University of British Columbia

Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Effectiveness of Educational Poster to Increase Student Engagement in CAP 2030

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Effectiveness of Educational Poster to Increase Student Engagement in CAP 2030.

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Executive Summary
Our research aims to explore whether visualization tools such as educational posters increase student engagement in Climate Action Plan 2030 or not. 66 participants were recruited and were randomly assigned into three conditions: poster, text, and control condition. Participants in the poster and text groups were asked to view either posters or texts related to food waste and then surveyed. In contrast, participants in the control condition were only asked to do a survey. Contrary to our hypothesis, we found that the visualization of information did not increase participants' engagement in climate change actions.

Introduction

Background Literature

Increasing levels of human-produced greenhouse gas emissions from burning fossil fuels and raising cattle for the meat industry have made climate change an inevitable problem (Parant et al., 2017). Climate change has social, geographical, ecological, economic, political, and psychological implications because climate change has altered the environment by making stable climates unpredictable and threatening (Zakeer & Nawaz, 2020). An example of these unpredictable environmental changes resulting from climate change is ecosystems that sustain food production being eradicated and a reduced freshwater resources supply (Zakeer & Nawaz, 2020).

However, climate change is a complex problem that must be solved by collaborating with people around the world (Newwell, Dale, & Winters, 2016). Even though climate change is a raging problem that requires constant effort, most people continue to view climate change as a less urgent issue that does not require instant solutions (Linden et al., 2015). There are many reasons why people consider climate change as a less urgent issue as compared to other economic, terrorist, and health care issues (Linden et al., 2015). One reason is that people think their actions cannot make a big difference in combating climate change (Linden et al., 2015). Thus, it is essential to increase people's engagement with climate action. One way to educate the masses is by describing climate change actions that people can actively engage in and witness how their effort helps combat climate change. One area of focus is on the reduction of food waste because the reduction in the consumption of beef, lamb, and dairy can reduce a large number of greenhouse gas emissions (Reisch et al., 2020). Next, food waste reduction is a climate change action that people can easily engage with at zero cost.

Visualization of climate change information has proved to be the most effective strategy for climate change engagement because visualization of information can quickly absorb a holistic sense of the consequences of climate change (Newwell et al., 2016). Further, visualization of information can engage people on not just an intellectual but an emotional level. This forces them to rely on the brain's fast-processing system, which has been discovered to have a more significant impact on making climate change decisions (Newwell et al., 2016; Reisch et al., 2020). Moreover, it can increase perceptual salience on the information presented (Newwell et al., 2016).

Psychological Insight

The Norm activation theory proposed by Schwartz argues that people perform altruistic behavior such as pro-environmental behavior if they are aware that performing pro-environmental behavior has certain beneficial consequences (Onwezen et al., 2013). Up until

now, there have not been many studies investigating the effect of visualization of food waste reduction to promote climate change actions. Because of this, we propose the research question: Do visualization tools such as educational posters increase student engagement in CAP 2030?

There are many ways to visualize climate change information. Certain ways are more effective in increasing people's awareness of climate change consequences and promoting their responsibilities on climate change actions. It is also known that visual attention impacts the types of features a person looks at through bottom-up visual processing and top-down visual processing (Harold, Lorenzoni, Shipley, & Coventry, 2016). For example, visual information, such as brighter color, larger font size, and arrows, can attract people's attention through bottom-up visual processing. Visual salient task-relevant features can attract people's attention through top-down processing (Harold et al., 2016). Visualization of information with realistic images that capture real-world objects and places can also increase people's willingness to promote climate change actions (Newwell et al., 2016). Furthermore, other features such as static visualization (e.g., Graphs and Pictures) allow the audience to better understand the presented information (Newwell et al., 2016). Through building posters integrating the visual features, we hypothesized that educational posters would reduce food waste and increase student engagement with the Climate Action Plan 2030.

Methods

Participants

We aimed to recruit 150 participants. At first, we had only one condition; therefore, we plan to recruit 50 people as participants. However, after communicating with our professor and clients, we decided to introduce 2 new conditions into our study, leaving us with 3 conditions. After conducting a power analysis, we found a medium effect size power of .80 and an alpha of .05. This revealed a required sample size of 159 participants. Thus, we need more people, ideally 50 people, for each condition. However, as the COVID-19 pandemic constrains our current social environment solely online, we were only able to recruit 66 participants.

We engaged these participants by sending the survey link out to all of our friends and family. When we noticed that we were not getting enough participants, we reached out to our SEEDS client for help. They distributed the survey more widely through their channels, so we were able to get some more respondents.

