Can Social Media Encourage Environmentally Responsible Behavior?
Using Facebook to Encourage Waste Reduction on Campus

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ABSTRACT

The growth of material consumption in our society paired with looming climate change has raised awareness and concern over waste production. The University of Michigan has specifically targeted waste prevention in their six sustainability goals to be achieved by 2025. The University has previously relied heavily on top-down, education-based approaches to encourage conservation behavior among students, faculty and staff, which has resulted in modest shifts in behavior. The use of social media sites has thus far not been widely used to deliver behavioral interventions on campus. However, this medium could potentially prove to be useful for universities like UM that are interested in encouraging waste reduction behaviors. This study utilizes social media, specifically a Facebook Group Page, to motivate and engage students in the Bursley Hall Dormitory to reduce their waste in four categories: food, water, energy, and solid waste. Data from pre- and post-test surveys as well as Facebook Group Page activity were analyzed. The preliminary results indicate that the social media-based intervention had a minimal impact on project participants. This suggests that although social media-based approaches may be appealing to large universities such as UM, projects relying solely on this medium may be ineffective in encouraging conservation behavior.

INTRODUCTION

Waste generation within the United States has steadily increased since the 1960s as a result of our increasingly consumptive lifestyle and growing population (EPA 2014). According to the Environmental Protection Agency (2014), Americans produced about 88.1 million tons of municipal solid waste as a nation in 1960, averaging 2.68 lbs. per capita. By 2012 waste production had grown to 250.9 million tons, averaging 4.38 lbs. per capita. Only about one-third (34.5%) of this waste was recycled and composted. Although this percentage may seem insignificant, the impact of recycling and composting is large. The EPA website states that the waste recovered in 2012 is "comparable to the annual GHG [Green House Gas] emissions from over 33 million passenger vehicles," and is "the same amount of energy consumed by almost 10 million U.S. households in a year." If this represents the impact of recovering merely one-third of our waste, the energy and environmental costs associated with sending waste to landfills is enormous. Clearly, waste reduction is an important and urgent issue facing Americans today.

In order to transition to a more frugal and less consumptive society, there is a need to create effective and durable changes in the behavior of households and individuals. Many campaigns to promote waste reduction behavior have primarily focused on raising awareness of the issue, such as how much waste is sent to landfills every day. Although this information is useful, it has largely been found to be ineffective in creating any change in behavior (Kaiser & Fuhrer, 2003). This information-only approach assumes that people are rational actors, deliberately weighing pros and cons when making decisions. Therefore, if they fully understand the negative consequences of current actions and the positive outcomes of alternative actions, behavior will surely shift. However, there is ample evidence to suggest that humans rely heavily on mental shortcuts when making decisions (Gigerenzer & Gaissmaier, 2011) and that many other factors, such as competence and social norms, influence behavior (De Young, 2000; Nolan et al., 2008). Given this, there is a need to explore interventions that utilize a wider variety of behavior change strategies and appeal to a broader set of motives.

The Reasonable Person Model offers a framework in which to "bring out the best in people" (Kaplan & Kaplan, 2008). This model views humans as information processors that have a deeply rooted evolutionary inclination to make sense of the world around them and act effectively. RPM also asserts that the way information is structured in the environment matters. In order to encourage wellbeing and reasonableness among people and support behavior change efforts, RPM suggests three categories of human needs that must be met: building models, being effective, and meaningful action. Mental models are essentially mental representations of situations or environments a person has experienced. These mental models help humans recognize what is going on around them, make predictions about the future, and evaluate potential courses of action. Building these models therefore requires practical experiences and personal exploration. Exploration is crucial, for people need to be able to understand a situation at their own pace and avoid being overwhelmed by lots of new information. Being effective is a person's capacity to effectively use this knowledge and skill. This includes the amount of attention they have available to focus on new situations or behaviors, such as if a person is awake and relaxed versus tired and stressed. In addition, being effective includes feelings of competence someone has related to the situation or behavior, such as the knowledge of how to compost in their home. Meaningful action is the human desire to be needed and to make a difference within their community. One noteworthy component is the need to *participate* – to take part in their community or with fellow humans to achieve goals together (Kaplan & Kaplan, 2009). We can see how powerful this need is in the popularity of volunteering in local communities. These components can be used together to organize a project or environment in which people are more likely to be reasonable and take on new behaviors. One possible medium to aid students in building mental models, support their mental effectiveness, and allow them to participate in and achieve goals with a community is social networking.

The use of social media in changing behaviors has not been widely studied, despite the dramatic increase in Internet and social network use among teens and young adults. The Pew Internet Project reports that 74% of all adult users (ages 18+) use social media, and of those, 71% are specifically using Facebook (Duggan et al., 2015). Furthermore, 89% of young adults (ages 18-29) are using social media. The widespread use of social media makes it an easy, cost-effective way to access large numbers of people (Korda & Itani, 2013). The Pew Center report states that social media is "increasingly used to keep up with close social ties," and that "internet users get more support from their social ties, and Facebook users get the most support" (Duggan et al., 2015). This data indicates that social networking could potentially provide an easily accessible social support system, regardless of distance. Social networking can enable behavioral interventions to directly engage participants in each step of the project, even including them in the creative process (Thackeray et al., 2008). The higher level of engagement coupled with access to a supportive social environment has the potential to support more active forms of participation. This can increase participant's loyalty to the program and improve the likelihood of participating in the preferred behavior. In addition, many Internet and social media users are actively seeking information and advice when online (Korda & Itani, 2013). Behavioral interventions could utilize information-seekers and provide the opportunity for user-generated content. This allows project participants to meaningfully engage with their community by asking questions and answering others.

