The BigBlueButton in teaching- learning processes, invironmental education in ecotecnologies for sustainability

La herramienta BigBlueButton en los procesos de enseñanza-aprendizaje, de educación ambiental en ecotecnologías para la sustentabilidad

GALINDO-GONZÁLEZ, Leticia†*

Universidad de Guadalajara. Calle Héctor Berlioz No 5536. C. P. 45030. Col. La Estancia en Zapopan Jalisco. México.

ID 1st Author: Leticia, Galindo-González / ORC ID: 0000-0001-9882-9308

DOI: 10.35429/JTER.2020.17.6.17.29Received January 30, 2020; Accepted April 01, 2020

Abstract

The present article is a qualitative investigation of descriptive and documentary scope, which aimed to identify how the technological tool called BigBlueButton (BBB) influenced the online teaching-learning processes of six students who lived out of Guadalajara metropolitan area, and other states of the country. The results showed that students who resided outside of metropolitan area and other states of the country, who used the online technological tool (BBB), achieved a teaching-learning process that gave them knowledge and skills necessities to develop their environmental education projects in Ecotechnologies, for sustainability in their locality.

BigBlueButton, Ecothenologies, environmental education, sustainability

Resumen

Se llevó a cabo una investigación cualitativa de alcance descriptivo y de tipo documental, la cual tuvo como objetivo identificar cómo la herramienta tecnológica llamada BigBlueButton (BBB), apoyó los procesos de enseñanza-aprendizaje en línea de seis alumnos que radicaban fuera de la zona metropolitana de Guadalajara y en otros estados del país. Los resultados arrojaron que los alumnos que residían fuera de la urbe y en otros estados del país y que se apoyaron con la herramienta (BBB) en una modalidad en línea, lograron proceso de enseñanza-aprendizaje que les aportó conocimientos y habilidades necesarias para desarrollar sus proyectos de educación Ambiental en Ecotecnologías para la Sustentabilidad en su localidad.

BigBlueButton, Ecotecnologías, Educación Ambiental, Sustentabilidad

Citation: GALINDO-GONZÁLEZ, Leticia. The BigBlueButton in teaching- learning processes, invironmental education in ecotecnologies for sustainability. Journal of Teaching and Educational Research. 2020. 6-17:17-29.

* Correspondence to the Author (Email: leticiagalindog@hotmail.com)
† Researcher contributing as first author.

Introduction

Environmental problems continue day by day, it seems that the environmental deterioration that is generated is faster, than the strategies to mitigate it, in this sense different proposals have been carried out with the aim of contributing to lessen the environmental impact that is experienced, and above all, look for a Sustainable Development, which is defined as: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs, (WCDE, 1978).

To achieve this type of development, there are many proposals, among them the use of ecotechnologies, which are defined by the Ecotechnologies Unit of the Ecosystem Research Center of the National Autonomous University of Mexico, Campus Morelia (2014), such as; Devices, methods and processes that foster a harmonious relationship with the environment and seek to provide tangible social and economic benefits to its users, with reference to a specific sociological context.

This is also how the “Santiago Mariño” Polytechnic University Technological Institute (2013) defines them, as a set of techniques, derived from some sciences, that integrate the fields of study of ecology and technology, seeking to satisfy human needs, minimizing the impact environmental through learning natural and social systems, adopting permaculture foundations, being holistic and sustainable development.

The practice of ecotechnologies are called ecotécnicas, which are defined as; The technological innovations developed to preserve and restore the balance of the natural environment, as well as the sustainable use of natural resources for the elaboration of diverse products, services and materials for life, (Zarate, 2011).

Ecotechnologies involve a process of intercultural and interdisciplinary dialogue on the knowledge provided by professionals, and the knowledge that remains in the context of the communities or recipients of these different technologies, causing an impact in the context through the proper use of the natural resources and the generation of ecotécnicas to improve the quality of life of the inhabitants García, (2013).

Likewise, eco-technologies represent a series of environmental benefits, both in the metropolitan area and in rural areas, such as; the improvement of soils, reduction of water pollution, use of solar energy as a source of electrical energy, or as a way of heating water for domestic use or the treatment of food for its conservation, these encompassing mainly satisfying four needs basic; water, food, waste and energy.

Ecotechnologies for energy use

The excessive use of energy has brought negative consequences for the environment, both for its use and for the ways in which it is obtained. Among these consequences is global warming, which today confronts us with a visible environmental crisis.

Faced with this problem, it is necessary to think of other sources of energy that do not impact the environment, being the most viable; solar energy which is endless and at no cost.

Wood saving stoves.

