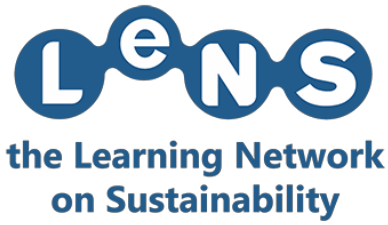

Using Design Thinking and Facebook to Help Moroccan Women Adapt to Climate Change Impacts

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ABSTRACT

In Morocco, floods carry wastes that pollute the water of the wadi. Design thinking and Facebook were chosen to accompany Moroccan women in the resolution of the water problems. Design thinking promotes user needs analysis and rapid prototyping. Facebook facilitates the collaborative definition of problems and solutions. The purpose of the research was to evaluate the potential of design thinking and Facebook as approaches to climate change education. At workshops and in Facebook exchanges, 12 women shared their experience of floods and studied the water and waste problems. They prototyped and experimented with hand-held filters for water cleaning and with waste reuse techniques. They improved their «awareness» of climate change impacts. Their technological and geographic «knowledge» grew as well as their problem-solving «skills» and «self-efficacy». Women »participated» by operating an electronic flood warning system, making hand-held water filters, making compost and recycled jewellery, and starting a waste reuse cooperative.
Key Words: adaptation to climate change, design thinking, Facebook, environmental education

1. INTRODUCTION

UNESCO-UNEP (1977) identified five learning objectives for environmental education (EE). Environmental educators have to develop learners' awareness and knowledge (of the environment and problems), attitudes (conducive to their commitment to improve their milieu), skills (that facilitate their engagement) and participation (direct involvement in the field). In climate change education, these objectives prevail, in particular the one of «participation», since citizens affected by climate change must implement adaptations to reduce risks that threaten them directly. How to provide educational support to citizens as they analyze local climate problems, propose, test and implement adaptations? How to educate citizens to climate change while developing their awareness and knowledge of the problems of their environment, their willingness and ability to act and their tangible involvement in adaptation actions?

In this perspective of climate change education, 12 women from Ourika, a region of Morocco, victims of floods, were accompanied for three years during the four stages of the adaptation process (Risbey et al., 1999): detection (realizing the need to adapt); evaluation (determine the consequences of the situation); decision (choose accommodations) and monitoring (observe the effects of selected adaptations). The accompaniment of women had pedagogical intentions: to progressively develop their awareness and knowledge of floods and subproblems, their skills (problem solving, communication, etc.), attitudes (self-efficacy) and their tangible participation in adaptation. To achieve these educational goals, two interventions were chosen: design thinking and Facebook. The purpose of the research was to evaluate the potential of design thinking and Facebook in climate change education. This paper reports on the educational experience of the Ourika women and analyzes its results in light of the objectives of EE: awareness, knowledge, attitudes, skills and participation.

2. DESIGN THINKING

In 2006, IDEO popularized a creative problem-solving approach: design thinking. Design thinking is a creative and collaborative way of working during which intuition matters, solutions are numerous, experimentation happens quickly and users' needs are taken into account (Brown, 2009). Design thinking takes place in the following stages: 1. Observation-inspiration: a survey is conducted to understand the people affected by the problem and the situation. 2. Synthesis: the problem is defined repeatedly and in various ways. The solvers look for information and various perspectives on the problem. The information is synthesized to pose the problem in a few statements, using visual representations. 3. Ideation: many ideas are formulated and a number are chosen. 4. Prototyping: prototypes are quickly constructed, illustrating the proposed ideas in order to share these ideas with others and to assess their potential. 5. Tests: the prototypes are evaluated by looking for the opinions of experts, novices, users. Winning prototypes are refined. 6. Communication: the product is publicized (Brown, 2009). Seidel and Fixson (2013) summarize the process of design thinking as follows: thorough research of user needs; brainstorming to produce multiple ideas; and prototyping to test and choose the best ideas. However, the process is not linear as the designers' attention flows between the problem-space and the solution-space, while the empathy for the needs of the consumer expands and the winning solution is refined. Divergent then convergent, the process is centered on human needs. Prototypes, made quickly and without seeking perfection, act as "playgrounds" to discuss and learn about certain solutions (Liedtka, 2015).

In this research project, design thinking was chosen as a support tool for Moroccan women because of the high-level skills it can develop in participants: information seeking, empathy, creativity, communication, collaboration ... and because of its construction of meaningful learning (Scheer et al., 2012).

3. FACEBOOK

Traditionally used as a distraction and communication tool, Facebook is actually the most popular social media (Newsroom.FB, 2017). Beneficial for interaction, collaboration, information and sharing of resources, Facebook would also have educational potential (Wang et al., 2012). The Facebook group is particularly popular and useful for discussions around common interests (Park et al., 2009). In Facebook groups, users form real communities of practice in which they seek to solve a common problem. A Facebook group would therefore have the potential to facilitate collective action, but real actions in the field are crucial factors that strengthen the group's self-efficacy. Actions show the tangible results of the digital discussions (Narozny-Barborska et al., 2016). However, the use of Facebook, for public participation in community projects, is just beginning to be explored in research.

