

Using Targeted Advertising to Promote Scientific Literacy

Grant Proposal



iCons 1 - Independent Case Study

Team E

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I. Project Summary

An issue brought to light by the Climate Crisis is a population's personal understanding and interpretation of science, or the concept of “Scientific Literacy”. It is generally understood that Scientific Literacy can be defined as, “the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity”(Scientific Literacy). As the world increasingly demonstrates the presence of science in the lives of every individual, from events such as the COVID-19 Pandemic to Global Climate Change, we believe that even an individual's understanding of science greatly influences the value that a society places on facts. Thus, this proposed study would investigate the impact of targeted ads on scientific literacy. We hypothesized that if a targeted advertisement is optimized to appeal to its viewer, then we would be able to improve an individual's scientific literacy, thus creating a greater societal priority of science-related issues such as Climate Change. Climate Change is just one example of a scientific issue of which we believe society’s understanding could be improved through higher rates of scientific literacy.

II. Background

We hope that our work will answer questions such as “Can algorithms work to effectively promote a concept, or increase understanding of a topic?” and “Does a person's background influence his or her openness to hearing another viewpoint, or to expanding his or her own viewpoint?”. Internet algorithms are often used to present a consumer with information that is related to topics they’ve expressed interest in in the past. For example, a targeted ad on a site such as Youtube may encourage a viewer to sign a petition to remove a politician from office if they view a political comedy video. However, a viewer on the same site, but who views a different video, might be shown a different ad- perhaps something completely unrelated to politics. The argument for implementing targeted advertising within media meant to enhance scientific literacy are the proposed benefits of a more informed populous gathered from the team's research. Both environmentalists and politicians alike have come to agree that scientific reasoning skills serve as values for responsible citizens. (Holbrook, Rannikmae, 2019).

After searching for previous work that has studied the influence of scientific literacy on an individual's decision making, a public health study (Nordheim) was found that examined the role that scientific literacy played in a student's ability to “identify and appraise health claims in the news media”(Nordheim). While the study does not directly aim to understand how *targeted ads*

can improve scientific literacy, it does provide some insights as to how scientific literacy influences an individual's understanding of science-related news. Overall, this study concludes that being scientifically literate allows students to more accurately assess the validity of a scientific claim (Nordheim). In this case, the study dealt with health related news. In our proposed study, we would instead plan to focus on how targeted ads can improve an individual's ability to interpret/understand information that is presented to them about Climate Change.

Additionally, a presentation by Ezra Markowitz, of the Department of Environmental Conservation at UMASS Amherst, describes some ways in which activists can encourage others to be more concerned about Climate Change. Markowitz makes an observation about society's general ability to empathize with a cause by stating that "people will adapt to climate change for their reasons, not yours"(Markowitz). This observation demonstrates something that many scientists understand to be true, which is that "facts do not speak for themselves"(Markowitz). These observations support the idea that individualized appeals to an issue are sometimes necessary in order to incite devotion to a topic. In the case of our proposed study, we see targeted advertisements as a method of creating these individualized appeals, and thus as a way to increase concern for Climate Change among a population. Markowitz also provides a content map, which could be used to aid in the creation of the ads we would need to produce for this proposed project.

At the conclusion of our experiment, we anticipate that we will be able to compare the results of our scientific targeted advertisement with the general results from more traditional targeted advertisements (such as those for clothes, food, or tv shows) and come up with a conclusion on whether or not they have different effectiveness. We will also be able to accept or reject our hypothesis. In addition to this, efforts made to improve scientific literacy among a population of citizens have already been made in various ways. For example, public science experiments involving both experts in their particular field and common citizens tend to yield better understanding of essential scientific concepts. The Cornell Lab of Ornithology has been conducting these programs for the last 20 years. These types of projects not only benefit the educational advancements of individuals, but also the potential for data collection as these projects typically require observations from different locations at different times. (Bonney et al., 2009).

