

Learning Strategies and Digital Interventions: An Analysis in the context of Education for Sustainable Development

Irais Monserrat Santillán-Rosas[†]
Escuela de Humanidades y Educación
Tecnologico de Monterrey
Monterrey, N. L. México
m.santillanrosas@gmail.com

Dr. Yolanda Heredia-Escorza
Escuela de Humanidades y Educación
Tecnologico de Monterrey
Monterrey, N. L. México
yheredia@tec.com

ABSTRACT

A future in which we can coexist with the environment in harmony. A future in which children can grow up healthy, happy, full of options and potential. Put simply: A sustainable future. How can digital learning strategies and interventions help shape and raise awareness about sustainable development? And how can online tools, such as Massive Open Online Courses (MOOCs) become better, more efficient and even more successful in reaching out to the general audience? In hopes of finding the answers to these questions, the present dissertation is of exploratory scope with mixed design, using both quantitative and qualitative approaches to hear the voice of the users and receive feedback on these questions. A pre-post survey was applied in five MOOCs relevant to the theme of sustainable development during the period of January 2019 to June of the same year. As a second part of the study, interviews are taking place with users who have both completed and abandoned the MOOC, in order to compare and contrast the opinion, perspective and advice these participants would provide for future MOOCs that would be designed to teach about sustainable development. So far, the progress achieved during this research shows that users would rather hear about real life cases rather than only theory, and that they would appreciate the involvement of more interactive and social media usage for the activities inside the course in order to share with their contacts how they are learning about sustainable development.

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CCS CONCEPTS

• Social and professional topics – User characteristics – Cultural characteristics

KEYWORDS

Innovation in Education, Sustainable Development, Massive Open Online Courses, Survey, Interviews

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1. Context and Motivation that drives the dissertation research

The topic of education for sustainable development has become one of the most voiced in the last years, especially because it is considered a factor that has an international impact that shapes the values of the students in order to promote a universal social responsibility regarding the environment and the use of resources of planet earth [1]. The efforts of several nations in recent years seeking to comply with the Sustainable Development Goals of UNESCO have emphasized the design and implementation of various learning strategies that have resulted in face-to-face and digital interventions [2].

One of said efforts took place in México through the Project 266632 “Laboratorio Binacional para la Gestión Inteligente de la Sustentabilidad Energética y la Formación Tecnológica” [“Bi-National Laboratory on Smart Sustainable Energy Management and Technology Training”], funded by the CONACYT SENER Fund for Energy Sustainability (Agreement: S0019-2014-01). This Project involved the creation of 12 Massive Open Online

Courses with the intention of allowing participants to integrate the content and the digital platforms in their learning process, allowing them to learn more about energy and various approaches as to why clean energy sources will play a key role in the future and the goal of a sustainable environment. These goals were possible thanks to diverse models and strategies to create innovative environments online [3]. In order to measure if these approaches were successful and had a positive impact on the participants in regards to their level of knowledge and education about sustainable development before and after participating in these MOOCs, an extensive literature review took place in order to understand and design the measuring tools in order to comprehend the point of view of the participants and the advice they would provide to future MOOCs in order to keep the users engaged and interested with the material regarding the theme of sustainable development.

2. State of the Art

Since they began to be implemented by George Siemens and Stephen Downes [4], MOOCs have opened the possibility for people in different parts of the world to access information or obtain knowledge with the only requirement of having an Internet connection. The MOOCs are an example in action of a distance training planned so that a very large number of users can register and take the course simultaneously.

MOOCs are usually open, participatory and with a methodology based on knowledge through self-learning using tools that are granted to users who register [5]. They have a massive, open and online character, characteristics for which it is considered that a MOOC is the ideal method to impart knowledge to those who are interested in deepening their knowledge on a specific topic. These courses have been refined over time and the implementation of new technology and resources that help students interact with the content of the course in an active way.