In Mexico, it is estimated that 19 million households still use firewood for cooking. In this sense, the 2019-2024 Development Plan assumed as its main objective the search for Sustainable Human Development, through a permanent process of capacities and freedoms that allow Mexicans to have a decent life without compromising the natural resources that are the heritage of future generations, based on the fact that the common good is the product of the solidarity effort of the members of society and the support of the state, in this In this sense, the promotion of different eco-technologies is considered important, among these energy-saving stoves. (Government Secretary, 2019).

To cover the needs of a family with an average monthly consumption, 500 kilos of firewood are required, which becomes approximately 6 tons per year, this implies that this resource is increasingly scarce, in addition to the time and money they spend in bringing it or transporting it to its place of use, in this sense he became aware of the need to create another strategy that implies the reduction of deforestation, as well as the health consequences that the combustion of this resource implies and, above all, make use of optimal energy provided by it.

Wood-saving stoves are also improved, efficient or ecological firewood stoves, and the importance of these is that in Mexico 20% of the Mexican population uses firewood to cook their food and heat their homes, which is mostly located in rural areas, which in addition to consuming important natural resources, are also exposed to wood smoke, according to data from INEGI 2010, (Federal Commission for the protection of health risks, 2017).

When using a wood-saving stove, there are several benefits, as previously mentioned, the percentage of deforestation in the area where people live is reduced, since the percentage of wood consumed in a traditional stove decreases by 40% , also decreasing the time spent collecting it, its construction does not imply a high cost, the smoke no longer stays inside the house because it is expelled outside it, and thus significantly reduces respiratory problems .

Likewise, PESA (2007) considers that the benefits provided by the use of wood-saving stoves are as follows:

- Pressure on wood energy resources and local deforestation rate are reduced.
- The consumption of firewood is greatly reduced since its gallery system that conducts heat and smoke to places of better use and expulsion of smoke conserves heat for a longer time.
- Decrease working hours for women.
- Significantly reduces the emission of smoke inside the houses.
- Family members stop breathing smoke and smoking family clothes and belongings.
- The risk of contracting respiratory diseases, throat and eye irritation, headache, cough, even lung cancer is avoided.
- Savings in money for the cost of transporting firewood.
- Two or three meals can be cooked at the same time.
- The burners are protected which avoids the risk of burns.

There are several models of wood-saving stoves and among these is the "Lorena Stove" which is built with several burners and two fire channels, where the burner located above the combustion chamber is attached to the largest pots, this type of stove also serves as an oven, wood dryer, home heater and can also be used as a dining table. With respect to the two chambers of this, they can be controlled by metal sheets in the cracks, in such a way that only one burner is used.

Its name is due to the composition of its materials mud and sand (Lorena) which provides high energy efficiency, comfort and smoke control and where you can also obtain the combustion of burning wood, straw, sawdust, pineapple pine and coconut shells. (Valencia, Limón, Arruda and Cardozo, 1999)

As an important investigation, it was found that an investigation was carried out in residents of two communities in the state of Puebla who had adopted the Lorena stove, finding that they had saved 25.84% of firewood consumption and that since its adoption in 2009-until 2016, The research was done, they had stopped cutting 40 trees (Vázquez, Cruz, Santos, Pérez & Sangerman, 2016), which means a great benefit both for the health of the inhabitants and for the conservation of forest resources.

Solar ovens

Solar ovens are attachments that use sunlight to cook food without the need to use traditional fuels, the first solar stove or oven was invented in 1767 by Horaca Saussure, who experimented with the greenhouse effect and also cooked using sunlight, but Finally, Dr. María Telkesi of Hungarian origin, who developed them in the decades of 1950-1970, is considered a pioneer of solar cookers (Placer, 2014).

Solar ovens can be of two types; Concentration ovens and box ovens, concentration ovens centralize the sun's radiant energy at a focal point through a parabolic reflector, which is the point where the pot that will contain the foods that are intended to cook due to It reaches high temperatures, so you can even fry food, while box ovens are as their name says, thermal boxes that capture sunlight and keep it inside.

In both cases the materials have the characteristic of being low caloric conduction, so different risks such as burns or fires are avoided, in addition to the fact that the food retains its flavor and nutritional value.

These represent an alternative for cooking when it is intended to reduce fuel consumption, both rural and metropolitan areas can be used, although it has its disadvantages, for example, it cannot cook food directly, nor can it be used on cloudy days, but it can be used for cooking foods that require a pot.

These accessories work by concentrating sunlight on a parabolic reflector or capturing infrared radiation in an isolated box, in such a way that the sun's rays are concentrated on a small surface, just as there are solar ovens, which are boxes covered with insulating materials which They have a transparent cover and allow food to be sewn through the cooking process, both implements have reflective materials that allow sunlight to reflect in a certain area, (Unit of Ecotechnologies, 2014).