In this study involving Moroccan women living in geographically spaced villages, the Facebook group was chosen because of the education and community involvement benefits mentioned above. The design thinking process was enriched by the Facebook group's exchanges when the participants were each in their village. From home, they could continue to define the flood problem, and propose, prototype and evaluate solutions.

4. THE DESIGN THINKING AND FACEBOOK EXPERIMENT

The exploratory case study was conducted in Morocco with 12 women from the poor region of Ourika. The GIREPSE Project's women, chosen for their minimal reading and writing skills, came from six isolated douars, located more or less 35 km from Marrakech. In this region, the economy is mainly based on agriculture. Since 2011, the floods of the wadi Ourika have increased in frequency and importance, in connection with climate change. These floods have devastating effects on the landscape, agriculture, human capital, infrastructures and food security. Women, guardians of their families while their husbands work in Marrakech, are facing floods and must protect their families.

The interventions with the women took place over three years, from March 2015 to February 2018. During the project, three minor floods of the Ourika occurred. The design thinking process dictated the activities of the 10 workshops organized with women and a private Facebook group (GIREPSE Women) was used regularly as a networking tool when women were at a distance.

At the first stage of design thinking (observation-inspiration), individual interviews were conducted with women to invite them to describe the problem of floods and their needs in the face of this disaster. A Journey Map, that is to say a visual representation summarizing their experience before, during and after a flood, prepared by two researchers, allowed the construction of the first synthesis of the problem of flooding. The women said that before the floods, they stored forest wood and essential food in case of road closures. They put plastic on the roof of their house to prevent water from seeping in. During the floods, they stored the goods in a room that was not subject to immersion and some took refuge with the neighbours. After the floods, they encountered problems of drinking water supply. At that time, the water of the wadi, laden with sediment became an alternative of drinking water and was placed in containers for deposit debris towards the bottom. After decantation, the water of the wadi was then consumed or used for various purposes.

In August 2015, during the first two workshops with the women gathered, the stages of the design thinking process, observation-inspiration and synthesis, were again applied, animated by the researchers. The women were invited to comment together on the previously prepared Journey Map reporting their experiences of the flood. They were also trained in the use of tablet computers, the Internet and Facebook. They then chose to work on a narrower problem: the quality of their drinking water after the floods. The Facebook exchanges then began, in September 2015, the women communicating with each other and with us, about the floods and the sub-problem of the quality of water. Initially, women were invited to post photos, videos and comments on local floods on Facebook. Subsequently, weekly specific questions were asked of women on Facebook inviting them to define the sub-problem of water quality after the floods: Where? When? Why? What are the impacts? What are the solutions? etc. Women had to observe the problem at home and answer questions with Facebook tools: comments, videos, photos, emoticons, etc. Workshop 3, held in November 2015, brought women back together for one day for the realization of the synthesis (2), ideation (3), prototyping (4) and testing (5) stages of design thinking on the sub - problem of water quality. During this workshop, a summary of the elements of the problem of drinking water and solutions proposed on Facebook was first realized. The water from the wadi collected in the villages was then tested with the women, to check the quality: ph, coliforms, bacteria, etc. The women were then invited to invent prototypes of filters using domestic materials: cloth, coal, plastic bottles, sand, rocks, etc. They had to check the capabilities of these filters to clean the water. After the workshop 3, the Facebook exchanges resumed, from November 2015 to January 2016, planned according to the stages prototyping (4), tests (5) and communication (6) of design thinking. The women built their own filters at home and they shared their essays on Facebook, receiving criticism from their peers. On Facebook, a general assessment concluded the process of prototyping filters.

Subsequently, a return to the definition of the problem (observation-inspiration) was carried out during a workshop in March 2016. The question asked was: How could we prevent the water of the wadi from being contaminated? A new ideation phase followed and the participants proposed solutions: search for better water sources, treat well water with chlorine, sensitize neighbours to avoid dumping their waste in the river, build solid pipelines, place wells

away from flood areas and reuse waste to reduce its amount, including composting leftover food. The solution "to sensitize the neighbours not to throw their waste in the river" was then tried at home, by the women, without much success. On the Facebook group, an analysis of domestic waste followed, with women invited to publish photos of their household waste. Among the waste, the group found the significant presence of food and plastic bottles. The project team then decided to provide the women with composters and teach them how to make compost (in September 2016). As the compost matured, the women asked questions on Facebook for advice. At the same time, photos of plastic bottle reuse ideas were placed on Facebook, first by our team and then by two women. Various themes of possible recovery have been explored: reuse of bottles for the garden, decoration, art, jewellery or as utilitarian containers. Women reacted to the possibility of applying these solutions at home and for the next workshop (April 2017), they chose to create, prototypes of jewellery, candy boxes and under-plates made with plastic bottles. As a result of the workshop, they responded positively to our invitation to start a women's cooperative specializing in waste recovery, the products of which would be jewellery and compost. During a workshop (August 2017), they tested their prototype jewellery by consulting community people about their creations. In October 2017, a first sale of jewellery of the cooperative was organized in Rabat. The Facebook group was used to plan the event by providing tips on jewellery arrangement. The women published on Facebook the prototypes of the best-selling jewels. In November 2017, the women took charge of their cooperative and registered at a local fair in Marrakech.

