and sanitation company of Paraná state (Sanepar) launched the campaign, “Treat the Network Well” through public and private partnerships. The Company expects that 500 thousand liters of oil per month will be correctly disposed. The separation of cooking oil is important, says Sanepar Company. The company is starting to put forward the pick-up logistic and so prevent pollution of rivers. It is a kind of a gadget to store the fried oil in a plastic bottle called “Oliplanet”. It is an adapted utensil that promises to lessen the problems when transferring the oil from the frying pan to a plastic bottle.

The objective is to encourage cultural change and help people to think about how we can cooperate to reduce environmental impacts. With free distribution, Sanepar, the water company, expects that the special funnel can be an object of change of attitudes and mind, and to show how serious are the aftereffects of this type of contamination: “to every one liter of oil you separate, you stop polluting 20 thousand liters of water!” (Oliplanet, 2018). The Oliplanet was developed by the art director of the advertising agency Master Rome Waiteman, David Keller. “One of the reasons for the low recycling rate is the lack of practicality to separate the oil,” he says (Oliplanet, 2018). (See Figure 1).



Figure 1. Oliplanet

Source: <http://oliplanet.com.br/>

The ball-shaped utensil is blue to allude to the Planet Earth color. It splits in the middle where the top is the lid and the bottom forms a funnel that is coupled to the mouth of the plastic beverage bottles PET, making it easier to discard at the moment to transfer the oil from one container to another (see figure 2).



Figure 2. How to use Oliplanet

Source: <http://oliplanet.com.br/>

All the bottles filled with fried oil should be delivered to collecting points such as: on special days in bus terminals (Note 7), at schools (Figure 3), hospitals and supermarkets. On the website of the Municipality of Curitiba it is explained the importance to separate waste correctly, particularly because it is possible to save energy, industrial raw material and to cooperate with the organization of the garbage collectors (Ecocidadao and

Cambio Verde) (Note 8). Safer water practices by the citizens can make a difference in the communities, notably to lessen water pollution and to support Sanepar Company toward providing cleaner drinking water for generations to come.



Figure 3. Collecting point at the school Lauro Esmanhoto

Source: authors

3.3 Water Value for Human Body

Water is a liquid substance presented in all living organisms, in different amounts quantities. In the human body, this compound cannot be stored, and it is necessary to drink it several times a day. From 60% to 80% of the total body weight is water. The main component of our cells and the extracellular fluid are located in the muscles and in the physiological processes. The water is a powerful solvent and transports human substances, such as oxygen, and it is part of the blood plasma composition (Santos, 2018).

Furthermore, the water brings nutrients to the cells, eliminates toxic substances by the urine, which is a waste product in the process of cleaning the blood. Each person, according to the physical activities performed, the climate and the body temperature regulation needs to ingest an amount of water. If someone drinks too much water, the body releases the sweat that evaporates to the surface of the skin. The tears and the saliva are watery substances made of water and other elements that contain nutrients for the eyes and for digestive functions (Santos, 2018).

“Water is the main component of the human body mass. It is essential for the physiological processes of digestion, absorption and elimination of non-digestible metabolic waste, and also for the structure and function of the circulatory system. It acts as a means of transporting nutrients and all body substances, and has direct action in maintaining body temperature. The human body has 75% water at birth and about 60% in adulthood. Approximately 60% of this water is found inside the cells (intracellular water), the rest (extracellular water) circulates in the blood and bathes the tissues”. (Iglesias Rosado et al, 2011, 28) (Note 9). Bent Friis-Hansen (sic), Malcolm Holiday, Thomas Stapleton, and William Wallace, in years 1950, analyzed 24 infants and children body water, not correlating age or sex of them, and verified that the body water, in premature and newborn babies, regulates between 70% and 83%. From de six to eleven months, there is a gradual decrease that varies from 53% to 63% (Hansen et al., 1950).