Of all the 66 that took part, 62% of the participants are female, 35% are male, and 1.5% are non-binary. 54% of the participants are Asian, 35% are white, 5% are Hispanic/Latino, and 5% identified as Others. Only 1% are black. The participants were selected between March 2nd and April 1st, 2021.

Conditions

As mentioned above, our study had three conditions. Our independent variable was what version of the visualization tool the survey participant viewed. Our survey was made up of 4 parts: consent, conditional questions, general questions and demographic questions. for the conditional questions, we had qualtrics randomly assign the participant to one of three categories of the independent variable: Poster, Text and Control. All categories answered the Consent, general questions and demographic questions. The participants in the Poster and Text conditions viewed engagement materials, then answered additional conditional questions about what they

had seen. The control condition did not answer additional questions as they did not view any engagement tools.

For the poster condition (shown in Appendix A), the survey participant viewed an educational poster, which we retrieved from Google images. We chose this poster along with Dr. Zhao during our first check-in meeting. We chose this poster because it had information on both Food Waste and Greenhouse Gas emissions, which are both issues that CAP 2030 are concerned about. The participant viewed the poster, then answered questions that evaluated their engagement with the poster.

As our research question was whether visualization tools such as educational posters increase student engagement in CAP 2030, we wanted to see if it was the fact that the information was portrayed in a visually engaging poster format that made the participant more willing to get involved with issues that the CAP 2030 are concerned with. Therefore, in our second condition, the text condition, the survey participants that were randomly assigned to this condition viewed the same information that was in the poster, but with none of the visual engagement add-ons such as colours or pictures (shown in Appendix B). They then completed the same questions about their engagement with the information. This was to evaluate whether it was the colours and visual format that engaged the survey participant with the information and made them more willing to engage with organizations that are concerned with the same issues.

Our third condition was the control condition. If the survey participant was randomly assigned to this condition, then they viewed a screen that simply told them to click a button to proceed to the general questions of the survey. We decided to use this control condition to find if participants that viewed no engagement material about climate change had statistically different answers to the general questions about being willing to change lifestyle choices for sustainability reasons and engage with CAP 2030. We hoped that the control would show us the effectiveness of both types of engagement material, visual and purely textual.

Measures

In our survey, the majority of our questions were answered by a 7 point Likert scale (shown in Appendix A, B and D). We chose the Likert scale as we wanted to know to what extent our respondents thought the visualization materials were engaging, and the Likert scale is able to express the opinions of the respondents in a statistically-analyzable numerical value.

We thought the 7-point Likert scale was most appropriate as we wanted to be able to express the opinions and attitudes of our survey participants as accurately as we could, without causing confusion, and be left with a numerical value that we could analyze. We discussed in our group that the 4 or 5 point Likert scale may not allow our survey participants enough options to accurately express their opinion, and any higher number of points may become confusing for the participant.

Procedure

After meeting with the professor, we had the final survey questions and produced a survey link with UBC Qualtrics. Each person in our group began to promote people to complete the survey on March 2nd, 2021. The biggest challenge we met during the study was that we couldn't collect enough data for our survey. We planned to take 150 responses but end up with 66 responses on April 1st, 2021, which created a small sample size for our study. This, as mentioned above, we believe is due to the difficulty of engaging people during the COVID-19 Pandemic. Moreover, we noticed that our social media pages seemed to be flooded with survey

links for our friends that are also conducting their final projects online and are collecting data through surveys. We think that in a way, our link may have gotten lost in the large number of surveys that were being advertised at the same time. In the future, we would try to combat this by making more visually appealing advertisements for our survey, to try and attract more respondents.

Results

Regarding which information on the educational poster is compelling to the participants, 33.33% thought valuable resources are the most compelling information on the poster. 38.10% of students thought that information about money down the drain is the most compelling information on the poster, and 28.57% of students thought that information about climate change is the most compelling information on the poster (see Appendix …., Graph 1). Thus, this highlights that participants thought information about money down the drain in the educational poster is the most compelling information, which means that this information draws their attention more to the poster. Regarding which information on the educational text is compelling to the participants, 41.18% thought valuable resources are the most compelling information on the poster. 35.29% of students thought that information about money down the drain is the most compelling information on the poster, and 23.53% of students thought that information about climate change is the most compelling information on the poster (see Appendix …., Graph 2). In the text, participants thought information about valuable resources is more compelling, which means that this information draws their attention more.