There is now evidence to support the efficacy of Internet and social media interventions; however, there is great variability among these results (Webb et al., 2010). One study dedicated to improving health behaviors included an interactive website that allowed participants to track

their progress as one part of a multi-component intervention (DeBar et al., 2008). This study found improvements in behavior, and when controlling for other components found that the website had an impact above and beyond the other components. Research by Webb et al. (2010), however, reviewed the broad category of Internet-based interventions and found little difference between web and non-web based projects. On average, Internet interventions had statistically small but significant effects on behavior. This review found that certain types of Internet-based behavioral interventions had greater impacts than others. Projects heavily based in behavioral theories, that included multiple behavior change techniques, and used more interactive modes of delivery (such as text messages and emails) resulted in greater behavioral shifts. The considerable variability found in the effectiveness of Internet-based interventions emphasizes the importance of identifying the most effective techniques.

Waste Production on Campus

The University of Michigan produces 17,000 tons of waste annually, of which 30% is recycled (Office of Campus Sustainability [OCS], 2012). UM has recently created six sustainability goals it wishes to achieve by the year 2025. One major theme identified in these goals is waste prevention. The university would like to reduce the amount of waste produced by 40% by 2025 (OCS, 2012). One campus effort designed to address this goal is the Planet Blue Water Bottle Initiative (Planet Blue, 2014). This program provides every first-year student on campus with a reusable water bottle with the Planet Blue logo printed on the side. The university has also made it easier to refill water bottles by creating over 100 water bottle filling stations around campus (Planet Blue, 2014). Other student-led efforts on campus include the Planet Blue Ambassadors, who are encouraged to be "sustainability champions on campus" and "lead by example" in their communities (Planet Blue, 2014), and the Kill-A-Watt program, which focuses on engaging students in energy and sustainability issues while reducing energy use on campus. In 2013, the Kill-A-Watt program held a competition between residence halls for who could reduce their energy use by at least 10%.

The UM Graham Sustainability Institute leads the Sustainability Cultural Indicators Program, a "survey tool to assess sustainability knowledge, dispositions, and behaviors among campus community members" (Planet Blue, 2014). The most recent survey reports a significant increase in awareness and concern for environmental issues, but unfortunately no significant changes in conservation behavior. Although the university has a variety of conservation programs aimed at engaging students on campus, it has not been successful in increasing conservation behavior among students, faculty and staff. Clearly, the university must engage in different types of programs and approaches if they hope to achieve their sustainability goals.

Using social media to encourage conservation behavior may be one approach that is worth investigating. While the use of social media to encourage behavior change has not been widely studied, this medium could provide students with an opportunity to access a supportive social environment virtually. The use of social media as an intervention tool may also be especially appropriate in university settings. The majority of students on campus are already using social networking sites, so the access point for an intervention is already present. In addition, it may be more cost and time effective because the work can be achieved over a computer rather than organizing and attending many in-person meetings. Social media sites may also provide an experience that is more interactive than merely receiving information. It can allow students to be more engaged in promoting behaviors and potentially increase their

motivation to participate. If social media is found to be an effective means of changing behavior, it could be included in future sustainability campaigns led by the university. The goal of this study is to measure the effectiveness of social media in motivating environmentally responsible behavior in students on campus.
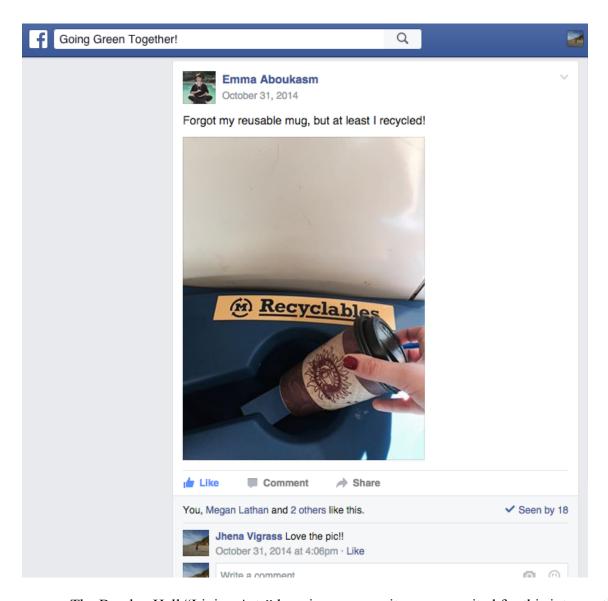
METHODOLOGY

Intervention Design

Participants in the intervention were given the community goal of reducing our waste together. The project was three weeks in length and focused on four overarching waste-reduction themes: food, water, energy, and solid waste. Participants were asked to actively work to reduce their waste every day, creating their own behaviors within the four categories to accomplish this. Three optional in-person meetings were organized over the course of the intervention.