Regarded as the most important nutrient, the water guarantees to the organisms a protection. "Membranes that surround the nervous system (meningeal), for example, are lubricated by a liquor, a water-rich substance that provides mechanical protection to this system" (Santos, 2018). Joint fluids also have water and protect the bones from friction. With so many functions of water in all living organisms, it is vital that we be very well hydrated (see Figure 4).



Figure 4. The amount of water in human body

Source: <http://brasilecola.uol.com.br/biologia/importancia-agua-para-corpo-humano.htm>

Moreover, all bodily functions to be daily exercised properly need at least intake 2.7 liters for women and for 3.7 men a day (Note 10). "The average urine output for adults is up to 1.5 liters a day". If the body receives less water, below normal, the motivation and effort reduce, and also the temperature control mechanisms and the central nervous activity suffer alterations (Kravitz, 2008. in Murray, 2007) (Note 11). Initially, we felt thirst, dry mouth, cracked lips and darker urine color. Our body can stay long time without food, but not without water.

Beyond that, this substance can also be withdrawn from all foods, which differ only by the quantity of water available in each of them. "Food contains different amounts of water. In their immature stages the plants contain 70-80% water (20-30% dry substance). However, seeds contain no more than 8 to 10% water (and 90 to 92% dry substance)" (Wattiaux, 2018: 5) (Note 12). Mopuri (2015) says that "in ideal conditions at room temperature (70 fahrenheit/21 degrees Celsius) with no food, a person could potentially last as long as 12 days. This would be on the extreme end of human survival though; a more likely estimate would be approximately 3-5 days without water" (Mopuri, 2015).

4. Academic Projects Transformed in Workshops

4.1 Workshop 1-Game "I Take Care of the River"

This activity project, explored with school students, was a basic pedagogical resource to encourage them to take care of water. It was composed of video, discussions, explanations, questions and answer exercises and the game dynamics and strategies experimentation. The aspects of collaboration, transformation and engagement of the actors, regarding drink water preservation in the city of Curitiba-PR, focusing on the Barigui River, aimed at privileging the interdisciplinary, socio-cultural and sustainability perspectives,

During the initial conversation, the students had contact between the two main subjects: how liquid grease and oils discarded damage the rivers and how the proper disposal of wipes; fats, oils, and grease are important to not contaminate drinking water. Also, they had a good participation in the oral exchange of observations about the Barigui River, because part of it flows behind the school and other parts are in their way from home to school. The process of teaching or learning was yielded through many questions and answers about safe water, cost-effective recycling solutions and environmental problems.

After that, a video-cartoon entitled "Let's take care of the environment" was presented as a moment to the students and teachers to think about topics of environment, history, ways of dealing with water problems and to express themselves "As a rule, films and drawings are vehicles for "product placement", and children are particularly vulnerable to these subliminal messages" (Jempson, 2002: 124) (Note 13).

The third part of the activity was the game "Eu cuido do Rio" (I care about the river). It had been a way to encouraged teachers and students in their purpose to conserve water clean and never pour grease down the sink, or directly into drains. "I must care about the river" because many animals live there and the fried oils make the oxygen level in water to low. The game, as a methodological resource, aimed to present in a ludic and funny way the actors network interaction to disposal garbage in water, soil and air. This specific knowledge in relation to our lives in school and home goes together with the competences of perception of different culturally social realities. The game board, (figure 5) is the outline of Curitiba's city area, with the Barigui river represented in the blue color and the seven parks along it depicted in green (Note 14).



Figure 5. Game Board "Eu cuido do rio!". The blue line is Barigui River; the green balls are the parks
Source: Authors.

The main objective of the game was that one of the teams arrived first at the end of the course of the river and received as a reward one OLIPLANET and the title of winner. Although only one winning team was identified in every game match, all participants won a sticker written “I care about the rivers” and an OLIPLANET to discard properly the oils.