A potential fault in our proposed study might be our ability to determine which demographics are most closely tied to a person's scientific literacy. In other words, which demographics have the closest associations with different rankings on the Likert scale. Based on data from previous targeted advertisements, for example successful ad campaigns done through various social media sites like FaceBook, we can expect to see that targeted ads can appeal to the person that is being

targeted. We believe there would be societal value in more individuals being able to interpret science and understand data, especially as Climate Change becomes a more prevalent issue.

III. Methods

Experimental Design

Our group is proposing a survey in response to advertisements regarding climate change that will be sent out mainly to four different experimental groups consisting of 20-50 people of varying demographic factors, as well as the entire iCons 1 class, in order to determine the most effective advertisements to increase scientific literacy. By having a sample size of roughly 150-250 individuals that will answer these surveys, our data set will be diverse enough to then make decisive conclusions with our results. We plan on accomplishing this by sending out a two part survey, in which the first part asks the respondents questions to better understand demographics, such as Age, Race, Gender, Political Party, or Household Income. The second part of the survey would ask respondents to rank their receptiveness of an idea promoted by an ad, such as the idea of installing solar panels on their home, or switching to reusable bags instead of plastic. After this initial survey is sent out, we would create a spreadsheet that indicates which advertisements each demographic claimed to be most receptive of. Then, we would send out a second survey, again measuring receptiveness to the messages of advertisements. However, this survey would be specific to the individual. Whichever advertisement was determined to be most resonant within the demographics to which the respondent identified with will be the basis of the set of advertisements that they are asked to respond to in the second survey. Some potential categories of ads that will be sent out during this round of surveying include ads that present climate change as: an economic issue; a moral issue; an ecological issue. After this survey was collected, we would make a second spreadsheet. With information about the respondents' interest in the advertisements they viewed, we would then be able to determine whether a specific type of ad can help an individual to better understand the significance of a science-related issue. Potential questions that would be asked of participants in both surveys, as well as potential sources of error, are listed below:

Survey Questions:

1. Rate your interest/personal investment in science classes taken in highschool?
2. What is your level of concern with climate change in general?
3. How much did the term "climate change" change your opinion of this survey?
4. How would you rate yourself in terms of being scientifically literate?

5. How informed do you feel on scientific/environmental issues as an individual?
6. How confident do you feel that your scientific education in highschool has prepared you as an informed voter?
7. Do you feel that civic responsibility should include scientific literacy?
8. Do you believe climate change should be a mandated topic of study in public schools?
9. How important do you believe environmental topics are to public policy?
10. How have your feelings changed on climate change in response to this ad?
11. Did this ad elicit an emotional response from you?
12. Are you more likely to do individual research as a result of this ad
13. How likely are you to change any aspect of your lifestyle because of this ad?

Potential Sources of Error:

- Participants choosing not to respond to certain questions
- Participants unsure of their stance on a topic
- Participants failure to understand advertisement
- Participants answering questions falsely

Data Analysis

In order to gather data from our surveys, we intend to use a Likert scale ranging from 1 to 5 (1 being not strong at all and 5 being very strong) for questions referring to advertisement response and a series of relevant selectable answers for demographic questions, as listed above. Once the data from the two surveys is collected, we will be able to calculate how each demographic responds to a specific ad, and we will be able to see which ad is optimal for increasing the scientific literacy of each demographic. In order to quantify our results, we will input the numerical results of our surveys into google sheets. Once this is done, we will compare the results of each ad and be able to accept or reject our null hypothesis. In order to accept our null hypothesis, at least 51% (or some majority) of respondents from survey group two would have to indicate that they feel their scientific literacy has improved. To do this, we will calculate the improvements for each question across the two surveys and find the average range of improvement. We will then be able to conclude if the threshold of accepting our null hypothesis was reached for each question. If the margin for improvement falls below this level, we must reject our null hypothesis because we did not improve or influence the audience's scientific literacy by an acceptable degree.