The materials used to build the solar oven must be resistant to humidity and heat, since in the cooking process, water is released from them in the form of steam and, on the other hand, the acquired temperature exceeds 100oC, for this, four types of materials are needed for its construction; a material for the same construction of the furnace, which may be wood, a material that insulates it, a transparent material and a reflective material, (Instituto Tecnológico de Canarias, 2007).

Solar cookers are safe and healthy, there is no fire or smoke that can cause affection in the eyes or diseases in the lungs, most of these ovens have a temperature between 82 and 121oC, which are ideal for preserving the nutrients in food Its flavor characteristics are versatile and adaptable to any type of construction material.

When using this type of solar oven you save money and large amounts of fuel since it is not required, as well as saving time since you can leave food cooking and go out to do activities outside the house without worrying that burn.

Solar water heater

The heating of water in homes in Mexico is obtained mainly by burning fossil fuels such as LP gas, natural gas and / or firewood, especially in rural areas, and in the productive sectors it is obtained with LP gas, gas natural, fuel oil, diesel and with electricity.

That is why it is necessary to reduce the environmental impact that has been generated over time, where energy resources, such as oil, gas and others are involved, and where we have forgotten that there is an important and endless source of energy that is sunlight, which provides heat through the physical process called radiation, and where the waves it releases travel through space and when they reach the planet heat it, considering that the solar energy that it receives in one hour is land, is equivalent to the energy that the world demands in a year, in itself only 40% is used.

In the phenomenon of the heating of the water by means of the sun, the absorption process develops, in which a part of the solar radiation is transformed into heat energy or body heat that is transmitted, in this process a part of the heat is absorbed and another is reflected, and the part that is absorbed will be from greater to lesser amount, depending on the color it has, since dark colors have a greater absorption capacity than light colors.

The solar heater offers the advantage of great savings in fuel consumption of up to 80%, making it beneficial for family spending, in this sense the importance of using solar energy to generate heat and electricity is recognized, as for example in the heating of water that we use for the bathroom, for which devices such as water heaters have been devised, which are systems that raise the temperature of the water with the energy that comes from the sun, in such a way that the use of gas or electric power, these normally consist of three parts.

- A flat solar collector, which has the function of capturing energy from the sun and transferring it to the guide.
- A thermal tank, which is where the hot water will be stored.
- A system of pipes through which the water will circulate once heated.

Water heaters are normally installed on the roofs of the house, which must be slightly inclined and oriented in such a way that it is exposed to the sun most of the day, and where its process is carried out through the process of thermosiphon, which is caused by the difference in temperatures, this happening between the flat collector and the hot water tank, which motivated a natural circulation without the intervention of any pumping system, this because hot water is lighter than water cold, (Barrientos, 2017).

There are several models of water heaters with sunlight, among the most practical is the heater made with a waste tire, its chamber is made of rubber material, flexible, but at the same time resistant, it is black, they are cheap, abundant and can contain water or air without any type of leakage, in addition to contributing to the reduction of pollution by burning them, where large amounts of carbon dioxide are generated, lethally harmful to humans.

To install the solar heater requires an approximate surface of two meters in radius, preferably located on a rooftop which allows it to have enough gravity for the water, direct exposure to the sun and a certain inclination to direct itself to the path of the sun, in addition it has the advantage that its duration is around 25 years, while that of a boiler is an average of five years.

The elements of the rubber chamber solar heater are as follows:

- Rim; the sensor of solar rays. - This works as the heat collector due to its material and its black color, it contains the hose and serves as a thermal insulator, avoiding heat losses and raising the temperature of the water contained in the hose, also the rim has a transparent glass surface which will allow the passage of the sun's rays, and at the base it has a black colored sheet that helps to better absorb heat.
- The hydraulic network; the hose. - The network through which the water circulates is a hose, which is also black to completely absorb radiation, in which the water accumulates inside to be heated and at the same time works as a storage tank.

- The absorbent plate; the black foil. -It is a plate of black painted foil itself that is placed at the base of the rim to cover the rear hole of the same rim, it serves as a heat-picking surface that emits radiation at a greater wavelength due to the effect of greenhouse, and at the same time prevents heat loss by sealing this collector.
- The transparent cover. - Glass. - the function of this circular glass placed in the front hole of the rim is to create a greenhouse effect, which reduces heat losses by convection and to isolate the collector from water from the wind and other meteorological agents.

It is recommended that the heater be located near the bathroom to prevent heat loss due to having distant pipes, since, in the path of the water through these, it could lose heat, this type of solar heater is calculated to meet the needs of a family of five members (Brito, Galindo, Ramos, and Romo 2014)

Wood oven for bread

The art of cooking in an oven made with stone and clay is lost throughout human history, it is known that they were used since the Egyptians and a wide region between the Tigris and Euphrates rivers, where clay is characterized by its hardness and its insulation since it conserves heat much better than other mud or earth.