Throughout the project, students were also members of a Facebook Group Page dedicated to the intervention. Members of the Facebook Group Page received daily posts that focused on sample behaviors they could participate in within the given four categories, pictures of others engaging in waste-reduction behaviors, and different creative projects committed to influencing environmental change, such as songs, dance routines, paintings and photography. In addition, participants were asked to create content for the page, such as sharing their experience with the project (see Figure 1).

Figure 1. *Image of the Facebook Group Page*

The Bursley Hall "Living Arts" learning community was recruited for this intervention because they are a community of first-year students on campus. It has been shown that people in times of transition are more likely to adopt new behaviors (Verplanken et al., 2008). If these students were to adopt new waste reduction behaviors and these actions become habitual, it is possible that these behaviors would continue after college. In addition, the Living Arts community is dedicated to the understanding and exploration of creativity in various forms: music, theater, art, dance, and engineering. Because participants were creating their own sets of behaviors, it seemed that a creative-minded group such as Living Arts would be more receptive to the project as compared to other groups on campus.

Before starting the intervention all Living Arts members were invited to participate in a 15-minute introductory meeting to raise awareness of the project and allow students to understand the expectations of participating. The meeting announcements were delivered via email, hallway flyers, and Facebook invites. During the meeting, the overall structure of the project was discussed. In addition, students were shown different creative art displays focused on influencing waste reduction in others. A pre-test survey was distributed to all individuals that

attended this informational meeting. The pre-test survey was also distributed via email and Facebook to the Living Arts community. In order to gain a larger sample size, the survey was also distributed in person to general residents of the Bursley Hall Dormitory. All pre-test survey respondents were invited to join the Facebook Group Page. Those that did not sign up for the page or attend the introductory meeting were considered members of the Control Group.

A second kick-off meeting was organized to begin the project. This meeting focused on the four predetermined categories of waste reduction, which were chosen to provide the greatest amount of behavioral opportunities for students in the campus environment. During this meeting the group worked together to identify various waste reduction strategies for each category, such as minimizing printing and taking shorter showers. The group then looked at different ways they could engage in the Facebook Group Page, such as what would be the best items to share with others. Meeting attendees were encouraged to think of how they could use their creativity within the Facebook Group Page and discussed possible ideas.

A final meeting occurred at the conclusion of the three-week project in order to receive feedback from intervention participants. During the meeting, participants were asked to evaluate the intervention and share their thoughts about how the intervention might be improved. This discussion focused on a number of issues, including the specific content and behaviors that were included in the intervention, the use of Facebook as a means of engaging students, and the barriers to participation. A post-test survey was administered in person to the meeting members, as well as to all intervention and control group members via email and the Facebook Group Page.

Participants

In total, 29 students participated in the intervention. These participants were recruited from general residents of the Bursley Hall dormitory as well as the Bursley Hall "Living Arts" learning community. Participants of the intervention were considered to be those that attended the introductory meeting and/or signed up for the Facebook Group Page. In total, 23 participants were members of the Facebook Group Page. Thirteen students participated in the introductory meeting, five students participated in the kick-off meeting that began the project, and four students participated in the final meeting.

In order to see if changes to the dependent variables were a result of the intervention and not due to other environmental programming occurring on campus, a control group was sampled in addition to the intervention group. A total of 34 individuals of the Living Arts community and general Bursley Hall Dormitory residents comprised the control group.

As can be seen in Table 1, the intervention and control groups were similar in terms of gender and academic standing. The majority of participants within the two groups were first-year students, and both groups were very familiar with using social media and Facebook.

Table 1. *Characteristics of Participants based on pre-test survey responses*

	Control Group (n=34)	Intervention Group (n=29)
GENDER (%)		
Male	47	45
Female	53	55

YEAR (%)		
Freshman	68	66
Sophomore	18	24
Junior	6	10
Senior	8	0
How familiar are you with… (Mean/S.D.)		
Social media in general?	4.00 (.78)	3.93 (.96)
Facebook?	4.06 (1.04)	4.31 (.71)

Measurements

As noted above, pre and post-test surveys (see Appendix) were distributed to participants in the intervention and control groups. The pre-test survey measured general experience with conservation behaviors, pro-environmental identity, recognition of campus environmental norms, as well as demographic information. The post-test survey measured the same constructs to assess change over time as a result of the intervention. The post-test survey administered to the intervention group also asked participants to evaluate their overall experience as well as several specific aspects of the intervention. Each construct measured is described in more detail below.

Conservation Behavior
On the pre-test survey respondents were asked to rate their familiarity prior to college with six behaviors relating to specific categories of waste reduction: food, energy, water, solid waste; as well as general efforts to reduce their environmental impact. These items were assessed on a 5-point Likert scale ranging from *not at all* to *extremely*. On both the pre-test and post-test survey respondents were then asked to rate how frequently they had performed a variety of waste reduction behaviors since they had been on campus, which were specific to opportunities available in the college environment such as food waste in the dining hall and using a reusable mug or water bottle. These questions were assessed on a 5-point Likert scale ranging from *never* to *very often*.

Environmental Social Norms
A set of five questions on the pre and post-test surveys measured respondents' understanding of the social norms associated with conservation and waste reduction on campus. These questions asked individuals about whether their friends would be supportive of environmental behaviors. In addition, several items investigated norms by asking respondents how frequently others were engaged in waste reduction behavior, such as using reusable mugs or wasting food in the dining halls. Questions were rated on a 5-point Likert scale, ranging from *not at all* to *extremely*.

