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Case study-based research on understanding app user engagement to develop environmental literacy of urban residents

Ewa DUDA
Maria Grzegorzewska University, Poland
eduda@aps.edu.pl

Abstract: Environmental literacy enables action to be taken against climate change. These actions should naturally be supported by developing information technology. Mobile applications can therefore be successfully used as a tool for learning, awareness-raising, but also for shaping environmentally friendly behavior. This article presents an analysis of the functionalities of mobile apps that enhance or undermine user engagement with the application. Qualitative research, carried out as a case study, was conducted by analyzing publicly available user reviews. The results show that a well-designed application can provide valuable support for ongoing educational interventions aimed at enhancing the environmental literacy of urban residents. It presents indications that are worth using when designing environmental applications to ensure a high level of future user engagement. Results can be successfully used by mobile app designers, but also educators, city authorities, or local activist.

Keywords: environmental literacy, educational applications, green transformation, pro-environmental behavior, urban education, user engagement

1. Introduction

Developing the environmental literacy of urban residents is becoming a necessity in the face of ongoing climate change. Such literacy is perceived as (1) understanding the resources at our disposal, (2) understanding that the actions of people (social beings) have roots and consequences, (3) the ability to work together to achieve common, rational goals, (4) the ability to responsibly obtain natural goods for basic needs and desires (Roth, 1992). Indeed, a pro-environmental approach must be embraced at multiple levels, taking care not only to strengthen awareness but also knowledge, attitudes and practical skills that will be an integral part of urban residents' conscious daily routines.

The changing society needs and the rapid development of information technology imply the question of how to effectively encourage people to engage in a process of shaping their environmental literacy, and to maintain that engagement over time. This study aims to explore the issue of co-development of solutions to foster green social transformation. The initial concept of the tool to support educational interventions among urban residents (Duda et al., 2022) is based on the use of a mobile application to facilitate environmentally friendly behaviors. To address this, the study attempts to answer the following research question:

- What features of a mobile application for environmental literacy encourage users to adopt environmentally friendly behavior?
- What features of a mobile application for environmental literacy discourage users to adopt environmentally friendly behavior?

2. Theoretical Framework

2.1 Environmental Literacy

The term environmental literacy is understood as an advanced level of conscious human interaction with the environment. It is defined as “the ability to appropriately read and to utilize environmental information, to anticipate rebound effects, and to adapt according to information about environmental resources and systems and their dynamics” (Scholz, 2011:8). On the other hand, Cole drew attention to the cultural aspect of the concept, where “environmental literacy can be understood as a culturally specific body of knowledge that fosters particular ways of thinking and acting in the world” (Cole, 2007:39).

The development of environmental literacy is based on active education that goes beyond the mere transmission of information. The vast majority of literature on developing environmental literacy focuses on formal, informal or non-formal education (Forsyth, 2018; Taylor, 2020). Research on aspects related to the use of mobile apps in education for environmental literacy is much more limited. Most often, they focus on application-specific research such as educational process among participants and gamers (Bowser et al., 2014), motivators to reinforce pro-environmental behavior (Pacheco, & Faria, 2022).

2.2 User Engagement

The definition used in this study is as proposed by Attfield, Kazai and Lalmas (2011). Regarding this definition “user engagement is the emotional, cognitive and behavioural connection that exists, at any point in time and possibly over time, between a user and a resource, […] user engagement with a technological resource is not just about how a single interaction unfolds, but about how and why people develop a relationship with technology and integrate it into their lives” (Attfield, Kazai, & Lalmas, 2011:2).

3. Methods

3.1 Procedure

The Google Play Store platform was used to search for mobile applications. Downloadable, English-language mobile applications with publicly available user reviews were included in the searches. The keyword used was "environment", next the search continued using the snowball method. The apps were examined for their widest range of features addressing environmental issues. The first search yielded 86 results. In the next step entertainment games, dictionaries, and quiz applications were excluded. Finally, three apps most related to the research objective were selected, with a significant number of user reviews available. They were: “Environment Challenge” (106), “Earth Hero: Climate Change” (445) and “JouleBug” (286 available reviews).

3.2 Data Analysis

As the aim of the study was to explore constructs and categories emerging from both positive and negative user statements, the study employed inductive analysis (Mary, & Pour, 2022). In this study, the data was divided into two main thematic areas. The first comprised functionalities that, according to users, stimulate them to undertake environmental behavior through the app. The second covered functionalities that discourage the use of the app, thus not encouraging environmental efforts.

4. Results and Discussion

Analyzing the posted reviews, a reflection arises that the users of the above applications are people who are interested in environmental problems, but their knowledge in this area is not very advanced and they need regular stimulation to take environmentally friendly actions. The app makes it easier for people to be more eco-friendly, especially those who may be struggling with environmental anxiety during the climate crisis.

Users stressed that their lifestyles have changed a bit since they started using the app. The friendly, non-judgmental tone of the notifications helped them. Also positive was the lack

of competition, a system based on goal-setting and reminders. Tips and suggestions were easy to follow and incorporate into a daily routine. A higher rating was given to the app providing measurable challenges and more personalized, as is in line with Morreale et al. (2015) research. Challenges that were too general or those that did not provide a point of reference caused a decline in engagement. Users questioned issues such as having a challenge to consume some percent less power when they have no idea about the quantity of their current consumption. The challenges formulated should therefore be more flexible.

Also demotivating for some users were vague statements about the challenges. While users received daily reminders to keep up with the challenges, they lacked detailed guidance on how to do this. On the other hand, seven out of ten users were satisfied with the support provided to them. They enjoyed the articles about the issues in the environment and steps to minimizing human impact. The data provided and the concept of environmental challenges was both useful and educative. They declared, that app made them more aware of their day to day actions and should be further developed and maintained. Such applications can help to develop environmentally friendly habits, and increase users' knowledge (Rosal et al., 2021).

5. Conclusion

The main novelty of the study is based on the uniqueness of the topic addressed. In addition to the small number of studies on the formation of various pro-environmental habits and behaviors of residents, it is difficult to find research on the engagement of mobile app users, especially based on a qualitative analysis of the opinions of current app users. This study, therefore, extends the available literature on the subject by contributing to the promotion of environmental action. The results of the research support the application design process of the project in which the authors of the text are involved. They can be also successfully used by other mobile app designers, educators, and city authorities. A limitation of this study is that it was carried out by a single researcher, which may introduce a bias in the coding process.

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