Cooking food in a wood oven provides them with a different flavor and texture, in addition to acquiring the knowledge of building a clay oven with your own hands and especially knowing how to concentrate heat to save fuel than in this case is firewood, To build this you need mud, stones or brick lime, sand, cement, metal rods and wire, wood and cow dung or horse fermented previously 15 days, and masonry and carpentry tools.

This is built starting from the base, which can be circular or square and its recommended height is 60-70 cm. To build it, it is recommended that the materials of the area are used, such as stones or, failing that, use brick. the MA. In the last brick layer at the base of the oven is the space where the trays should be placed with what is going to be cooked, recommending putting a glass layer formed with pieces of bottle waste, which have the function of concentrating and keep the heat, and on top of this goes the last layer of brick.

GALINDO-GONZÁLEZ, Leticia. The BigBlueButton in teaching- learning processes, invironmental education in ecotecnologies for sustainability. Journal of Teaching and Educational Research. 2020

Later there is the mouth of the furnace, which can be made with two rods in the form of a reverse “U” and its walls form the same furnace with stone or brick and mud.

For the construction of the dome cross rods are placed, and on these you can put wire mesh and on top of the stones or brick, finally the layer of mud is put on the outside and inside and trying to make it well flattened, it can also be used mortar to keep the temperature in the oven more, finally a duct is placed to exit the smoke from the oven, which can be a galvanized tube.

When the food is cooked first, it must be put to the formation of the coals, once they are red hot, they are traveled to the periphery of the oven in such a way that the center of the oven is free and in that space they must be to put the trays with the foods that are intended to cook.

The advantages of cooking with the clay oven is that the heat becomes concrete, so less firewood will be required, local materials are used, and the cooked food acquires a better flavor.

Solar dehydrator

Throughout history, the human being has invented different methods to preserve food, among these is dehydration, which consists of extracting water through heat, this allows the properties of its nutrients not to be altered, this eco-technology it not only preserves food, but allows it to be stored, transported and handled.

The advantages of foods that have been dehydrated are as follows:

- It allows preserving all kinds of food such as fruits, vegetables, meats, fish, mushrooms, aromatic and medicinal herbs.
- Food can be kept for months and years, especially if stored in glass containers after dehydrated.
- Maintains the quality of nutrients in food.
- Food flavors intensify.
- Food dehydration allows them to take up less space.

- They are a food alternative when traveling.
- Food can be kept outside the production seasons of these.

The conditions for a good drying of food must take into account:

1. That the air is at a temperature between 40-70oC.
2. That the air has a low percentage of humidity.
3. That the air movement is constant.

This is necessary since, when air is heated, which is at room temperature and with a certain percentage of humidity, it increases its property of absorbing water vapor, this is because, for every 20oC increase in air temperature , its property of retaining water vapor triples and humidity is considerably reduced. In this process it is important that in order to eliminate the humidity of the food the air constantly passes, where the chimney effect develops.

Something important to mention is that for there to be a good drying of the food, these must be separated enough so that none of its parts remain where the air does not pass.

The dehydrator consists of two sections: The window for the entry of cold air, which is protected with mosquito netting and located at the bottom of the front of the dehydrator, the air goes to the drawer where the racks with the food to be dehydrated will be contained. , there is also the area where the sun's rays are caught, this concentrates the heat from the sun's rays, which allows heating the air that passes inside the dehydrator box.

There are also the racks which are made up of two black shelves with mosquito netting, also black and located inside the dehydrator box.

Finally there is the air outlet, which is a window that is located at the back and at a higher height than the dehydrator's air inlet window, which has a mesh to prevent the entry of dust or insects and where The hot air comes out once it has passed through the food to dehydrate it. (Celestine Pérez Almada Foundation s / f)

Ecotechnologies for biofertilizers; the vermicompost

Heterotrophic organisms also contribute to the formation of ecotechnologies, in this case the Californian Red Earthworm, whose function is to reduce, use and take advantage of organic waste that leaves the home or other activity, such as kitchen waste and especially manure. of animals. Earthworms through their digestive system transform these organic wastes into compost soil, in addition to contributing to oxygenate the soil through their excavation, and thus give rise to a compost called earthworm humus (National Commission for the development of indigenous peoples, 2002). The advantages of the vermicompost are the following.

- It favors the environment by reducing pollution problems from urban solid organic waste that is thrown into the open air.
- It transforms organic waste into products of great benefit for agriculture in the production of healthy food.
- The worm compost has a high microbial load that allows it to participate directly in soil regeneration.
- Increases and maintains a high level of soil fertility.
- Regulates sudden changes in pH.
- It cushions sudden changes in temperature.
- Increases the moisture retention capacity of the soil.
- Nutrients in the earthworm compost are in the form available to plants.