Environmental Identity
The pre and post-test survey instruments also investigated the degree to which respondents identified themselves as environmentally conscious individuals. It included five questions about the importance of conservation, feelings of personal responsibility, and whether they are seen as environmentally oriented by others. Participants rated themselves on a 5-point Likert scale, ranging from *not at all* to *extremely*.

Experience with Project

Intervention participants were asked to evaluate their experience on the post-test survey. Eleven questions focused on overall enjoyment and learning opportunities provided by participating, as well as the effectiveness of the Facebook group. A comment box was provided to allow participants to go into greater depth if needed. All questions were scored on a 5-point Likert scale, ranging from *not at all* to *extremely*. As mentioned above, during the final intervention meeting, participants were also asked to provide qualitative feedback regarding their experience and suggestions for future project improvements. Qualitative and quantitative data regarding the intervention group's involvement was also gathered from the Facebook Group Page, such as how many students posted in the group, how many students saw each post, and how many "liked" each post.

Background Information
The pre-test survey asked respondents to provide general demographic information, which included their gender and current academic level at university. In addition, they were asked to rate their overall familiarity with social media mediums and, more specifically, their familiarity with Facebook on a 5-point scale ranging from *not at all* to *extremely*.

Analysis
To measure if there were any differences between the control and intervention groups, independent samples t-tests were performed comparing pre and post-test responses. Paired samples t-tests were used to investigate the changes from pre to post-test within the control and intervention groups. This will demonstrate if the intervention had any effect on the sample population over time. All other reported results are calculated means of respondent scores.

RESULTS

Development of Measures

In an effort to simplify analysis a priori categories were created with regard to the conservation behaviors, environmental social norms, and environmental identity survey questions (see Table 2). Three categories were created with respect to conservation behavior. These focused on behaviors prior to arriving on campus, current campus waste reduction behaviors that require higher effort, and current campus behaviors that require lower effort. Higher effort behaviors were those that were less obvious and more difficult to perform, while lower effort behaviors were ones that took less time and were more obvious to students. The categories were each named *Prior Conservation Behavior*, *High Effort Conservation Behavior*, and *Low Effort Conservation Behavior* respectively.

For overall pre-test scores, survey respondents rated themselves mid-scale for familiarity with conservation behavior before coming to campus. This indicates that students had some experience performing waste reduction behaviors before coming to the university. The more high effort behaviors, such as shortening shower times, have a slightly below mid-scale performance with all respondents. In contrast, respondents rated their performance for the lower effort behaviors very high, almost reaching the maximum score in the Likert scale. This indicates that the students were very familiar and experienced with easier behaviors, and were not as familiar with the more difficult, inconvenient behaviors.

Questions regarding perceived environmental social norms on campus, such as common peer conservation behaviors and beliefs were grouped into one a priori category named

Environmental Social Norms. All respondents on the pre-test displayed a mid-scale rating of perceived pro-environmental social norms on campus. This indicates that students were moderately aware of others participating in waste reduction behaviors around them.

Survey questions focused on environmental identification were grouped into one a priori category named *Environmental Identity*. This category included questions that asked respondents to assess their level of environmental consciousness and feelings of personal responsibility. In addition, respondents were asked whether their friends considered them to be environmentally oriented. Overall, all pre-test respondents rated their *Environmental Identity* in the middle of the scale. This shows that respondents perceive themselves to be moderately pro-environmental, which aligns with their moderate experience and familiarity with waste reduction behaviors.

Table 2. *A Priori Categories Based on All Pretest Responses*

Category Names and Items Included	Mean	S.D.
Prior Conservation Behavior	3.48	.76
Items		
Recycling		
Composting food scraps		
Reducing water use		
Using less energy		
Lowering food waste		
Minimizing environmental impact		
High Effort Campus Conservation Behavior	2.85	.57
Items		
Shower for 10 minutes or longer (rev)		
Unplug your laptop or phone chargers when device is fully charged		
Have food left on your tray in the dining hall (rev)		
Low Effort Campus Conservation Behavior	4.53	.47
Items		
Recycle paper or plastic		
Use a reusable mug instead of a paper cup		
Turn off the faucet when brushing your teeth		
Turn off the light when you leave your room		
Environmental Social Norms	3.39	.54
Items		
My friends think recycling is important		
A lot of people use reusable mugs and water bottles on campus		
My friend would give me a hard time for unplugging unused electronics (rev)		
A lot of people waste food in the dining hall (rev)		
Environmental Identity	3.44	.76
Items		
I describe myself as environmentally conscious		
My friends consider me environmentally conscious		
Reducing my waste is important		
I have a strong sense of personal responsibility to reduce my environmental impact		
It is now a habit to reduce my waste production		
I reduce my environmental impact because I care about others		

Comparing Differences of Control and Intervention Groups

In order to see if the intervention and control groups were similar before the program started, pre-test scores for the two groups were compared, none of which were found to be significantly different (Table 3). However, a slight trend can be seen when comparing pre-test scores for the high effort conservation behaviors, where the intervention group is slightly higher than the control group (p=0.096). Post-test scores for the intervention and control groups were compared to help demonstrate any impact of the intervention. Again, none of the categories were found to be significantly different.