Some antecedents of the MOOC courses helped to define some key points that would later form the standard for a massive online course. OpenCourseWare, OpenClassrooms and UNESCO's open educational resources were the pioneers in this format. [6]

The MOOC term was formally used by Dave Comier in 2008, referring to a course called "Conectivism and Connective Knowledge", a course that is also identified by researchers as CCK08. This course was taught by George Siemens and Stephen Downes. The course participants were 25 students from the University of Minitoba and 2200 online students who did not have to pay to take the course. [7]

The content of the course was made available to the general public through Really Simple Syndication, RSS, an online platform that helps to display information in a summarized and concise manner. Students who participated online were able to

participate in the course through online collaborative tools, mainly blog posts and open forums. [8]

In 2011, Sebastian Thrun and Peter Norvig, from Stanford University, organized a massive course on artificial intelligence. More than 160,000 people around the world enrolled in this course, demonstrating the scope of an online course. In 2012, the New York Times refers to the MOOCs and the strong boom they have begun to create. It is called 2012 "The Year of the MOOCs", establishing that it is a new educational format that will be used to give access to a large public the information and resources necessary to learn any topic that is proposed [9].

The MOOC model opens the door to the development of new business models, based on an economic gain derived from the payment of certificates, credits, advertising or subscription of users who wish to have access to online material [10]. In other words, the course itself is free, but being able to have the official certificate or form part of a restricted access subscription are the elements that could be a source of income for those who design the MOOC. However, the knowledge that users obtain, even if they fail to make the purchase of the certificate or some other service offered, remains. Measuring the level of learning or the impact that the online course had on students still lacks refinement, especially when it is based on individual variables such as test scores [11].

Meanwhile, in 2015, UNESCO revealed the Sustainable Development Goals (SDGs) adopted by the global community with the aim of achieving a better world by 2030 [12]. Goal 4.7 addresses the issue of education and addresses Education for Sustainable Development and related approaches, such as the Global Citizenship Education. Currently, UNESCO is responsible for the coordination of the World Program of Action (GAP) on ESD [12].

Since its announcement, many countries have started efforts to educate and consider the objectives of UNESCO when planning their curricular activities. An example of this is the Network of Schools for Sustainability of Catalonia, which aims to "collaborate in the training of teachers and provide educational resources and internal debate to advance in the conceptualization of Education for Sustainability." Currently, the Network includes to more than 800 Catalan schools [13].

It should be noted that being part of this network does not only mean adapting the school curriculum to the themes of sustainable development. It seeks to involve the educational community in the project and modify teaching methodologies, taking projects where the student takes the role of protagonist and the teacher the role of facilitator. It also seeks to promote creativity, values of responsibility, equity, inclusion, ecology and raise awareness about global issues [14].

Another example is the Network of Sustainable Schools of Terrassa, which carries out events such as the School Experiences Exchange Day, where students prepare presentations that share the projects related to environmental

and sustainability issues that are being carried out in your schools.

In November 2018, the third edition of this event took place in the Assembly Hall of the Central Library of Terrassa, where 17 schools participated and 14 projects were presented. This day is celebrated every two years, but it helps maintain an active communication between the schools that belong to this network [15]. Another important network is the E-9, which existed before the announcement of the Sustainable Development Goals. The E-9 is a forum of nine countries that seek to achieve the objectives of UNESCO's "Education for All" (EFA) initiative. The "E" means education and the "9" represents nine countries: Bangladesh, Brazil, China, Egypt, India, Indonesia, Mexico, Nigeria and Pakistan [16].

This network opened a dialogue between countries to discuss their experiences related to education, opening a forum where they can exchange best practices and monitor the progress made with respect to the EFA goals [16].

The Prime Minister of Bangladesh Hasina, said that the Goal for Sustainable Development number 4 aims mainly to ensure inclusive and quality education for all, promoting lifelong learning for all citizens of the world. "As we move into the era of the Sustainable Development Goals (SDGs), we need to align and integrate our initiatives and strategies with SDG-4 (Education-2030), bringing lessons and achievements from the MDGs and EFA. Living in a world where we depend on one another despite our diversity in culture, religion, race and language, education can play a bridging role in the promotion of mutual understanding, tolerance and friendship," he said at the Inauguration of the ministerial meeting E-9 in Dhaka [16].