The protein content present in earthworms allows them to be used as a complement in human and animal nutrition (Brito, Galindo, Ramos and Romo, 20000). Other important benefits found according to Prado (2013), are the following:

- The vermicompost is a fertilizer high in some nutrients that are essential for plants such as nitrogen, potassium, phosphorus and magnesium, in addition to minerals and micronutrients which are easily absorbed by plants.
- The vermicompost also contains beneficial microorganisms, as well as enzymes and growth hormones for the same plants.
- The vermicompost has the ability to drain soils, improve their structure, as well as moisture retention.

The BigBlueButton Tool (BBB)

BigBlueButton is an open source synchronous tool, which has proven to be an effective alternative in educational processes, since it gives rise to virtual spaces for real-time communication where students, the advisor and students can exchange information through a videoconference, chat, whiteboard, as well as file sharing, thus generating a teaching-learning process remotely.

The BigBlueButton tool provides a series of elements that make interactivity possible between those who participate, such as:

- It has an interactive whiteboard in which the participants can present transparencies, clarify doubts, make comments, make annotations in relation to the file or the image that was uploaded to the whiteboard, the whiteboard is normally controlled by the teacher, but the teacher can also give command to one of the students.
- Also this tool allows the students and the advisor to see and hear each other, where the teacher controls who is participating by giving the voice to one or more of the students.
- It allows the teacher and students to share their desktop or a window in real time, giving them the opportunity for participants to make their demonstrations or raise questions such as the realization of a technique, application or tool.
- Each student can choose the practice they want to do, such as talks, giving a presentation, holding a seminar.

- This also gives rise to interaction between the students or between the advisor and students, through audio, video and text messages.
- Another of its advantages is that the sessions can be recorded and watched as many times as required according to the needs of the participants, (Grimaldo, Fuertes, Cobos and others, 2014)

The problem

The students of a Bachelor of Education with a specialty in Environmental Education from a Virtual University, began with their professional practices, where they would carry out an Environmental Education in Ecotechnologies project in different locations in the Guadalajara metropolitan area, which was mainly intended for low-income people who live in remote locations, aiming for people to know and become aware of the importance of making a different use of natural resources, and to develop a different way of relating to the environment, in addition to having savings in expenses. The project included the following stages:

- 1st Stage of information; where they would be provided with knowledge to identify the elements of the environment, their dynamics and relationships, using for this pedagogical strategies and didactic resources.
- 2nd Stage of awareness; where people would be led to a process of reflection based on the lessons learned, about the importance of caring for the environment through the use of different ecological technologies.
- 3rd Stage of Planning of ecotechnology; at this stage he would plan the development of the construction of eco-technologies.
- 4th Stage of construction of eco-technology.

At the beginning, six students who resided in the Guadalajara metropolitan area were enrolled, so it would be easier to carry out professional practices, since the advice of teachers would be in person.

Subsequently, the application was received from 6 students who were very interested in participating in these professional practices, but resided outside the Guadalajara metropolitan area; two of these in other municipalities of the State of Jalisco such as Atotonilco el Alto and Ocotlán, and four other students in other states of the country, such as Toluca of the State of Mexico, Mérida Yucatán, Cd. Jiménez Chihuahua and Ixtapaluca of the State of Mexico.

This application was complex since teaching students how to build an ecotechnology and how it works is easier in person, than, at a distance, so they had to think of an online teaching strategy that would enable the student to carry out the development of ecotechnologies in their localities, so it was decided to use the technological tool called BBB as an important element of the teaching-learning strategy.

For this reason, this research aimed to identify which teaching-learning processes can be developed online, using the BBB tool, in relation to an environmental education project in ecotechnologies for sustainability.

By knowing the results of this research, it will be possible to continue using the ICT tools for online environmental education, furthermore, improvements can be made to the online educational process regarding this area of knowledge, as well as environmental education can be taken to areas where it is not possible to get face-to-face education and finally people will have an education about the environment, which will allow them to have a different relationship with the environment around them.

Method

A qualitative research was carried out which according to Stratuss and Corbin (1990), cited by Sandín (2003); It is the research that generates results that are not normally accessed by statistical procedures, for example, people's lives, stories, attitudes, as well as being descriptive in scope, since they seek to specify the properties, characteristics of people, characteristics and profiles of groups, communities and processes (Danhke, 1989) cited by (Hernández, Fernández and Baptista, 2014).

In order to obtain the information, documentary research was used through the student reports, as well as the audiovisual material that accompanied these reports, which showed the progress and final results of their Environmental Education project, in eco-technologies for the Sustainability in the different localities of the state and the country.