An independent sample t-test revealed the mean rates engagement to our educational posters in the poster condition ($M = 4.42$, $s = 1.83$) were not significantly higher than the mean rates engagement to our educational posters ($M = 4.47$, $s = 1.38$), $t(36) = -0.08$, $p=.94$, $d = 0.03$(See Appendix .., Table 1). This suggests that participants found the educational poster and educational text equally engaging, so visualization of food waste information did not increase participants' engagement in climate change actions. An independent sample t-test revealed the mean knowledge gained in our educational posters in the poster condition ($M= 4.67$, $s = 1.28$) were not significantly higher than the mean rates of engagement to our educational posters ($M= 5.00$, $s = 1.37$), $t(36) = -0.77$, $p=.44$, $d = -0.25$ (See Appendix .., Table 2). This suggests that participants found the educational poster and educational text as equal knowledge, so the visualization of climate change information doesn't speed up students' information absorption.

A one-way between-groups ANOVA test revealed no significant main effect of visualizing climate change materials on the willingness of food waste reduction, $F(2,55)=0.83$, $p = .44$, $\eta2 = .03$ (See Appendix .., Table 3). The one-way between-groups ANOVA suggests educational posters did not increase participants' willingness to reduce their food waste from every meal. Thus, our hypothesis that the educational posters did not increase the willingness of food waste reduction. A one-way between-groups ANOVA revealed no significant main effect of visualizing climate change materials on the support of Climate Action Plan 2030, $F(2,55)=1.69$, $p = 0.19$, $\eta2 = .06$ (See Appendix .., Table 4). The one-way between-groups ANOVA suggests educational posters did not increase participants' willingness to support Climate Change Plan 2030. Thus, the results indicate that the educational posters did not increase participants' engagement in the Climate Change Plan 2030.

Discussion

The results show that information about money down the drain is the most compelling information on the poster. In contrast, participants in the text condition thought information about valuable resources is more compelling. Also, the results indicate that educational posters did not increase students' support or involvement in the Climate Change Plan 2030, which illustrates that visualization of information did not increase participants' engagement in climate change actions either. In short, our results do not confirm the hypothesis. However, that does not mean our hypothesis is wrong because we have one significant limitation in this study: we do not have enough participants to complete the survey, ending up with a smaller sample size. We have one-third of the participants that we expected, which may cause errors in our results. In the future, we will try to ensure we have enough participants to finish our survey. Another limitation of our study is that 54% of our participants are Asian, which means most of our participants are from similar cultural backgrounds. Therefore, the results of our study cannot be applied to the diverse population. We can improve the participants' diversity by recruiting UBC students from different cultural backgrounds in the future. Besides, we did not give participants enough time to be exposed to those visualization tools, leading to minor effects of the visualization poster on them. Maybe next time we can try a different design method, for example, giving them more posters to view or a longer time to consider. Or we could even change to 3D visualization to attract people more. Our goal is to help people protect the environment and achieve environmental sustainability as much as possible by promoting that knowledge to them. In this case, maybe we could show the visualization tool in a website way and appeal for donating clothes they don't need to the homeless. This example shows that we could change our method designs next time to ensure people would have more engagement; therefore, our results could be different in the future study.

Although we did not get what we expected for the results, our research project still contributes to possible environmental-friendly changes when trying to show people about food waste and climate change. As the psychological insight says, few studies investigate the effect of visualization of food waste reduction to promote climate change actions; therefore, we start to explore this time. We can learn lessons from that experience and try to confirm our hypothesis next time.

Recommendations

Although the findings of our study are not statistically representative of the broader public, they can be applied to the research on the tendency of UBC undergraduate students to engage in the Climate Action Plan 2030. It seems that educational posters might not be an effective tool to increase students' engagement in the CAP based on our study. However, to fully understand the impacts of educational posters, more data needs to be collected and analyzed as mentioned before. Besides, since we asked the participants to do the survey online due to the global pandemic, participants might not be able to stay engaged in the online survey and they might be distracted when they did the survey during their own time. It is also challenging to examine the effectiveness of educational posters since we only showed the participants electronic posters instead of printed posters. The potential positive impacts of printed posters might be greater than electronic posters. Thus, we suggest exploring the effectiveness of printed educational posters in different settings. For instance, educational posters about CAP can be

placed in the UBC library or other sites with high population flow so that the essential information can be exposed to a large number of people.

Moreover, to maximize students' engagement in the CAP, multiple types of visualization tools can be used as attractors for broader engagement and increasing the influence of the CAP. For instance, the visualization of numerical information about food waste, could highlight the amount of food people waste and increase the potential for recognition of the environmental issues among the audience. Also, artists can contribute to the development of environmental sustainability by creating attractive graphic designs and data visualizations (Newell, 2016). It is important for the researchers to focus on how to better engage and inform UBC students to support the CAP through different types of promotion. Therefore, further research can focus on how to deliver the information of sustainability issues such as climate change clearly to the public through multiple types of visualization tools.