It is a simple game regarding the video games that can be replicated in different contexts, with changes according to the objectives. The reproduction of the material resources for the game is accessible, with low printing costs. The cards as showed in figure 6 were written in the form of playing cards and contain the challenges presented in the game route.

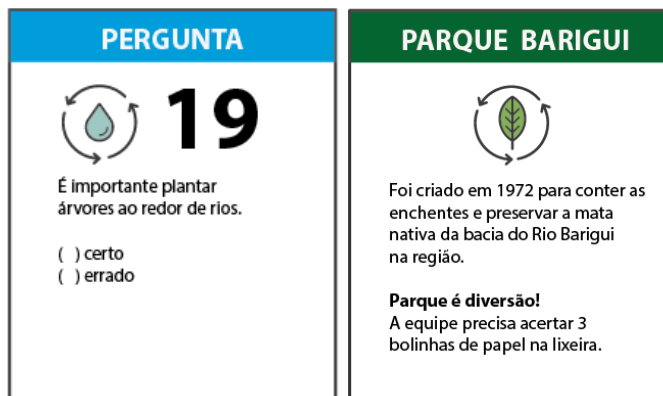


Figure 6. Blue and green cards are complementary and have subjects about consumption, disposal and pollution
Source: Authors

The cards' contents were related to the environmental cares as planting trees, to pee in the shower and event dates. The wrong answers were compensated with tasks like singing, dancing; hitting targets and others. Throughout the activity, the green cards, referring to the parks, presented challenges like searching for a toy alligator hidden in the room, dancing as a bird or a flier, and imitate noises of animals. Throwing trash in baskets as a basketball game sparked many emotions for the students.

During the four sessions, the Game Board was signed by the different students who participated in the activities. This attitude was a special symbol of engagement or commitment to care about the water and rivers. Outside the classrooms, the Game Board was hung it on one of the school's corridors, giving greater visibility to the activity and to all who participated in it (see Figure 7).

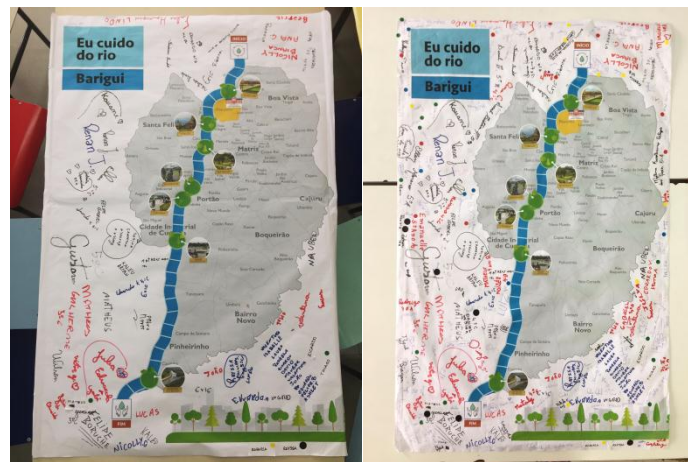


Figure 7. Game board at the beginning and at the end of the activities

Source: Authors

4.1.1 Results

By analyzing these three parts of the activity “Eu cuido do Rio”, we realize that the map of the city designed as a Game Board could cover the subjects under the aspect of many disciplines: design (artistic, aesthetic), geography (spatial localization of places, like their school, and of themselves), language (reading and comprehension), history (progress of the city), and science (environmental facts, water contamination).

The students were able to feel as a network acts in the sense to pick up that all cities are involved in the same mean: to care about de river. As human actors, they saw in the map their house, their neighborhoods, the parks, the school as part of the non-humans actors. They were very excited, anxious and nosy at the end. That means that they were integrated and forming a body. Although the game brought relaxation, the knowledge was motivated and also developed the critical ability to think about some specific subjects. (See Figure 8).