To carry out the research, the students of the Guadalajara metropolitan area began with the approach of stage 1, in which they took on the task of taking the photographs and videos necessary so that the foreign students will be clear about the strategies of teaching that they had used, then began with the videoconference sessions through the tool (BBB) between the students and advisers where they shared, archive, photographs, videos, asked questions, comments, doubts were clarified, thus giving collaborative learning process, with the intention of preparing foreign students to start their 1st stage in their communities. When the foreign students carried out the 2nd stage, audiovisual material and files were also collected, which were shared through two sessions per week with classmates from outside the metropolitan area, to prepare them so that they could begin their stage. 2nd.

When the foreign students carried out the 3rd stage, audiovisual material and files were also collected, which were shared through two sessions per week with peers from outside the metropolitan area, with the aim of preparing foreign students to develop its 3rd stage. When the 4th stage was reached, where the eco-technologies were built, more emphasis was placed on collecting audiovisual material since it implied more skills to be developed in the students, as well as documents that were more focused on instructions, for which four videoconferences were held. where it was shown how eco-technologies were built, foreign students were trained and they carried out the construction of their eco-technologies in the communities.

Results

10 sessions of one and a half to two hours of videoconference were carried out, using the tool (BBB), for the 1st, 2nd and 3rd stages two sessions were needed for each one and for the 4th stage 4 sessions were occupied since the learning was more complex, in these sessions 12 students and two advisers participated.

During the course of the professional internship period and at the end of this, reports on the progress of the projects and their conclusion were arriving, finding that the teaching-learning processes were very similar between foreign students and those from the city, Like the eco-technologies that the students who lived in other municipalities and other states of the country built, they were very similar to those that the students from the Guadalajara metropolitan area had built, to whom the advice was given in person. The eco-technologies built by students from outside the municipality and from other states were as follows:

- It was found that the students of the municipality of Ocotlán Jalisco, through the environmental education they received through the aforementioned technological tools, carried out their project within an upper secondary school with a group of 40 students in an area far from the municipality. called Zapotlán del Rey, with the intention that the students will replicate them in their homes, carrying out the eco-techniques of the artisan clay oven, and where their reports made clear the process of information, awareness, planning of eco-technology as well as the photographs of the correct construction of the aforementioned eco-technology.
- As for the students of the Municipality of Atotonilco, they carried out their project in a community in the same municipality called Milpillas, where 28 people from that town attended, who attended the 1st, 2nd, 3rd and 4th stages carried out the construction of the ecotecnias of Stove Saving of firewood and El oven of mud, which allowed the people of the town to make better use of natural resources.
- As for the students from other states of the country, we found that the students from Mérida Yucatán, worked in a community called Dzununcán, which is an area with few public services, a low-level school, with a house mostly of dirt floor , with tin roofs of chapopote, but with a lot of sun in that state, in that locality they worked in a community center called “Companions of the way”, which was attended by ten housewives.

- In this community house, the first 3 stages were carried out, supported by the information provided by their colleagues through the aforementioned technological tools and also with the use of posters and drawings. Finally, in their fourth stage, they developed the eco-technologies of the solar water heater and solar stove, even later the solar stove was presented at a local fair.
- In the case of Toluca students from the state of Mexico, the development of the project was carried out in a community called Cacalomacán, being a community where the climate is from cold to temperate, so the water heater would be of great benefit to them. benefit, in this community people are mainly engaged in trade as workers, farm traders and some professionals, and women are mostly dedicated to their home, so it was thought that another of the eco-technologies that could support them would be the food dehydrator so that people could use them for their family consumption or to market them.
- The 1st, 2nd, and 3rd stages were carried out in the home of one of the families, where posters and drawings were also used as didactic material, since there was no projector, and the development of eco-technologies was carried out out with two other families.
- At the end of the construction of these, the people asked about their doubts and some mentioned the need to make a larger heater, since the families are numerous and the calculations were made for other heaters of greater capacity.
- In the case of the students from Ixtapaluca from the State of Mexico, the project was presented at a basic middle school in Colonia Morelos, with two groups of approximately one of 32 students and another of 36, where they were first given the 1st, 2nd, and 3rd stage, and finally the construction of the fruit dehydrator was completed, but the interesting thing about this eco-technology was that it was linked to the subject of physics and biology since the student responsible for this project is a secondary school teacher, the Students were very excited and especially interested in seeing the possibility of marketing dehydrated products, since in this town some families are low-income and could replicate them at home.
- The construction of the ecotechnology of the solar heater was also carried out, this was carried out in the Aquiles Córdoba neighborhood of the same municipality with the people of the community, as in the rest of the projects, the 1st stages were carried out first, 2nd and 3rd and the day of the execution of the construction of the solar water heater arrived at the beginning, all the people of the town were doubtful that hot water could be obtained at such a low cost compared to the normal boiler, and besides that the use of gas that causes an impact on the environment would be saved, finally the heater was built in the home of one of the people in the community, they tested it confirming that it did work, finally they commented that they were going to buy their materials to also have their heater .
- Finally, the student who was in Ciudad Jiménez Chihuahua carried out her project through eco-technology called Lombricomposta, she carried it out in the ejido called "Jacobo" located 10 minutes from the mentioned city, for this she contacted the teacher of the secondary school of that town since they have a family garden and many of the families have a plot, or small orchards and gardens in their houses.