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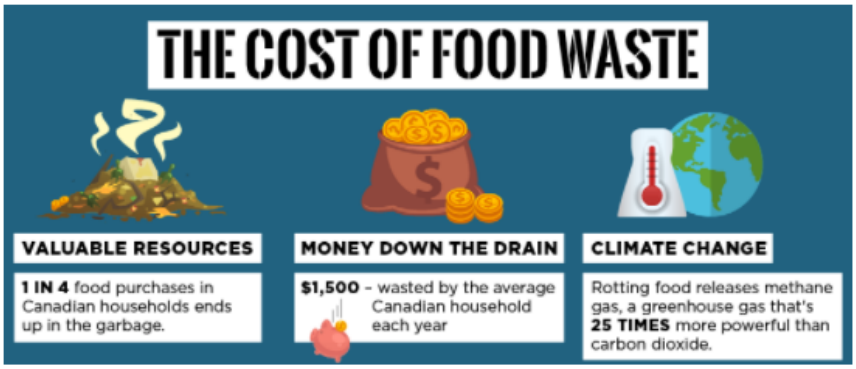
Appendix A

Survey Questions:

Poster Condition:

You will see a poster on food waste in Canada. Please read the poster carefully. You will answer some questions after.



How engaging do you find the poster to be?

1- Not at all engaging	2	3	4	5	6	7 - Very engaging
○	○	○	○	○	○	○

Which information on the poster is the most compelling to you?

- ○ Valuable resources
- ○ Money down the drain
- ○ Climate change

How much knowledge about food waste do you feel you have gained from the poster?

1 - I did not learn anything	2	3	4	5	6	7 - I learned a lot
○	○	○	○	○	○	○

Appendix B

Text Condition:

You will see a paragraph on food waste in Canada. Please read the paragraph carefully. You will answer some questions after.

The cost of food waste involves the following.

Valuable resources: **1 in 4 food** purchases in Canadian households ends up in the garbage.
Money down the drain: **$1,500** is wasted by the average Canadian household each year.
Climate change: Rotting food releases methane gas, a greenhouse gas that's **25 times** more powerful than carbon dioxide.

How engaging do you find the paragraph to be?

1- Not at all engaging	2	3	4	5	6	7 - Very engaging
○	○	○	○	○	○	○

Which information in the paragraph is the most compelling to you?

- ○ Valuable resources
- ○ Money down the drain
- ○ Climate change

How much knowledge about food waste do you feel you have gained from the paragraph?

1 - I did not learn anything	2	3	4	5	6	7 - I learned a lot
○	○	○	○	○	○	○

Appendix C

Control Condition:

Please click on the button below to proceed to the next page.

Appendix D

General Questions:

How willing are you to reduce your food waste from every meal?

1 - Not willing at all	2	3	4	5	6	7 - Extremely willing
○	○	○	○	○	○	○

How willing are you to change your personal actions to reduce greenhouse gas emissions?

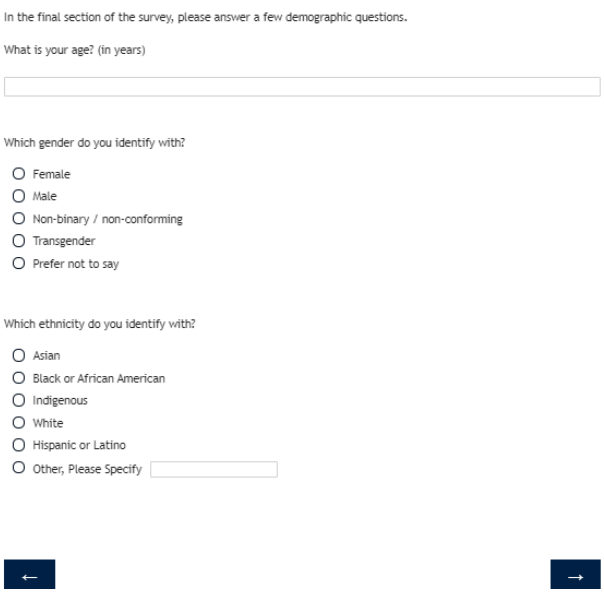
1 - Not willing at all	2	3	4	5	6	7 - Extremely willing
○	○	○	○	○	○	○

How supportive are you of the Climate Action Plan 2030? This plan will define new emissions reduction actions and targets, along with implementation strategies for the next 10 years.