Figure 8. Students playing the game at school and trying to figure out how to use OLIPLANET

Source: Authors

They could construct the actor roles and the negotiations through the questions done and the different answers obtained during the match. The stronger doubt was about peeing in the shower. Is a way or not a way to preserve water? Some groups responded that it was not right to pee in the shower. Others didn't have arguments to say it is right. Most of them confessed that when they take a bath or go to swimming pools they pee. A video about environment "SOS Mata Atlantica" (Atlantic Forest) was shown to explain this puzzle. Other discussions were related to that: spend water to do the dishes, wash clothes, brush the teeth, and discard objects.

4.2 Workshop 2-Flavoring Water With Herbs and Spices and Growing Them

According to the several challenges to diminish the large amounts of floating garbage on rivers; and the treatment difficulties, there are imperious interventions that might increase the water clean levels. We can help purifying water by growing native's plants suitable for aerobic wastewater disposal systems (grasses, ground covers, trees, shrubs, herbaceous plants) (Note 15). Just like these plants, herbs flourish in draining soil. To cultivate aromatic fresh herbs, savory and sweet, for any culinary recipe, as a garnish, makes food or beverage alive, pretty and nutritious. There are many agricultural techniques to combine plants in the ground or in a container, if they need a neighbor, the best time and how frequently to water and cut them, if they prefer more or less sun and the best time to plant it (see figure 9).



Figure 9. Students' practices

Source: Authors

At Ivy Tech Community College, in conjunction with Mexican scientists, professor Douglas Schauer defied his students to find a low-cost water purification alternative for poor countries. They found that the herb called coriander (Thai parsley or cilantro) in home water filtration systems works as activate carbon to absorb heavy metals. Besides, "the herb is thought to prevent cardiovascular damage, prolong sleep, minimize anxiety, and according to a study published in the *The Journal of Food Science*, potentially even help beat diabetes" (Walkiewicz, 2018).

Growing certain plants indoors or outdoors, native ones or herbs can help people to breathe better. At schools, the air quality can be improved by the plants that convert carbon dioxide into oxygen, remove the ozone gas, formaldehyde and benzene. Maier (2018) says that NASA's scientists mentioned some herbs and houseplants as air cleaners and absorbers of harmful toxins. Among them, we cite the followings: "dwarf banana (*Musa cavendishii*), chrysanthemum (*Chrysanthemum morifolium*), and bamboo palm (*Chamaedorea seifrizii*) [...] weeping fig (*Ficus benjamina*), English ivy (*Hedera helix*), peace lily (*Spathiphyllum "Mauna Loa"*), Chinese evergreen (*Aglaonema modestum*) and various species of philodendron (*Philodendron* spp.) (Maier, 2018).

A healthy diet does not require liquids to meet energy and nutrient needs. As a result, drinking water can be used to meet almost all the fluid needs of healthy individuals. However, to allow for some variety and individual preferences, a healthy diet may include various types of beverages, in addition to water. Another reason for the development of these beverage recommendations is the possibility of helping consumers to choose and the government to promote a variety of healthy drinks in order to replace the current unhealthy pattern of beverages ingested (Riviera et al., 2008: 210).

It is important to pay attention to a research made by David Benton and Naomi Burgess in 2009 about the possible relations between consumption of water and children attention and memory: "There are several reasons why children might be more susceptible to minor changes in hydration than adults. As children are often dependent on adults for the provision of drink they may not always have the opportunity to respond to physiological signals. The surface to mass ratio is greater in children than adults so that moisture may be lost at a

greater rate. Children are more active and therefore generate more heat with the need for cooling. Finally it is suggested that children have immature thirst mechanisms" (2009: 145).

Based on the arguments for the importance of water to the human body and the alternatives and healthy nutriment options, a workshop was organized entitled "Flavored Water and Growing Plants" for elementary students of Lauro Esmanhoto School. The theoretical and practical activities carried out with them took place in the classrooms. The main objective was to introduce new habits for water consumption and simultaneously stimulate the act of planting herbs and spices, for medical and edible purposes, as a way to ensure the supply of healthy plants necessary for the preparation of drinking and food with different flavors.