Table 3. Independent samples t-test results comparing differences of control and intervention groups

	_n_	Control Group Mean (S.D.)	_n_	Intervention Group Mean (S.D.)	95% CI for Mean Difference	t	df
Prior Conservation Behavior							
Pre-test	34	3.43 (.82)	29	3.55 (.69)	-.50, .27	-.62	61.00
Post-test	--	--	--	--	--	--	--
High Effort Campus Conservation Behavior							
Pre-test	34	2.74 (.56)	29	2.98 (.58)	-.52, .04	-1.69*	61.00
Post-test	14	2.86 (.48)	16	2.73 (.81)	-.38, .64	.53	24.96
Low Effort Campus Conservation Behavior							
Pre-test	34	4.52 (.42)	29	4.53 (.52)	-.25, .22	-.13	61.00
Post-test	14	4.70 (.38)	16	4.55 (.63)	-.25, .55	.77	28.00
Environmental Social Norms							
Pre-test	34	3.31 (.62)	29	3.48 (.44)	-.45, .10	-1.25	61.00
Post-test	14	3.68 (.37)	16	3.57 (.48)	-.22, .44	.70	28.00
Environmental Identity							
Pre-test	34	3.53 (.80)	29	3.35 (.71)	-.20, -.56	.94	61.00
Post-test	14	3.69 (.78)	16	3.60 (.77)	-.49, .66	.30	28.00

Note: Statistical significance: *p<.10

Comparing Differences of Pre and Post-test Scores

In order to measure changes in the intervention and control groups over time, pre and post-test scores for the two were compared (Table 4). Comparing pre and post-test scores for low effort conservation behaviors and environmental identity showed no significant difference. Interestingly, the intervention group's high effort conservation behaviors showed a significant difference between the pre- and post-test responses (p=0.045). Unfortunately, this difference was in a negative direction, showing that individuals in the intervention group decreased their frequency of performing high effort behaviors over the intervention period. As stated previously, a slight positive trend can be seen when comparing the two groups' performance in high effort behaviors at pre-test, where the intervention group was slightly higher than the control group. Narrowing the two groups to just those that took both the pre- and post-test surveys, the difference at pre-test becomes significantly different (t(28)=2.26, p=0.032). This suggests that the intervention group may have begun the semester performing more difficult behaviors more frequently than the average student, and as the semester went on the frequency of these behaviors declined. A comparison of environmental norms on campus for the intervention group was not found to be statistically significant, indicating no statistically significant change in perception of their social environment over the intervention period. While the control group showed no statistically significant change with respect to environmental social norms on campus, a strong

positive trend can be seen in the data (p=0.055). This suggests that the control group became slightly more aware of the waste reduction behaviors of their fellow students. This may be a result of students becoming more comfortable and familiar with the campus environment over time.

Table 4. Paired samples t-test results comparing differences of pre and post-test scores

	_n_	Pre-test Mean (S.D.)	Post-test Mean (S.D.)	95% CI for Mean Difference	_t_	_df_
High Effort Campus Conservation Behavior						
Control Group	14	2.64 (.48)	2.86 (.48)	-.52, .09	-1.51	13.00
Intervention Group	16	3.10 (.62)	2.73 (.81)	.01, .74	2.18**	15.00
Low Effort Campus Conservation Behavior						
Control Group	14	4.61 (.38)	4.70 (.38)	-.23, .06	-1.32	13.00
Intervention Group	16	4.53 (.55)	4.55 (.63)	-.30, .27	-.12	15.00
Environmental Norms on Campus						
Control Group	14	3.33 (.61)	3.68 (.37)	-.71, .01	-2.10*	13.00
Intervention Group	16	3.55 (.37)	3.57 (.48)	-.34, .30	-.10	15.00
Environmental Identity						
Control Group	14	3.46 (.94)	3.69 (.94)	-.50, .05	-1.73	13.00
Intervention Group	16	3.50 (.78)	3.60 (.77)	-.43, .24	-.61	15.00

Note: Statistical significance: *p<.10; **p<.05

Participant Experience with the Intervention

Respondents rated their overall experience with the project positively. This indicates that intervention participants were moderately supportive of the project. In particular, respondents reported that the project was moderately fun and not a large time commitment. When looking specifically at experience with the Facebook Group Page, respondents also reported moderately positive support. This indicates that the students moderately enjoyed being members of the page. Questions focusing on willingness to engage in environmental issues in the future were rated highly by the respondents, indicating that the students were looking forward to continuing their conservation behaviors and were not deterred by participating in this intervention.

Survey respondents also gave written and verbal feedback about the project. Overall, these comments indicated that participants wanted a more in-person, social environment in which to actively engage in environmental behaviors and projects. These suggestions included ideas such as a competition between groups within Living Arts and weekly assignments either given by the project organizer or participants themselves. They expressed a desire for a clearer, visualized end goal for the project. Many of the suggestions also focused on improving participation in the project, which included providing a clearer idea of the project to possible participants and what the different time constraints, components, and outcomes of the project would be before committing to participate.

The Facebook Group Page received a minimal amount of involvement by intervention participants. Initial posts on the page were the most highly viewed. The first week received a total of 130 views, the second week a total of 118 views, and the last week received a total of 98 views. Students did not usually "like" any of the posts. This may be a result of the novelty of the page wearing off for participants. In addition, the project's facilitators created the majority of posts, and only one post was submitted by intervention participants. However, this post did seem

to garner slightly more interest from the community and received three "likes" from fellow students. This may indicate that intervention participants were more likely to respond favorably to material submitted by members of their social group as compared to an outsider.