- To start, the parents were summoned to several meetings, carrying out the 1st, 2nd, and 3rd stages of the project, and in the 4th session the preparation of the vermicompost was carried out, for which they contacted in advance with SEMARNAF staff so they could provide you with the California Red Earthworm.
- On the day the earthworm was made, the people brought a wooden fruit box lined with newspaper and with soil and manure. They were provided with the earthworm and explained how to care for and handle the earthworm.
- The development of the solar heater project was also carried out in a colony located on the outskirts of the city, for which the president of the colony was located, the project was presented to him and it was carried out in the house of one of the people developing the 1st, 2nd, and 3rd stages using a PowerPoint presentation with a laptop.
- In the 4th stage, the construction of the solar heater was carried out in the house of another family, for which the people of the colony attended to help in the process and ask the questions of the doubts they had, later the student returned with the family after three days and it was pleasantly found that the family was already taking their bath with hot water and that they were very pleased.

Discussion

The fact that environmental education projects in ecotechnologies are developed within an educational institution, allows this type of education to be more widely distributed, since the number of people who learn is greater, and at the same time they are multipliers of these techniques in their homes and at the same time in the community. When developing energy-saving stove ecotechnologies, and the artisan clay oven in ranches or towns far from the municipal capitals, allows people to know how to better use their natural resources such as firewood, since techniques that concentrate heat and also reduces the amount of firewood they consume, thus also decreasing the amount of pollution to the environment from the emission of gases.

Another important eco-technology was the solar stove, which, together with the energy-saving stove and the handmade clay oven, represent techniques that allow people to obtain a benefit from energy and at a low cost, since in the event of sun this is free.

The selection of eco-technologies must be based on the climate, the locality and the economic activities of the people, since taking into account these conditions will be of greater use to people.

It is important to take into account that eco-technologies were accepted because space was given for people to have learning about the environment, which allowed them to carry out an exercise to reflect on how they could have a different relationship with their environment. and appear more receptive for the construction of the same.

Conclusions

The tool (BBB) represents a very effective instrument for achieving online teaching-learning processes, since it allows synchronous interaction, leading to complete feedback and collaborative learning.

The use of the BBB tool favors online education to be more effective in distant areas, as well as to have better results in terms of teaching-learning processes.

The tool (BBB) not only allows the development of competences in terms of knowledge, but also fosters the development of skills and attitudes in the educational field and in this way online education allows Environmental Education to reach the communities where there is a need for this education, which develops a different form of the relationship between man and his environment.

The fact that ecotechnologies for sustainability reach retired communities, allows people to take advantage of natural resources that were previously not taken into account, and by using them, people can have better living conditions, such as having hot water for the bath, cook your food with solar energy, process food for preservation and make nutrients for your crops.

In the same way, the use of ecotechnologies allows people to save on their expenses, since they will not have to buy energy, or synthetic fertilizers, so they will not use natural resources in a way that impacts the environment, but the most important thing is that people based on their new knowledge about the environment will have the opportunity to reflect on the role they play in the conservation of nature and the importance of relating in a balanced way with their environment.