1 - Not supportive at all	2	3	4	5	6	7 - Extremely supportive
○	○	○	○	○	○	○

Appendix E

Demographic Questions:


In the final section of the survey, please answer a few demographic questions.

What is your age? (in years)

Which gender do you identify with?

- Female
- Male
- Non-binary / non-conforming
- Transgender
- Prefer not to say

Which ethnicity do you identify with?

- Asian
- Black or African American
- Indigenous
- White
- Hispanic or Latino
- Other, Please Specify

←

→

Appendix F

Contribution of each team member:

Katie Little: Contributed to research proposal; Attended and led both progress check-in meetings; led survey distribution; Created and edited slides for the presentation (but did not present due to technical difficulties); did the measurements and conditions parts, then edited the final report.

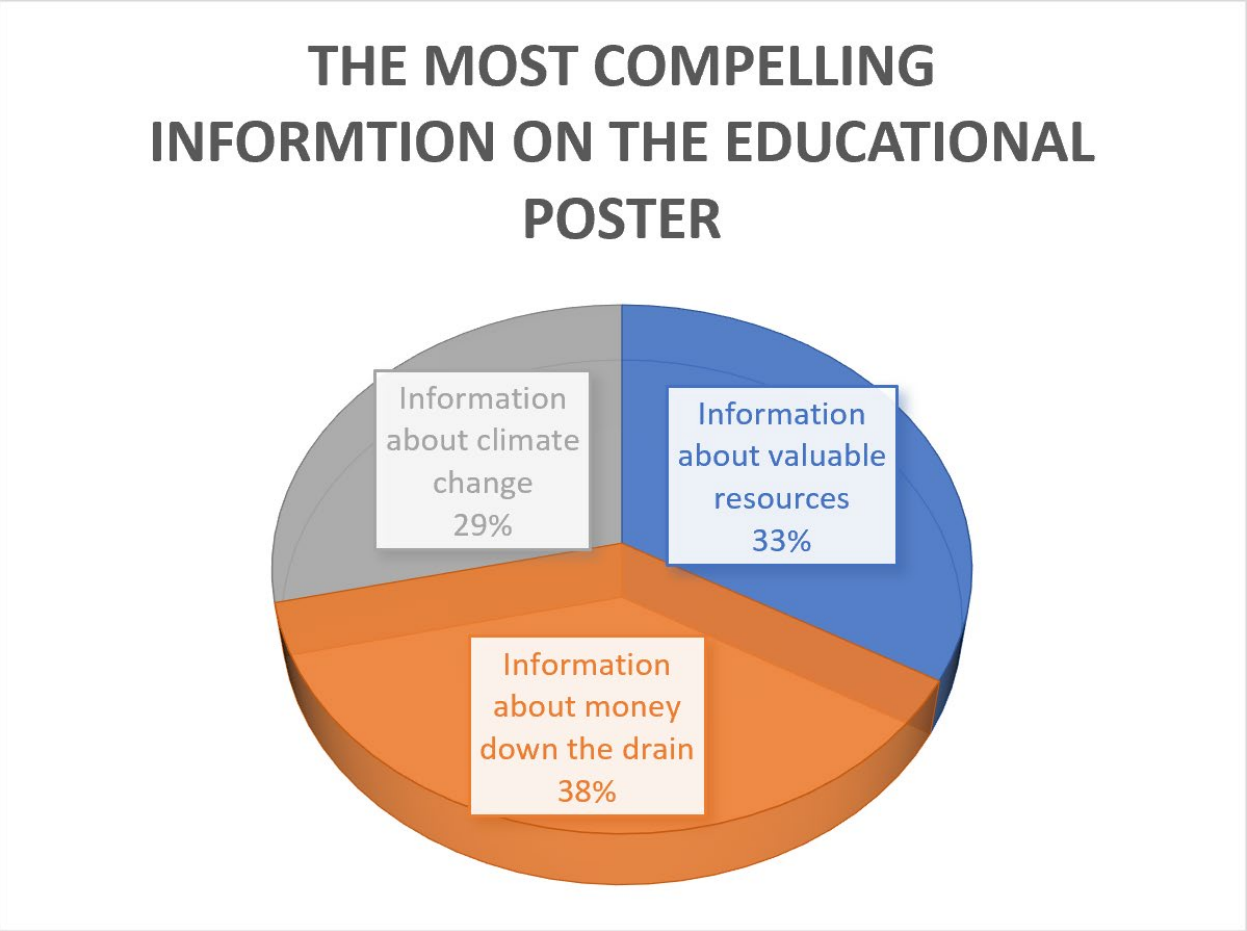
Yanki Hu: Contributed to research proposal; Attended both Proposal Approval and Progress Check-in Meetings; Provided some of the survey questions; Edited slides for the presentation and attended the presentation; Contributed to the introduction includes Background Literature and Psychological Insight, part of the results, references, and appendix for the final report.