Table 5. *Respondent Feedback on Project Experience*

Survey Item	*n*	Mean	S.D.
Being involved in this project…			
Allowed me to take action on something that I care about	13	3.31	.95
Was fun	13	3.38	1.04
Helped me to learn about environmental issues	13	3.15	1.07
Made me feel personally responsible to contribute	12	3.33	.89
Was a large time commitment *(reversed)*	13	4.31	.95
Allowed me to think differently about the role of creativity and environmental issues	12	3.17	.94
The Facebook Group Page…			
Didn't have enough new content *(reversed)*	11	3.36	.92
It's focus on creative expression inspired me	11	2.64	1.12
Had too much content *(reversed)*	11	4.64	.81
The content made me excited to participate	12	2.50	.80
The content caused me to think differently about environmental issues	12	3.08	.90
Prospection Questions			
I look forward to continuing my conservation behaviors	16	4.00	.63
Was able to get my friends to reduce their environmental impact	15	3.07	1.28
I want to get more involved in environmental issues	16	3.50	1.03

DISCUSSION

Encouraging conservation and waste reduction behaviors on college campuses is an important, but extremely challenging endeavor. While the University of Michigan has tried different techniques, the impact of these efforts has been modest. However, the emergence of social media and the increasing use of social networking sites may offer new and appealing opportunities for engaging students in conservation behavior. The findings of this study provide insights about how and to what extent social media might be incorporated into future university-led projects.

Overall the comparison of pre-test scores indicated that the intervention and control groups were similar in terms of background characteristics, conservation attitudes, and conservation behaviors at baseline. This suggests that the intervention group was representative of students at the university. However, there was a slight positive trend in the pre-test data showing that the intervention group rated their performance of high effort behaviors as more frequent than the control group prior to the start of this study, indicating that the intervention group may have been more inclined to participate in environmental behaviors that are more time intensive or more difficult to achieve.

As noted earlier, the intervention group displayed a significant decline in high effort conservation behaviors from pre to post-test. Although this could be a result of the intervention, the low intensity of this particular program suggests it is equally likely to be a result of other situational factors. The post-test survey was administered later in the semester, therefore the decrease in participation in high effort conservation behaviors may be a result of less available

time, higher levels of stress, and lower attentional resources available to focus on more demanding or inconvenient behaviors. When narrowing the group to just those participating in both pre and post-test surveys, the difference between the two groups' high effort conservation behaviors was significantly different at pre-test. Again, this suggests that the intervention group may have begun the semester performing more difficult behaviors more frequently than the average student. As the semester went on and demands increased they may have simply reverted to the average student engagement level.

For both the intervention and control groups, low effort conservation behaviors and environmental identity were not found to be significantly different from pre to post-test. This indicates that performance of low effort behaviors, such as turning off dormitory room lights and recycling, and their sense of environmental identity remained stable over the intervention period. The control group displayed a strong positive trend for identifying environmental social norms on campus from pre to post-test, suggesting an increased awareness of and support for environmental actions occurring in their social groups. This may be a result of more familiarity with the dormitory environment, which may lead to easier identification of peer behaviors. The intervention group did not display an increase in identifying environmental social norms on campus. While this may indicate that the group did not become more aware of sustainable actions around them, it is possible that this lack of growth may be a result of intervention participants entering campus with an already heightened awareness of these social norms.

How effective was the intervention?

Ultimately, comparing the two groups' post-test scores on all categories did not show any statistically significant differences. These findings suggest that the intervention had a minimal impact on project participants, as their scores were similar to those not exposed to the intervention. This may be a result of the vague structure of the intervention and/or the use of a social networking site as the delivery medium.

Feedback from the survey and attendees of the final meeting expressed a need for clearer information about the project before committing to participate. This suggests that students are not likely to commit to participate in something whose time constraints and components are vague. These first-year students seemed hesitant to add onto their workload, especially if they were not sure of the full extent of the project. In addition, participants expressed a desire for a clearer, visualized end goal or accomplishment to work towards. Overall, this feedback seems to indicate that students new to the campus environment need a highly structured, coherent intervention that allows them to explore new behaviors. While a highly structured program would likely limit the number and variety of behaviors that can be targeted, it could provide participants a greater sense of confidence and comfort during the intervention. In addition, this comfort may actually lead to more creativity in participants, especially if some opportunities for personal decision-making and autonomy are incorporated. Although they are a group of creative-minded individuals, the large amount of personal autonomy allowed by the project's structure clearly deterred students from participating and more actively engaging in the intervention.

Many of the respondents indicated that a more intensive social environment is needed to motivate their full participation in this type of project and to motivate behavior change in general. It is possible that efforts to encourage conservation behaviors are more effective when they incorporate more salient visual signals of others acting in environmentally responsible ways. Physically seeing others recycling and saving water in the immediate environment may

make one more likely to reflect on their own behavior and acknowledge social norms. As a result, it seems that a social media approach alone may not be a strong enough stimulus to motivate participation in environmental behaviors. It can be argued that social media does not create a strong enough sense of belonging to a group or community to be considered effective, nor does it create the required sense of responsibility or obligation that face-to-face interaction can produce.