References

- Barrientos C. (2017). Calentador solar de agua usos domésticos con control de variables y funcionamiento con Arduino. Informe de investigación. Ministerio de Educación Gobierno del Salvador. Consultado en mayo del 2019. Disponible en: <https://www.itca.edu.sv/wp-content/uploads/2018/03/05-Calentador-Solar.pdf>
- Brito. H, Galindo. L, Ramos Ma de J, Romo Ma M. (2014). Revalorando la Huella. En Busca de la Sustentabilidad. Editorial Amate. México.
- Comisión Federal para la protección de Riesgos sanitarios. (2017). Usuarios de leña en México. Consultado en abril del 2019. Disponible en: <https://www.gob.mx/cofepris/acciones-y-programas/3-usuarios-de-lena-en-mexico>
- Comisión Nacional para el desarrollo de los pueblos indígenas. (2008). Programa Organización productiva para mujeres Indígenas. Gobierno federal. Consultado en julio del 2109. Disponible en:
- Fundación Celestina Pérez de Almada. (s/f) GUIA DE USO de secadores solares para frutas, legumbres hortalizas plantas medicinales y carne. COSUDE. Agencia Suiza para el desarrollo y la cooperación. Consultada en mayo del 2019. Disponible en: <http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Montevideo/pdf/ED-Guiasecaderosolar.pdf>
- García H. (2013) Las ecotécnicas en situación de aprendizaje participativo. Segundo Encuentro Nacional de Ecotécnicas, consultada en junio del 2019. Disponible en: <http://www.cecodes.net/file/LAS%20ECOTECNIAS%20EN%20SITUACION%20DE%20APRENDIZAJE%20PARTICIPATIVO.pdf>
- Grimaldo, F. Fuertes, A. Cobos, M. Arevalillo, M. Pérez, C. Moreno, P. Ferrís, R. (2014). BigBlueButton, una alternativa de código abierto para la comunicación interactiva en actividades educativas. Departamento de Informática Universidad de Valencia. Consultado en junio del 2019. Disponible en: https://upcommons.upc.edu/bitstream/handle/2099/15454/P75gr_bigb.pdf
- Hernández, R. Fernández C. Baptista, P. (2014). Metodología de la investigación. Mac Graw Hill. México.
- Instituto Tecnológico Universitario Politécnico “Santiago Mariño” (2013). Consultada en marzo del 2019. Disponible en: <https://es.scribd.com/document/206597814/Eco-tecnologia#scribd%3E>
- Instituto Tecnológico de Canarias. (2007) Guía Didáctica de Energía Solar. Hornos Solares. Consultado en marzo del 2019. Disponible en: <https://www.cienciacanaria.es/files/Guia-didactica-de-energia-solar-Hornos-solares.pdf>
- Placer, A. (2014). Diseño de un hornillo portátil. Trabajo fin de grado. Universidad de Valladolid. Esc. De Ing. Industriales. consultado en abril del 2019. Disponible en: <https://docplayer.es/13693394-Diseno-de-un-hornillo-portatil.html>
- Prado, J. (2013) Manual de Lombricompostaje de pulpa de café para los cafecultores de la región Otomí- Tepehua de Hidalgo. Indesol. INNOVA y RENUEVA. Asociación para el Desarrollo A.C.
- Programa Especial para la Seguridad Alimentaria. PESA. SAGARPA. Proyecto tipo Estufas Ahorradoras de Leña. 2007. Consultado en marzo del 2019. Disponible en: <http://ecotec.unam.mx/Ecotec/wp-content/uploads/FAO-y-SAGARPA-2007.-Estufas-ahorradoras-de-le-a-.pdf>

Sandín, M. Paz. (2003). Investigación cualitativa en Educación, Fundamentos y tradiciones. Mac Graw Hill. España.

Secretaria de Gobierno. (2019). Diario oficial de la Federación. Plan Nacional de Desarrollo 2019-2024. Consultado en agosto del 2019. Disponible en: https://www.dof.gob.mx/nota_detalle.php?codigo=5565599&fecha=12/07/2019

Unidad de ecotecnologías, CIECO, UNAM (2014). LA ECOTECNOLOGIA EN MÉXICO. Consultada en mayo del 2019. Disponible en: <file:///F:/Para%20libro%20de%20ecotecnologias/Bibliografia%20para%20libro%20cartera%20de%20proyectos/La-Ecotecnolog--a-en-M--xico-ENE-2015-BR.pdf>

WORLD COMMISSION ON ENVIRONMENTAL AND DEVELOPMENT (WCDE). (1987). Our Common Future (Vol. 383). Oxford: Oxford University Press.

Zarate, Ignacio. 2011. ECOTECNIAS. Consultado en junio del 2014. Disponible en: <http://cbtis259ecologia.wordpress.com/2011/06/07/ecotecnias/>

Valencia, Limón, Arruda y Cardozo (1999) TECNOLOGIAS APROPIADAS Y APROPIABLES DE CONSTRUCCION, SANEAMIENTO BASICO Y ENERGIAS ALTERNATIVAS: Experiencias Amazónicas como Base para la Creación de la Red de Tecnologías Apropriadas de la Amazonia. FAO, FUNDABITAT, Secretaria Pro Tempore del Tratado de Cooperación Amazónica. Consultado en junio del 2019. Disponible en: https://www.itacanet.org/esp/construccion/Tecnolog%C3%ADas_apropiadas_construcci%C3%B3n.pdf

Vázquez. M. Antonio, Cruz. Artemio, Santos. Cristóbal, Pérez Miguel A. Sangerman, Dora M. 2016. Estufas Lorena: uso de leña y conservación de la vegetación. Consultado en abril del 2019. Disponible en: <file:///C:/Users/IGCAAV/Downloads/386-Texto%20del%20art%C3%ADculo-1070-1-10-20171019.pdf>.