Yuxin Sun: Contributed to research proposal; Attended the proposal approval meeting; Edited slides for the presentation and attended the presentation; contributed to the recommendations and suggestions for the final report.

Yinan Guo: Contributed to research proposal; Attended the proposal approval meeting; Provided some of the survey questions; edited slides for the presentation and attended the presentation; Contributed to the participants, procedure, and discussion as well as appendix for the final report.

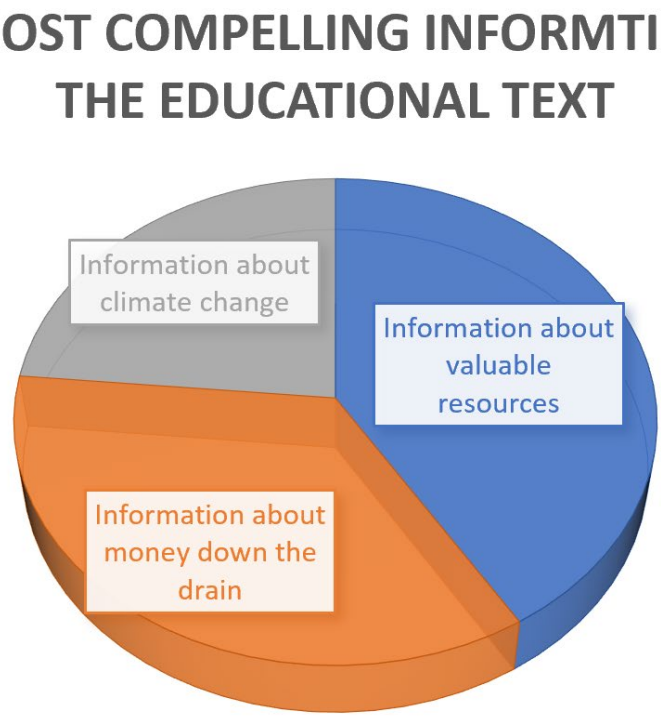
Yijin Shi: Contributed to research proposal; Attended the proposal approval meeting; Attended the presentation and edited slides for the presentation; Contributed to most of the results and appendix for the final report.

Appendix G



Graph 1: The most compelling information on the educational poster.

Appendix H



Graph 2: The most compelling information on the educational text.