Thus, the mix between MOOCs and the education for sustainable development is an interesting combination that deserves a deeper research approach, in order to learn from the run of these MOOCs and take in consideration different elements that could make future implementations of MOOCs more successful for both participants and educational designers. [17]

3. Hypothesis and Problem Statement

During the development of these 12 MOOCs that were designed by the Binational Laboratory for the Intelligent Management of Energy Sustainability, the goals that they enlisted as a result of the application of these digital interventions were:

- To train specialized talent in this field
- To develop smart technologies for the energy value chain (electricity)
- To offer a set of courses based on MOOC technology to cover training needs in Mexico.

- To create an avant-garde, physical and virtual infrastructure for the construction of national scientific and technological research networks

To explore the potential of new educational trends for the generation of innovative solutions, characterized by citizen participation and the use of digital technology [18].

The question that thrived after considering the focus of the dissertation was: Were the MOOCs successful in making the participants more aware of sustainable development?

The hypothesis is that the MOOCs had a positive impact in the level of self-awareness that the participants perceived in themselves in comparison to their level of knowledge before and after taking the MOOC.

However, it is important to also take in consideration if the users have valuable feedback to make future runs of these types of MOOCs more interesting for the general public while discussing this theme.

4. Research Objectives

The objectives of these research include:

- Design a measuring tool (in this case, a pre-post survey that can be answered by the participants in the MOOC platform) that will give an insight of the changes in perception and level of self-awareness that the participants have before and after taking one of the MOOC courses
- Run both surveys in at least five of these twelve MOOCs, putting in priority the MOOCs whose theme is more related to sustainable development
- Download and clean the databases of the results of these surveys and run a quantitative test to verify if the Likert Scale questions had a significant change or not before and after the MOOC took place
- Get in touch with participants who showed a disposal to be contacted for research purposes and schedule interviews with them in order to listen to their thoughts regarding the theme of education for sustainable development and figure out if the MOOCs had a positive impact for them in this regard.
- Question the participants of different approaches they would like to see in the design of future MOOCs.
- Reach a conclusion about the most requested learning strategies and digital implementations that might provide a positive experience for the participants in regards to MOOCs or other online tools in order to learn more about sustainable development.

5. Research Approach and Methods

Regardless of whether the intervention was done face-to-face or with the support of distance learning strategies, it is important to evaluate the impact that the intervention had on its participants. In the chaos of the MOOCs, what is usually done is to take into consideration whether the participants correctly answered the reagents in the tests that are scheduled in the course. As mentioned before, measuring the level of learning or the impact that the online course had on students still lacks refinement [4].

However, the research approach for this dissertation is to go beyond the level of knowledge of the participants before and after the MOOC intervention regarding the main topic of the course they took. The approach is to question the participants about their self-image regarding their levels of awareness and knowledge regarding sustainable development, as well as their sustainable attitudes in their daily lives before and after they took the online course. They are also questioned about their perspective regarding the problem of lack of awareness about sustainable development in the general public, and, if they were willing to be interviewed, they were asked to explain which new approaches or strategies they considered would be best to reach out to the general public to educate them about the topic of sustainable development.

These instruments include elements on the self-perception of the subjects, their attitudes and sustainable activities in daily life; as well as a series of questions whose final objective is to determine what elements and type of energy they put in priority to ensure a sustainable future for everyone. The elaboration and design of these instruments were based on a series of instruments that have been already validated by experts in the area [19, 20, 21, 22, 23].

The analysis of the results of these surveys, that are designed with a Likert Scale of 1 to 5, is going to have a quantitative approach. As a second phase of the dissertation, all the users who mentioned that they were open to be interviewed will be contacted, including those who didn't finish the MOOC, in order to receive their feedback and perspective about new and better approaches that could be used in order to educate people about sustainable development through online courses.

6. Results to date and their validity

At the moment of writing this proposal, the pre-MOOC survey has been answered 288 times. Out of those 288 times, the survey was answered completely 252 times. The post-MOOC survey has been answered 135 times. Out of these 135 times, the survey was completely answered 128 times.

In the last question, which asks users if they are open to be contacted in order to be interviewed for research purposes,

156 users (including those who answered both the pre and post survey) agreed to be contacted. These users are being contacted in order to schedule the meetings according to their availability. In total, the goal is to make 16 interviews.