The recommended simple water consumption varies according to the age and weight of each person. "In general, it is recommended that the consumption of beverages with little or no calorie should be preferred over the consumption of beverages with higher caloric intake" (Hernández et al., 2012). The authors present comparative statistical data on the consumption of beverages in Mexican children who show a growing consumption of milk and sugary beverages.

Between 1999 and 2006, the interviews showed an increase in the consumption of high energy drinks (soft drinks, sugary coffee and tea, flavored milk and a drink named "atole" that is made with cooked, ground corn, diluted in water or milk and boiled), with low nutritional benefit, for pre-school children (1 to 4 years) and in school age (5 to 11 years). Moreover, "in both cases, no changes were observed in the consumption of low energy drinks" (Hernández et al., 2012: 13).

In 2009, the authors collected data from 16 Mexican cities on drinking for 1,413 six-month-olds (52.7%) by age 17 (47.3%). Children under the age of seven take more milk, and milk, than water. Teens drink more water than refreshments. During the meal, everyone prefers refreshments. The water is ingested at the intervals of the features and the orange juice is most consumed at breakfast.

The Health Secretariat of Mexico recommends a reduction in the consumption of sugared drinks because it has brought disease risks and increased body weight. "In beverage recommendations, guidelines were developed that seek to meet the greatest daily requirement of liquids through water and other beverages with low energy content" (Hernández et al., 2012: 16).



Figure 10. Flavored water with roots, vegetables and fruits

Source: <https://mejorconsalud.com/agua-de-sabores/>

The student products or behavior during the different appliances of the workshop didn't count for effective educational practice. The emphasis was placed on the importance of daily drinking water intake, juices or soft drinks, and in the direct and indirect impacts on the benefits of water, flavored or not, sugars, gases and chemicals. The beverages like flavored drinking water prepared in classroom were basically the ones presented in recipes (text genre) showed in power point and in paper (Marcuschi, 2002). The healthy school drinking was tasted by all and evaluated through a graphic of stickers expressions. The recipes 'paper was cut and transformed in a little notebook for the students 'family.



Figure 11. Students preparing the flavored drinking water

Source: Authors.

A recipe was chosen to be made by the students. The presented beverage was made with drinking water, fruits and leaves of herbs. Thus, the water had a different color, flavor and aroma, and it was called flavored or flavored water. All the students tasted the drink and expressed their feelings and points of view about the taste and aromas of the ingredients used. Later on, the testimonies came around the school.

In Brazil, the students can drink water from the tap and can buy mineral water. But in United States, the bottled water is preferable, although the policy government intervention to improve the access, consumption and quality of tap water. Two problems can be presented: “relying on bottled water to address students’ hydration needs is problematic. The cost of bottled water discourages children from drinking an adequate amount of water, and the excess waste from bottles that are discarded rather than recycled could have a negative environmental impact”. (Patel & Hampton, 2011: 1374; & Patel et al., 2010).

In Germany, the policy of placement of water coolers in cafeterias on secondary schools didn’t reduce the student beverage intake or increase the water intake. On the other hand, in 32 elementary German schools, with an educational program, filters and coolers, to encourage students to drink water had good results (Loughridge; Barratt, 2005).

4.2.1 Workshop Results

Almost all the school teacher’s believed that it is important to change habits and chose healthy beverages when eating. They introduced the flavored drinking water in their school meeting room as an alternative practice. They also saw the food practice in an effort to an encouragement for students to break the traditional social verities and consuetudes. Some students were surprised that school teachers adopted our drinking practices. In contrast, others didn’t support it. The beneficial change in practices was also seen outside the school. More than three or five students caught the attention of their family when they met and recognized some of us as “the juice teachers”. It was meaningful for them the classroom practices, indicating a change in food relations with school activities. The student’s incentives in health promotion must be oriented on the nutrition focus and dietary behavior. The workshop suggests a small model of healthy eating, given the proliferation of bottled beverages and concerns about the school food habits. The actors brought a beverage option despite others improvements could be added in the nutrient standards of prepared juices and soft drinking. It is worthwhile to mention that the school teachers introduced the both workshops subjects in the School Science Fair, open to the community. These findings should be considered, in the sense that teachers play an important role in improving healthy behaviors and attitudes of good programs (See figure 12).