Implications and Conclusions

Universities are increasingly looking for new techniques to encourage waste reduction behaviors in students on campus. The University of Michigan has largely utilized top-down, education-based approaches in this effort, resulting in minimal behavioral impacts. The use of social media is potentially a useful tool for interventions as it provides more engagement for students with less intensive work for the university. The preliminary results of this intervention indicate that the timing of a project and the degree to which it depends on social networking sites can greatly influence the project's effectiveness.

As stated previously, the intervention group greatly decreased engagement in high effort behaviors over the course of the intervention. This specific group of students appears to be more involved and active, and therefore has a more difficult time performing these behaviors throughout the semester. While this finding was only evident for individuals in the intervention, it is reasonable to assume that many students face similar demands as the semester progresses. This suggests that future interventions should be more strategic about when students are asked to perform more difficult conservation behaviors. Given this, it may be advisable to focus on difficult behaviors earlier in the semester when students have the time and mental capacity to explore them. Potentially, these behaviors could become habits during this time and continue at a stable rate throughout the semester. Projects could then focus on low effort behaviors during the end of a semester when students face more attentional demands and have less time available. If higher effort behaviors were targeted at the end of a semester, students may need greater support for participating, such as a more structured project, greater incentives, and social support.

This intervention can also offer valuable insights regarding the use of social media for encouraging conservation behaviors on campus. Large universities such as the University of Michigan may find the use of social media as an intervention tool appealing because of the cost and time efficiency. However, the preliminary results of this study indicate that programs that rely heavily on social media to encourage conservation behavior may be relatively ineffective. Given the ubiquitous nature of social media at this time, these findings are potentially important. Alone, social media does not seem to be a replacement for other traditional interventions, such as holding frequent face-to-face meetings. At best, social media may be considered as a supplement to a more intensive social-based intervention. Therefore, future campus efforts supporting waste reduction or other shifts in behavior should utilize a variety of different projects and techniques of which social media may be one component, but it should not be the main means of changing behavior.

Acknowledgements

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Pre-Test Survey

Thank you for taking the time to complete this survey. The survey is about your experience with reducing your environmental impact and waste production and will measure general environmental attitudes in students on campus. The survey should only take 5 minutes to complete.

Based on your experiences prior to college, how familiar are you with the following?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Recycling	○	○	○	○	○	○
Composting food scraps	○	○	○	○	○	○
Reducing water use	○	○	○	○	○	○
Using less energy	○	○	○	○	○	○
Lowering food waste	○	○	○	○	○	○
Minimizing environmental impact	○	○	○	○	○	○

To what extent are you familiar with using creativity (through art, music, theater, etc.) to address environmental issues?

Not at all	Slightly	Moderately	Very	Extremely
○	○	○	○	○

How frequently have you performed these behaviors since you've been on campus?

	Never	Rarely	Sometimes	Often	Very often	Don't know
Recycle paper or plastic	○	○	○	○	○	○
Use a reusable mug instead of a paper cup	○	○	○	○	○	○
Have food left on your tray in the dining hall	○	○	○	○	○	○
Shower for 10 minutes or longer	○	○	○	○	○	○
Turn off the faucet when brushing your teeth	○	○	○	○	○	○
Unplug your laptop or phone chargers when device is fully charged	○	○	○	○	○	○
Turn off the light when you leave your room	○	○	○	○	○	○

To what extent do you agree with the following statements?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
My friends think recycling is important	○	○	○	○	○	○
My friends consider me environmentally conscious	○	○	○	○	○	○
A lot of people use reusable mugs and water bottles on campus	○	○	○	○	○	○

My friends would give me a hard time for unplugging unused electronics	○	○	○	○	○	○
A lot of people waste food in the dining hall	○	○	○	○	○	○

Please indicate how much the following applies to you.

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
I describe myself as environmentally conscious	○	○	○	○	○	○
Reducing my waste is important	○	○	○	○	○	○
Strong sense of personal responsibility to reduce my environmental impact	○	○	○	○	○	○
It is now a habit to reduce my waste production	○	○	○	○	○	○
Reduce my environmental impact because I care about others	○	○	○	○	○	○

How likely would you be to get involved in a program to reduce your waste in a dorm?

Not at all	Slightly	Not sure	Likely	Very Likely
○	○	○	○	○

How important would the following factors be in influencing your willingness to participate?

	Not at all	Slightly	Moderately	Very	Extremely
The ability to use my unique skills and talents	○	○	○	○	○
Working together with other members of my dorm community	○	○	○	○	○
Reducing my personal environmental impact	○	○	○	○	○
The involvement of my friends	○	○	○	○	○
Being able to take action on something I feel is important	○	○	○	○	○
Being part of the sustainability effort at UM	○	○	○	○	○

Have you received information or incentives to reduce your waste since you've been on campus?

○ No

○ Yes, if so please describe:

To what extent do you agree with the following?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
It has been hard to make friends so far in college	○	○	○	○	○	○

I feel at home on campus	○	○	○	○	○	○
People are welcoming on campus	○	○	○	○	○	○
It is hard to adjust to the workload in college	○	○	○	○	○	○
Managing my stress is difficult	○	○	○	○	○	○

How familiar are you with the following?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
General social media	○	○	○	○	○	○
Facebook	○	○	○	○	○	○
Instagram	○	○	○	○	○	○
Snapchat	○	○	○	○	○	○

Background Information

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What is your concentration? [   ]

What year are you in school?