Appendix I

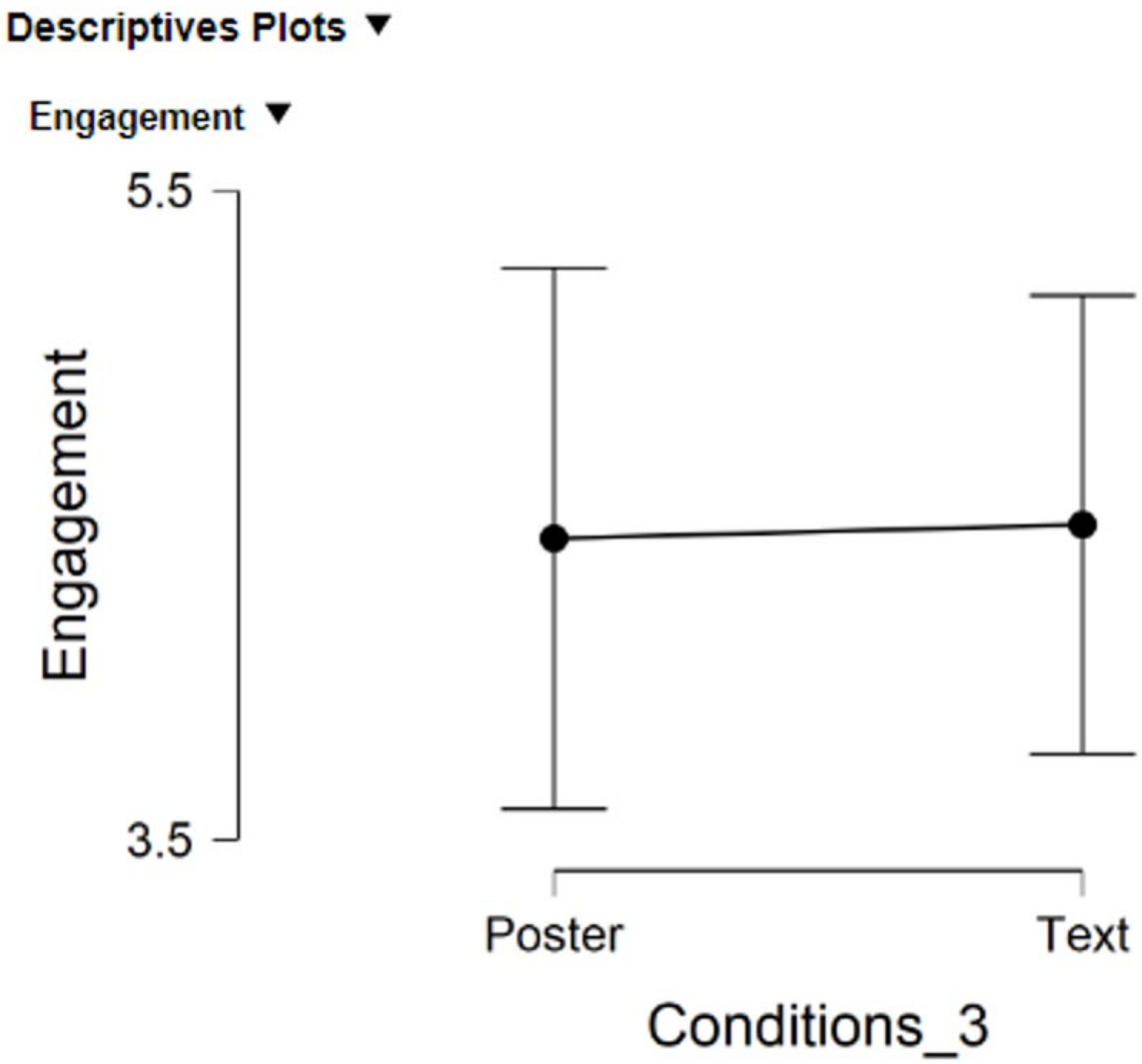


Table 1: The independent sample t-test on the engagement rates through the educational text condition and the educational poster condition.

