

An Educational Intervention to Foster Interest in Sustainable Design

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ABSTRACT

Issues compromising the educational role of video social networks include individual, social and structural factors. We propose an educational intervention using online videos and implementation intentions, copying with these issues to foster interest on Sustainable Design. Based on semantic and sentiment analysis on top YouTube videos related to Sustainable Design, we created a recommendation system in English and Spanish. We compared the system's performance with a YouTube search and with participants divided in three groups. One group used YouTube while the other two used the recommendation system. The third group practiced implementation intentions activity and some participants used an eye-tracking device. Precision and recall in English were slightly lower for the system in comparison to YouTube, but the variety of recommended videos increased. In Spanish, precision and recall were higher for the system, increasing the number of videos from Spanish speaking countries. After two months, there was a significant difference in number of Sustainable Design projects from subjects of the full intervention group and the control group, while interest post intervention was a significant predictor of projects. Testing with a bigger number of participants during longer periods of time is recommended.

1. INTRODUCTION

Cognitive and psychological aspects are still not accurately predicted nor handled by recommendation systems. Leakage of personal information, data-based discrimination, and unclear collection and management of data procedures by companies are other issues receiving attention recently. The structure of Social Networks also leads to echo chambers, particularly in the case of divisive topics (Bakshy et al., 2015). Yera and Martinez (2017) found that only one among over a hundred of recommendation algorithms consider level of interest, while Trung et al. (2013) provided evidence of a relationship between specific sentiments and topics. Therefore, the present study explores an alternative way to manage YouTube's content, enhancing it for educational purposes and taking on account the user's feelings and interest.

Ito (2017) proposed a view of sustainable technology as extended, adaptive and regenerative intelligence that aids psychological restorage. Therefore, we created an application to watch YouTube videos with a reduction of distractions and without storing user information permanently to enhance anonymity. It also takes on account the user's objective characteristics (professional level, area of expertise and nationality) to optimize recommendations, with some degree of randomization to avoid echo chambers. Semantic and sentiment analyses (described in Vargas Meza, Yamanaka, 2018) related a sentiment polarity scale and sentiment types based on Plutchick (1980) with specific topics in the context of Sustainable Design. This information was stored in curated video databases for the system's use. The videos are called through the YouTube API, so they receive views and are not manipulated in a way that infringes the social network policies.

We also considered an offline activity to complement the system. Gollwitzer's implementation intentions are based on Ajzen's (1991) attitude-behavior model, which make people specify when, where, and how a behavior will occur. Those who changed their behavior through this technique were faster when recognizing words describing situational cues and had automatic activation of stereotypical beliefs and prejudicial feelings inhibited (Gollwitzer, 1999).

2. METHOD

2.1 Recommendation System Evaluation

While precision is the number of relevant videos divided by the total of existent videos, recall is the number of relevant videos divided by total relevant videos to a particular search case. Because it is not possible to know the real number of videos that exist in YouTube, the first 20 items in 4 search cases were taken on account (for interested, indecisive and uninterested types of user in the recommendation system, and one YouTube search). Speaker's language, professional level, design expertise area and continent were also considered, based on whether the videos matched a student of architecture located in seven different continents.

2.2 Educational Intervention Evaluation

28 participants who were either English speakers or Spanish speakers were divided in three groups, being called individually for the evaluation. The first group used YouTube to search for Sustainable Design related videos and watch them, while the second and third groups used the recommendation system. The third group discussed more in depth with the researcher to practice implementation intentions according to their particular abilities, interests and difficulty to practice Sustainable Design. Participants also answered a survey before and after watching videos, and they were sent one more survey two months later, in order to measure their basic knowledge, practice, feelings and interest related to Sustainable Design. Moreover, some of the participants' gaze was tracked with Tobiiipro while they were watching/searching videos. This procedure lets us quantify the viewers' objects of interest and register their viewing and searching patterns.

3. RESULTS AND DISCUSSION

Table 1 shows the results of the recommendation system evaluation. Scores in English were lower for the system, but content from more continents was included among recommended videos; while scores in Spanish were higher, with content from unclear locations considerably less present among recommended videos.

Table 1. Average interest and recall for YouTube; and for recommendation system under interested, indecisive and uninterested settings.

English	YT Prc	YT Rec	Sys Int Prc	Sys Int Rec	Sys Ind Prc	Sys Ind Rec	Sys Un Prc	Sys Un Rec
N. Am.	0.275	0.275	0.316	0.316	0.275	0.275	0.275	0.275
Europe	0.266	0.266	0.200	0.200	0.166	0.166	0.166	0.166

Oceania	0.150	0.150	0.150	0.150	0.158	0.158	0.158	0.158
S. Asia	0.150	0.150	0.183	0.183	0.141	0.141	0.141	0.141
Asia	0.150	0.150	0.158	0.158	0.141	0.141	0.141	0.141
Africa	0.150	0.150	0.166	0.166	0.141	0.141	0.141	0.141
Spanish								
Europe	0.155	0.155	0.283	0.283	0.266	0.266	0.266	0.266
L. Am.	0.180	0.180	0.341	0.341	0.433	0.433	0.433	0.433

A significant difference ($H(2)=4.27, p<0.05$) in number of Sustainable Design projects after two months from subjects of the control group (mean rank of 8) and the full intervention group (mean rank of 11.8) was found. Regression analysis on the projects (shown in Table 2) indicated that the Mixed area (which includes engineering), interest post intervention, and interest, positive sentiment and definition length after two months were significant predictors. Interest post intervention was correlated ($p<0.05$) with sentiment in the likert scale (0.547) and negative sentiment (0.487) described before the intervention.

Table 2. Regression for Number of Projects after Two Months ($p\leq 0.005$).

Variable	Sum of Squares	df	Mean Square	F	Adj. R Square
Interest1	6.187	1	6.187	9.471	0.275
Interest2	12.294	2	6.147	14.428	0.546
Mixed Area	14.783	3	4.928	14.652	0.656
Sentiment Positive2	16.336	4	4.084	14.533	0.725
Definition2	17.816	5	3.563	15.912	0.791

Preliminary results of the eye-tracking of 19 subjects let us distinguish between two patterns of video viewing: exploring and focused. Exploring subjects tended to look all over the place, used the timeline navigation often and read comments by other users. They also tended to feel more negative towards the recommendation system, while focused subjects were calm. Moreover, there is indication that viewers with little or no knowledge of Sustainable Design tended to find animations interesting, while users who had hands-on experience or a lot of knowledge about Sustainable Design tended to find designers, real design objects and methodologies interesting.

4. CONCLUSIONS

Results suggest that: a) managing negative feelings and practicing implementation intentions contributed to maintain the interest on Sustainable Design practice, b) the Mixed area of design expertise might have relevancy in the adoption of Sustainable Design, and c) animation might be better suited to teach those with basic knowledge on Sustainable Design, while videos showing designers, projects and detailed methodologies might be better suited for those with advanced knowledge.

Limitations include lack of participants from some geographical regions. It is possible that subjects were not aware that they were doing Sustainable Design before the intervention. English speakers apparently benefited more from the educational intervention because: a) focused viewers tended to be English speakers, b) Spanish speakers tended to consider English videos as higher quality, but these were absent from the recommendation system, and c) Sustainable Design projects, sentiment, interest and knowledge were higher among Spanish speakers from the beginning. Testing the educational intervention with a bigger number of participants during longer periods of time would be advisable.

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