Figure 12. Teachers and students drinking flavored water

Source: Authors

The planted herbs at school were: mint, lemon grass, rosemary, garden basil, purple basil and fennel. The seasonings were the green onion and the parsley. This practice provided students with meaningful learning, a knowledge that instilled curiosity into the research, and a network of thoughts under discussion among “peers future researchers”. Besides, the city policies were complemented because the government is working for regulation of school solid waste by composting.

School garden installation is an educational tool in the teaching and learning process. It is a special moment to practice and apply many scientific concepts from biology, language, design, environment, physicals and chemical reactions. “Plants may be started from seed, grown from cuttings, or purchased as mature plants. Most classrooms begin their gardens by planting seeds because they are relatively inexpensive and their growth helps students to visualize the full life cycle of a plant” (Gardens for learning, 2010: 59).

There are people dedicating themselves to give opportunities for kids to learn through gardening. “Kids Gardening” is an organization responsible to introduce knowledge about nutritional attitudes and environment, giving value to garden based education. “We reach more than 90,000 monthly with grant funding, curriculum, lesson plans, and inspiration to get more kids learning through the garden. And this year alone, we partnered with educators nationwide to deliver the benefits of garden-based learning to more than 34,000 kids across the country” (Kids gardening, 2018).

5. Conclusions

This article gave relevance to environmental school network practices as an extension of school curriculum and introduced new ways to values ´appropriation. The game was well accepted as a pedagogical material to put actors in their roles of consumers and players. The idea to disposal the frying oil using oil planet was attractive, because the filler is like a ball and it is adaptable to plastic bottles. Symbolic, the non-human object played many roles in the classroom. All of the students learned his first function and the damage the oil makes to rivers. This specific food poisoning element can worsen the quality of city water. The flavor drinking water, with herbs and fruits, without sugar and carbon dioxide was positively evaluated in an empirical network bringing together classroom culturally processes, curriculum contents and academic talking.

The consumption of flavored drinking water and the care about the Barigui River became, within the school, a unit in the curriculum, and a daily habit for students and teachers. It was hypothesized that the related students and teachers ´knowledge and value appropriation could be positively associated to care about the water. All the practices shared with them, including the authors´ participation, established an Actor Network between academic and school places. School actor´s networks, humans and non-humans, help us to grow awareness of increasing environmental programs and studies to contribute to the development of intervention in school food practices. Clean water became one of our main responsibility and challenge issues of the present moment, affecting both adults and children.

Efforts must start in lifestyle dietary practices and include individual and educational and environmental practices. The importance of water as a vital and essential food for life should be part of our daily thinking and actions. It is up to us our personal body care, and we must treat it as a system organism that needs nourishment for all parts of it.

The interdisciplinary view made the workshops subject's meaningful to all actors. Our experiences and knowledge's appropriation allowed us to introduce changes, innovations in the both in pedagogical-didactic actions, values and in the teaching and learning process. The positive and negative impacts, if we can dichotomize the extremes, convinced some groups to socialize knowledge on the classroom, to share active and cooperative learning, and to work values and feelings of acceptance and rejection consumption. Likewise, we include attention to the body nutrition integrity to support and promote healthy dietary practices. School food practices are on beverage high in calories and low in nutrients.

To model positive drinking behaviors depends on healthy food choices and on creating recipes with nutrition ingredients and maintaining clean the rivers' water. It is not difficult to model, develop and monitor curriculum school practices and policies in water, especially because of the theme's interdisciplinary characteristics. The actively engagement of the actors is the secret, attached to a favorably teacher's training that can help guide practices interventions in delivering knowledge.