During the design thinking process facilitated by Facebook, individual interviews with women (in the middle and at the end of the project) and their Facebook postings were exploited. The purpose of the research was to evaluate the potential of design thinking and Facebook as approaches to environmental education and for co-creation of adaptations to climate change. The first individual interviews were conducted after the first year while the second interviews took place in the last year of the project. The analysis of the first individual interviews is not the subject of this article because these results were published in Pruneau et al. (2016). This article discusses the final interviews in which the interviewees were invited to draw and comment on their experiences before, during and after the project. Similar interviews were conducted with three stakeholders from the project. The interview data were analyzed using conceptualizing categories by two researchers who worked individually and then in confrontation. The goals of EE (UNESCO-UNEP, 1977) served as broad categories from which sub-themes emerged. For the Facebook group, a bi-monthly table of women's publications was first prepared, summarizing the participants' actions and non-actions (in person and on line) and qualifying and quantifying their types of publication: presence on the group, images and videos, comments, emoticons and "likes". A 10-page compiled table, made by a researcher and then completed by another researcher, reduced the data to make sense of the women's participation.

5. RESULTS

During the final interview, the women described some aspects of their experience before and during the GIREPSE Women Project.

Participation: A core of 8 women remained active throughout the project. About 75% of them actively participated in the workshops, providing elements of the problems, proposing solutions and experimenting and testing prototypes. In their community, they carried out actions: filming the floods and their impacts; sensitize their neighbours to the harmful presence of waste; create an alert system to warn communities of a flood; test their soil; study the composition of their household waste; make compost; make jewellery with plastic bottles; start a cooperative; sell jewellery; experiment with a high-speed composter; register for and participate in a craft fair. Through these actions, periods of passivity have been observed. Women were less involved in times when they had less confidence in their abilities, in times when they met personal limits (having a child, being sick ...), or when too much time passed between the on-site workshops. Given the language limitations of women writing, their comments on Facebook remained short: a brief opinion, many "thanks", several "likes" and other emoticons. Women often used images to express themselves on Facebook and sometimes videos filmed with their tablet. Facebook's "personal conversation" feature has been used extensively as well as the Whatsapp digital tool for exchanging news and information.

Awareness: Before the project, women said they were aware of the nuisance of floods, which they associated with natural causes and not with climate change. They knew that there was waste in their village and that their environment was not healthy, nor their quality of life. During the project, they say they have become aware of various dimensions of floods, waste and the impacts of these two problems on health.

Knowledge: Before the project, they admitted that they could barely read and write in Arabic and that they knew little about technology. They had not heard about climate change, waste reuse and flood adaptations. Their knowledge of the other villages of Ourika was very limited because they had never or almost never been there. They had few friends outside their village. During the project, they say they have known other regions, cultures and made new friends in Ourika and in other countries (thanks to the Internet). They learned to reuse waste, and to make filter water, compost and jewellery. They better understand the variability of floods from year to year as well as their impacts. They have some means to get out of their misery.

State of mind: Before the project, they perceived themselves as unconfident and inactive. They used their time to take care of their families and to listen to television. During the project, they say they have gained greater self-confidence and pride because of their participation in the project and because they help the environment. They say they like to learn. They are keen to go to school, find a job, learn to read and write better, learn about ICTs and diversify the cooperative's products.

Skills: Before the project, they did not know how to use ICTs. They say they learned to use an electronic tablet, to search the Internet (for images, recipes, drugs, jewellery ideas, solutions to environmental problems ...), to use new ICTs (YouTube, Whatsapp ...), to solve problems and to make crafts.

6. CONCLUSION

Design thinking helped to broaden the description of the flood and waste problems, according to the participants' needs. Several solutions were proposed, tested and implemented in the field. The women became aware of the causes of the floods and their impact on health. They now can use technologies for learning, finding ideas and solutions, meeting new people, communicating. They know flood adaptation solutions and they apply some of them. They say they have increased self-confidence. Their social networks have expanded. Facebook has proven as a powerful tool for learning, problem definition, ideation, building self-efficacy, planning, prototyping and decision-making. Facebook has also expanded geographic and time boundaries. Thanks to continued work on Facebook, the women have had more time than workshops to analyze problems and find solutions. Facebook has provided updates and images of disasters and empathy with those affected by them.

In this project, it can be argued that participating women went through the first four stages of the change process described by Rochlkepartain (2001): 1) receptivity (cultivating openness to change); 2) consciousness (emphasize the possibility of change); 3) mobilization (organizing for change); 4) action (implement some change). As for the fifth stage of the process, namely continuity (making sure that change becomes a way of life), the future will tell if the women's personal skills and if the local culture will be supportive enough to favour these women's further commitment in adaptation to floods.

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