Eight interviews will be with users who answered both the pre and post survey, and eight interviews will be with users who only answered the pre-MOOC survey. The intention behind this approach is to get the opinion of users who finished the MOOC and those who deserted the online course.

So far, eight interviews have taken place. At the moment of writing this document, the transcription of these interviews is taking place. However, the main discoveries that have arisen from the interviews, include the following points:

- The people that agreed and completed the interview are from Colombia, Ecuador, Costa Rica and Mexico. This means that the massive open online courses had a reach in all Latin America.
- Most of the users agree that sustainable development is a key topic that should be taught to future generations early in their education programs, regardless of the country they belong to
- Even though most of the users expressed a positive experience in the massive open online courses they took, all of them have given advice on ways in which future implementations could be more dynamic and fun for the users.
- The use of social media inside the course, in order to share with friends and family an activity they could've done was a suggestion that was repeated in five out of the eight interviews that have taken place.
- Most of the people interviewed consider that there was not enough diffusion about the set of massive open online courses. They believe a more public campaign or even ads on platforms such as YouTube and Instagram might help grasp the interest of a younger audience to join the platform and enroll in these types of MOOCs.
- Most of the people interviewed wished that the videos that were included in the courses were shorter or that at least there was more than one person speaking in them all the time. After seeing the same professor speak video after video, they wished that there was a bit more variety in the videos.
- Although the users agree that the MOOCs have an important role in providing the average user new knowledge, most of the people that have been interviewed reckon that only using the MOOCs as an instrument to help people become aware of sustainable development is not wise. To reach out in other platforms and trying out different approaches to educate people about the reality and need of sustainable development

would help boost the signal and reach more people, specially of younger generations.

- Another interesting opinion that came up after one of the semi-structured interviews took place was that one of the users, who is an expert in the theme of energy and who constantly provides consultation work to different kinds of businesses in Mexico thought that the evaluation of the course was not challenging or interesting enough.

-In his opinion, he considered that most of the questions that were presented in the course he took were not really that closely related to the videos and lessons that the professor provided through the course. He considered that he could've just skipped the videos altogether and just answer the questions directly, since they weren't really hard to guess thanks to his expertise. In order to motivate him more, in case new MOOCs are planned on being created in order to educate people about sustainable development, he hoped that the evaluation process would be more than just multiple choice tests.

7. Dissertation Status

At the moment of writing this proposal, the dissertation status is: still in progress of gathering data. Currently, the interviews with the participants who expressed consent in being contacted for research purposes are still being scheduled and taking place. There has also begun a process of cleaning up the database of both surveys (the pre and post surveys that were placed in the courses) in order to begin a quantitative analysis and figure out if there was a significant change in the users before and after taking the course.

Most of the literature review for the context of the dissertation is done, since most of it was applied in the moment of designing the instruments for this research (both surveys and the semi-structured interview that is taking place at the moment of redacting this document). However, further literature review for analysis approaches in both the quantitative and qualitative methods are taking place during the Summer in 2019. Once analysis is done and the results and conclusions are finished, the dissertation is planned to be presented and defended in May 2020.

8. Current and expected contributions

Until now, the contributions and instruments created for this dissertation include:

- A pre-MOOC survey that can be applied in any online course whose goal is to measure the level of self-

awareness and interest the users presented before taking the course

- A post-MOOC survey that can be applied in any online course whose goal is to measure the level of self-awareness and interest the users presented after the online intervention. This survey also deepens on the perspective that the user has when it comes to the level of responsibility that involves the Economic, Social and Political approaches in order to ensure a sustainable future for the world.
- A presentation of the process of the dissertation has taken place in the University of Texas at Austin in late June.
- A database with over 380 replies derived from the two surveys that were run in the courses is being cleaned up and ready to be shared for research purposes.
- In the future, an article is planned to describe the process that took place in order to design these surveys. The content of these surveys is also planned to be shared online, so that future courses can take the reagents in consideration in case they want to measure the impact and change in perspective of their users before and after the online intervention.

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