Freshman	Sophomore	Junior	Senior
○	○	○	○

What is your gender?

○ Male   ○ Female

[>>]

Post-Test Survey: Intervention Group

Thank you for participating in this project. In order to evaluate the effectiveness of this effort we are asking participants to complete several surveys about their experience with reducing environmental impact and waste production at the beginning and end of the program.

How frequently have you performed these behaviors in the past few weeks?

	Never	Rarely	Sometimes	Often	Very often	Don't know
Recycle paper or plastic	○	○	○	○	○	○
Use a reusable mug instead of a paper cup	○	○	○	○	○	○
Have food left on your tray in the dining hall	○	○	○	○	○	○
Shower for 10 minutes or longer	○	○	○	○	○	○
Turn off the faucet when brushing your teeth	○	○	○	○	○	○
Unplug your laptop or phone chargers when device is fully charged	○	○	○	○	○	○
Turn off the light when you leave your room	○	○	○	○	○	○

To what extent do you agree with the following statements?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
My friends think recycling is important	○	○	○	○	○	○
My friends consider me environmentally conscious	○	○	○	○	○	○
A lot of people use reusable mugs and water bottles on campus	○	○	○	○	○	○
My friends would give me a hard time for unplugging unused electronics	○	○	○	○	○	○
A lot of people waste food in the dining hall	○	○	○	○	○	○

Please indicate how much the following applies to you.

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
I describe myself as environmentally conscious	○	○	○	○	○	○
Reducing my waste is important	○	○	○	○	○	○
Strong sense of personal responsibility to reduce my environmental impact	○	○	○	○	○	○
In the last few weeks I've gotten into the habit of reducing my waste	○	○	○	○	○	○
Reduce my environmental impact because I care about others	○	○	○	○	○	○

Please evaluate your experience with this project.

Being involved in this project...

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Allowed me to take action on something that I care about	○	○	○	○	○	○
Was fun	○	○	○	○	○	○
Helped me to learn about environmental issues	○	○	○	○	○	○
Made me feel personally responsible to contribute	○	○	○	○	○	○

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Was a large time commitment	○	○	○	○	○	○
Allowed me to think differently about the role of creativity and environmental issues	○	○	○	○	○	○

Please evaluate your experience with the Facebook Group Page.

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Didn't have enough new content	○	○	○	○	○	○
It's focus on creative expression inspired me	○	○	○	○	○	○
Had too much content	○	○	○	○	○	○
The content made me excited to participate	○	○	○	○	○	○
The content caused me to think differently about environmental issues	○	○	○	○	○	○

To what extent do you agree with the following?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
I am looking forward to continuing my conservation behaviors	○	○	○	○	○	○
Was able to get my friends to reduce their environmental impact	○	○	○	○	○	○
I want to get more involved in environmental issues	○	○	○	○	○	○

Which opportunities would you like to see more of in the dorms?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Composting	○	○	○	○	○	○
Water-saving appliances	○	○	○	○	○	○
Energy-efficient appliances	○	○	○	○	○	○
Workshops about how to reduce your environmental impact	○	○	○	○	○	○

How could this project, focused on encouraging waste reduction within the dorms, be improved?

Background Information

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Post-Test Survey: Control Group

Thank you for taking the time to complete this survey. The survey is about your experience with reducing your environmental impact and waste production and will measure general environmental attitudes in students on campus. The survey should only take 5 minutes to complete.

How frequently have you performed these behaviors in the past few weeks?

	Never	Rarely	Sometimes	Often	Very often	Don't know
Recycle paper or plastic	○	○	○	○	○	○
Use a reusable mug instead of a paper cup	○	○	○	○	○	○
Have food left on your tray in the dining hall	○	○	○	○	○	○
Shower for 10 minutes or longer	○	○	○	○	○	○
Turn off the faucet when brushing your teeth	○	○	○	○	○	○
Unplug your laptop or phone chargers when device is fully charged	○	○	○	○	○	○
Turn off the light when you leave your room	○	○	○	○	○	○

To what extent do you agree with the following statements?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
My friends think recycling is important	○	○	○	○	○	○
My friends consider me environmentally conscious	○	○	○	○	○	○
A lot of people use reusable mugs and water bottles on campus	○	○	○	○	○	○
My friends would give me a hard time for unplugging unused electronics	○	○	○	○	○	○
A lot of people waste food in the dining hall	○	○	○	○	○	○

Please indicate how much the following applies to you.

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
I describe myself as environmentally conscious	○	○	○	○	○	○
Reducing my waste is important	○	○	○	○	○	○
Strong sense of personal responsibility to reduce my environmental impact	○	○	○	○	○	○
It is now a habit to reduce my waste	○	○	○	○	○	○
Reduce my environmental impact because I care about others	○	○	○	○	○	○

How likely are you to get involved in environmental issues in the future?

Not at all	Slightly	Moderately	Very	Extremely
○	○	○	○	○

Which opportunities would you like to see more of in the dorms?

	Not at all	Slightly	Moderately	Very	Extremely	Don't know
Composting	○	○	○	○	○	○
Water-saving appliances	○	○	○	○	○	○
Energy-efficient appliances	○	○	○	○	○	○
Workshops on how to reduce your environmental impact	○	○	○	○	○	○

Background Information

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