Appendix J

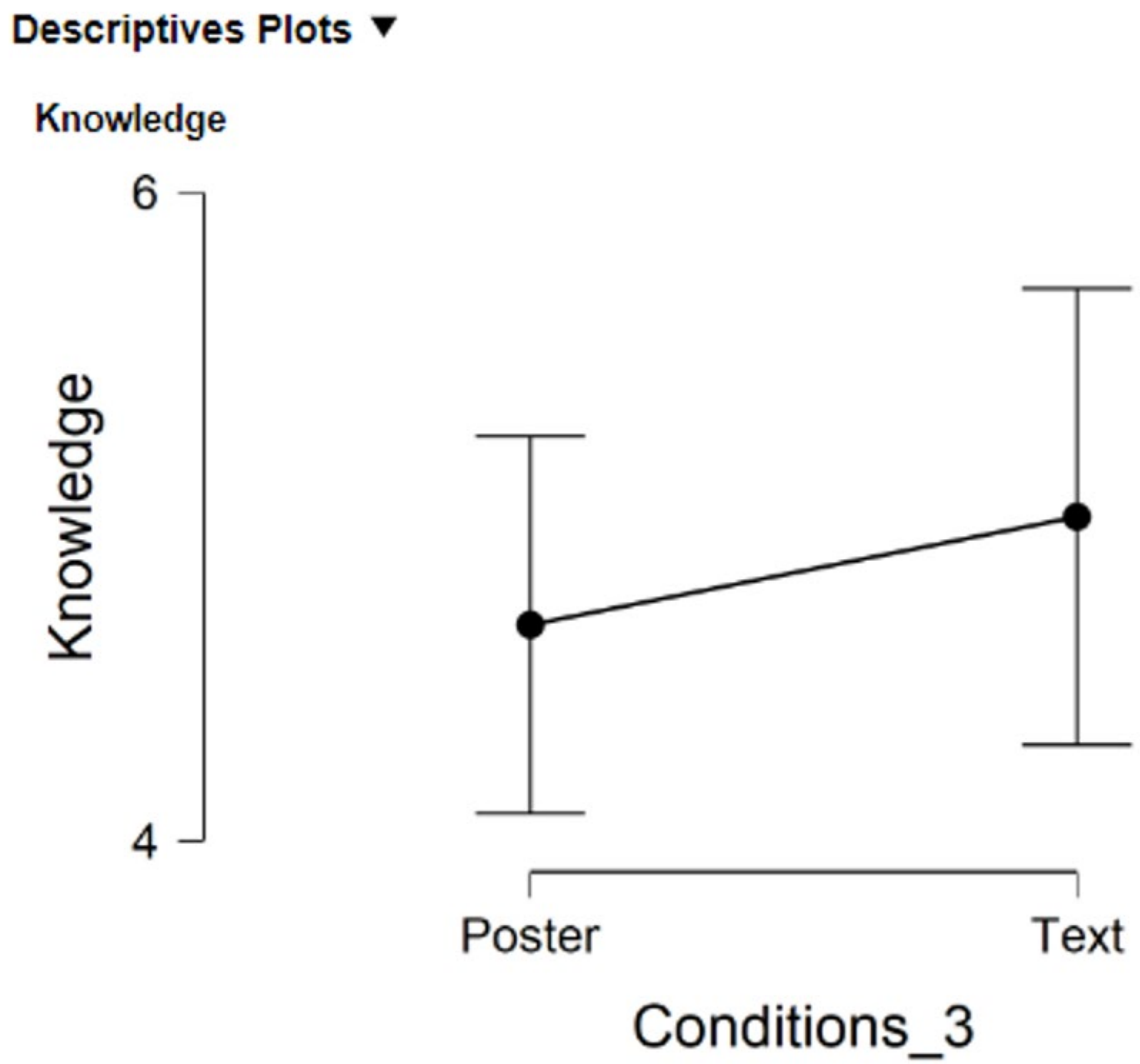


Table 2: The independent sample t-test on the knowledge about food waste gained through the educational text condition and the educational poster condition.

Appendix K

ANOVA ▼

ANOVA - Willingness of Food Waste Reduction

Cases	Sum of Squares	df	Mean Square	F	p	η²
Conditions_5	4.053	2	2.027	0.828	0.442	0.029
Residuals	134.568	55	2.447			

Note. Type III Sum of Squares

Descriptives

Descriptives - Willingness of Food Waste Reduction

Conditions_5	Mean	SD	N
Control	4.900	1.917	20
Poster	5.524	1.365	21
Text	5.294	1.312	17

Descriptives plots

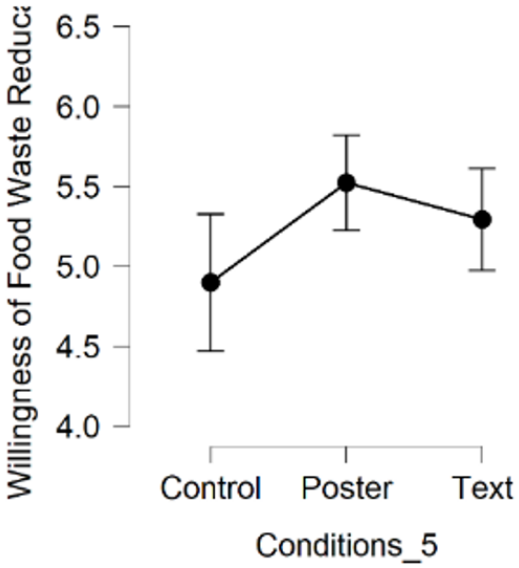


Table 3: The one-way between-groups ANOVA result on the willingness of food waste reduction between control, educational text, and the educational poster conditions.

Appendix L

ANOVA ▼

ANOVA - supportive ▼

Cases	Sum of Squares	df	Mean Square	F	p	η²
Conditions_5	7.837	2	3.919	1.687	0.194	0.058
Residuals	127.749	55	2.323			

Note. Type III Sum of Squares

Descriptives

Descriptives - supportive

Conditions_5	Mean	SD	N
Control	4.800	1.704	20
Poster	5.667	1.390	21
Text	5.353	1.455	17

Descriptives plots

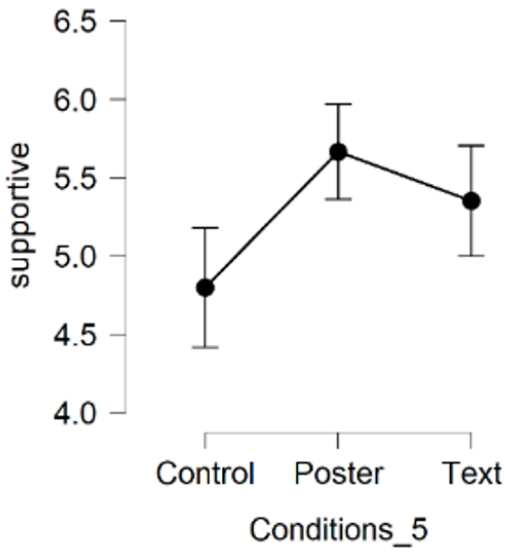


Table 4: The one-way between-groups ANOVA result on the support of Climate Change Plan 2020 between control, educational text, and the educational poster conditions.