IV. Anticipated Results

We expect to obtain a variety of datasets that reflect demographics, world views, and levels of scientific literacy that may or may not correlate each other.

- For example, if a population demographic is receptive of a certain category of advertisement, then we would expect this demographic to be open to learning more about the issue depicted by the advertisement.

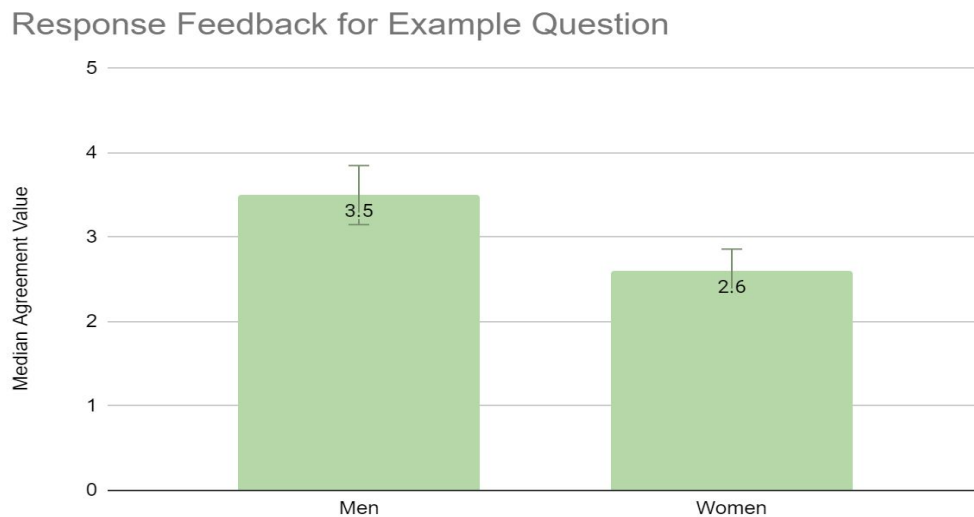


Figure 1: Represented above is hypothetical data that compares how the demographic of gender, (men/women), would affect responses to a particular advertisement. In this hypothetical data, men have a higher median agreement value than women, indicating that as a group, men were more receptive of the message promoted by the advertisement.

We anticipate being able to use the data collected from our surveys to model our results from the chosen variables and compare them for each individual advertisement.

V. Timeline

Week	Phase/Goal
1	Survey design and modification
2	First distribution of experimental material
3	(Participants complete 1st survey)
4	Collection and organization of Results
5	Analysis of results by question and demographic
6	Preparation of second survey / categorizing participants
7	(Participants complete 2nd survey)
8	Collection and organization of Results / Conclusion

VI. Materials and Budget

Item	Description	Cost (\$)
Google Sheets		\$0
Google Surveys		\$0
Photoshop	Adobe Suite (Edu pricing)	\$19.99/month
Total		\$19.99

VII. Key Personnel

Team Member	Relevant skills / Responsibilities
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Andrew Sullivan	Advertisement response research
Bridget Beaudoin	Creating/Distributing Surveys
Sebastian Haro	Ad Design/Photoshop
Carter Paul	Data Analysis

VIII. Relevance of Proposed Study and Broader Impacts

We anticipate that our data will be able to provide educational, private, and federal organizations with the information needed to promote scientific literacy among population demographics. This would include developing advertisements advocating for environmental policies that are both supported by the people, and by science. We suspect that if people are willing to learn about how scientific issues will impact them, they will be more supportive of policies that are sustainable.

By having documented evidence of successful targeted advertising for educational purposes, we hope to establish a method of increasing scientific literacy. In turn we expect that, this would aid public and/or private officials in introducing new environmentally friendly policies or infrastructure to communities, including strategies to accurately inform voters on details of future ballot questions pertaining to environmental policy. Overall, we expect an improvement in scientific literacy to be represented by our results and their impacts on society, creating a more unified meaning of “global citizenship”.

IX. References

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