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Notes

Note 1. Jacques Yves Cousteau-French explorer (1910-1997). In https://www.brainyquote.com/authors/jacques_yves_cousteau.

Note 2. “El agua puede ser un vehículo importante de agentes biológicos y químicos potencialmente nocivos para el hombre cuando hay una falta de atención y un tratamiento eficaz, poniendo en peligro la salud y el bienestar de una comunidad”.

Note 3. “Consideramos que as pesquisas educacionais se constituem em três perspectivas essenciais: na subjetividade do professor-pesquisador, ou seja, em sua dimensão individual; na constituição do coletivo de professores e na articulação do grupo; e, por fim, em todo o contexto em que está sendo construída a pesquisa.”

Note 4. “A ideia é que a sociedade é feita de humanos e não humanos, sujeitos e objetos. No cotidiano, humanos e não humanos nunca estão dissociados. Eles formam, em conjunto, redes que constituem aquilo que chamamos de real. Cada ação que realizamos está associada, ou é mediada, por não humanos que também agem, apresentando, as-sim como os humanos, capacidade de ação”.

Note 5. Dale Carnegie (1888-1955) was an American Author and lecturer in self-improvement, public speaking, interpersonal skills and salesmanship.

Note 6. No planeta Terra, são inúmeras e intensamente crescentes as interferências da humanidade nos ciclos naturais, sendo que delas tem resultado uma série de problemas ambientais de degradação da biosfera, que têm prejudicado a vida de seres vivos do planeta, inclusive da própria humanidade. Tais problemas são decorrentes de condutas humanas inapropriadas ao meio ambiente e que necessitam ser alteradas, a exemplo da destinação inadequada de efluentes domésticos e resíduos sólidos [...]. (ONO, 2012: 45).

Note 7. At Curitiba city, the 24 bus terminals are used to park municipal trucks to collect different types of materials in specific days. The citizen must consult the following website: <http://coletalixo.curitiba.pr.gov.br>.

Note 8. The Green Exchange Program (Cambio Verde) was created by the Curitiba Town Hall and it consists in the exchange of recyclable material for season vegetables and fruits.

Note 9. El agua es el principal componente del cuerpo humano. Es esencial para los procesos fisiológicos de la digestión, absorción y eliminación de desechos metabólicos no digeribles, y también para la estructura y función del aparato circulatorio. Actúa como medio de transporte de nutrientes y todas las sustancias corporales, y tiene acción directa en el mantenimiento de la temperatura corporal. El cuerpo humano tiene un 75% de agua al nacer y cerca del 60% en la edad adulta. Aproximadamente el 60% de este agua se encuentra en el interior de las células (agua intracelular), el resto (agua extracelular) circula en la sangre y baña los tejidos ((Iglesias Rosado et al., 2011, 28).

Note 10. 1 liter = 33.8 fluid ounces.

Note 11. Murray, B. (2007). Hydration and physical performance. *Journal of the American College of Nutrition*, 26(5), 542s-548s.

Note 12. “Los alimentos contienen cantidades diferentes de agua. En sus etapas inmaduras las planta contienen 70-80% agua (es decir 20-30% materia seca). Sin embargo, las semillas no contienen más de 8 a 10% de agua (y 90 a 92% materia seca)” (Wattiaux, 2018, 5)

Note 13. Em regra, filmes e desenhos são veículos para a “colocação de produtos”, e as crianças são particularmente vulneráveis a essas mensagens subliminares.

Note 14. The city of Curitiba has 22 parks distributed in 424 square kilometers (104.773 acres).

Note 15.
<https://www.boprc.govt.nz/our-region-and-environment/pollution-prevention-and-compliance/on-site-effluent-systems-0set/plants-suitable-for-planting-on-wastewater-disposal-systems/>

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