



Assessing Opportunities and Constraints in Campus Sustainability

The Role of Paper Consumption

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Abstract

This article presents the findings of a case study of paper consumption behavior at the School of Public Health at the University of Alberta. Using methods of social research such as survey, focus groups, and behavioral experimentation, we tested explanations of pro-environmental behavior with respect to paper consumption in academia. Our behavioral experiment, designed to encourage voluntary reduction of paper use and adoption of green paper products at the School of Public Health, resulted in a reduction in paper consumption of approximately 23 percent. Not surprisingly, our findings indicate an inverse relationship between willingness to adopt pro-environmental behaviors and individual effort. Behavioral experimentation, however, illustrated several mechanisms for motivating pro-environmental behaviors, even when such behaviors entailed increased effort. While the provision of information is a necessary but insufficient condition in achieving pro-environmental behavioral change, results show that the content and mechanism of information dissemination can affect its uptake by individuals. Among a set of communication strategies, in-person presentations of information that placed individual behaviors into the larger context of environmental impact were perceived to be the most effective source of motivation.

Keywords: consumption, higher education, paper, sustainability

Introduction

With approximately 45,000 staff, faculty, and students associated with several campuses, the University of Alberta is a large consumer of paper products. Paper plays an important role in any strategy to improve the university's sustainability performance. The environmental impacts of paper consumption include the generation of solid waste, greenhouse

gas emissions associated with transport, forestry, and manufacturing, and ecosystem disruption, if such products are produced through the application of unsustainable forestry practices.¹ As such, the university can make a significant reduction in its own ecological footprint by pursuing paper conservation and environmentally responsible purchasing strategies. The environmental benefits are both direct (e.g., waste reduction) and indirect (e.g., increasing forest health by supporting more sustainable forestry practices).

To evaluate the potential for adoption of pro-environmental behaviors pertaining to paper use, we initiated an experimental study of paper consumption behaviors in the University of Alberta's School of Public Health (SPH). SPH members kindly expressed their willingness to participate in our study through a council meeting vote. Our study focuses on several individual behavioral variables associated with paper use, including levels of awareness, perceived barriers, degree of prioritization, and habitualized consumption routines.

Literature Review

The ultimate effectiveness of many public initiatives depends on the willingness and ability of users to comply.² Public support is particularly important to environmental improvement strategies, considering the myriad ways personal behaviors can impact the natural world. Pro-environmental behavior can take many forms—from involvement in social movement organizations, to writing campaigns to political officials, to changes in personal consumption and waste production.³

During the past decade, there has been increasing public policy interest in the role of consumers in environmental improvement.⁴ This interest coincides with growing research attention to consumers' environmental awareness and "green consumption" practices. While information

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campaigns have been widely used to pursue environmental goals,⁵ environmental awareness does not in itself guarantee behavioral change.⁶ To the contrary, empirical research indicates a weak relationship between information availability and behavioral change.⁷⁻⁹ Consequently, understanding how, why, and to what degree personal behavioral change occurs is an important prerequisite for developing effective environmental improvement strategies.

Some recent literature provides a certain degree of scepticism regarding the potential for personal change in consumption behavior. Most citizens tend to be “locked in” to unsustainable consumption patterns due to factors that restrict individual choices, including incentive structures (taxes, subsidies, penalties associated with consumption), institutional barriers (dependence on private automobiles), and inequalities in access to alternatives (such as local and/or organically produced foods).⁵ Barriers to personal change also flow from habits and routines, social norms and expectations, and dominant cultural values.⁵

Rational Choice Model

Various theoretical models have been employed to evaluate individual level environmental decision-making, including the rational choice model, the psychometric paradigm, structural theories, and a combined values-beliefs-norms theory. The rational choice model contends that individuals make decisions that maximize their expected net benefits, based on a calculation of the relative cost and benefit of a set of available courses of action.⁵ Within this model, environmental concerns tend to present a conflict between private and collective interests.¹⁰ Recycling, for example, imposes a cost to the individual in terms of the time taken to sort the waste and transport it to a recycling station, while the benefits of such action accrue collectively. The rational choice model assumes that individuals have sufficient information to deliberately weigh all possible outcomes or consequences of their choices.

Psychometric Paradigm

Criticism of the rational choice model has led to the development of several alternative models. Researchers adopting the psychometric paradigm have produced results that directly challenge the rational choice model. According to this body of research, individuals use a variety of mental “shortcuts”—habits, routines, emotional cues, heuristics—to reduce the cognitive processing needed to act. A degree of automaticity enters our behavior, making it more difficult to change. Related to this line of reasoning is an extensive inquiry into habit formation. Many behaviors are performed with little mental awareness, which we characterize as habits.⁶ The

purchase and consumption of everyday items, choice of transportation, and decisions to print documents can all become habitual acts, performed in a stable context and often executed with high frequency and limited cognitive reflection.

Since many environmentally significant behaviors are habitual in nature, the adoption of pro-environmental behavior requires addressing and renegotiating habitual actions.⁵ A vital ingredient for changing habits is to “unfreeze” existing behavior and raise the behavior to a level of conscious reflection and decision-making. To change habits, people must reflect upon their present behavior and overcome behavioral obstacles.¹⁰ This process evolves in three phases: 1.) environmental concern and an impetus to alter present behavior, 2.) availability and consideration of alternative behaviors, and 3.) testing and adoption of new behaviors.⁶ Policies designed to promote behavioral change must include incentive structures (taxes, subsidies, penalties); engagement of people in initiatives (social and cultural context); institutional context conducive to change (rules, regulations, market structures); and access to pro-environmental choices (facilitating conditions, situational factors).⁵

Structural Theory

Structural theorists call into question the extent to which individual behaviors are truly individual. Rather, they believe individual behaviors are usually embedded in social contexts. Our economic structures impose constraints on options available for “greener” lifestyles, influencing everything from forms of energy to the distances between places of residence and employment.

Social and interpersonal factors also shape and constrain individual preference,⁵ and often support collective interests or altruistic behaviors. For example, Takasc-Santa notes that environmental concern has increasingly become a cultural norm in many societies¹¹; social sanctions and incentives, often in the form of peer pressure, have been shown to support environmental awareness, in much the same way that social norms have come to support racial and gender equity. Institutional rules, market structures, and facilitating conditions focus our attention on other approaches to achieve sustainability goals. In short, encouraging changes in citizen behavior may require addressing deep-seated personal norms, beliefs, and habits through different strategies.

Structural researchers often focus on the extent to which individual choice situations must be modified through supply-side management: altering entire provisioning systems of physical infrastructures and technology, as well as pricing.¹² This strategy also includes availability of environmentally friendly products, such as certified green paper or other eco-labeled products, as well as information



pertaining to these products. Indeed, third-party certification is now in practice for dozens of products available worldwide, driving changes through diversification of supply chain options.¹³ As Thorgersen notes, however, “knowing a label is a prerequisite for using it in decision-making and understanding it is a prerequisite for using it correctly. Understanding a label implies that the person knows it exists, what it looks like, and what it means” (p. 288).¹⁴

Combined Theoretical Models

Among the more compelling lines of research inquiry are those employing combined theoretical models that incorporate features of the research previously mentioned. Stern and colleagues provided one of the first such combined models, the values-beliefs-norms theory.³ While they use this model to assess individual level support for environmental movements,³ the model is equally applicable to other forms of pro-environmental behavior. The values-beliefs-norms theory suggests that norm-based actions flow from three factors: acceptance of particular personal values, a belief that those values are under threat, and normative sentiments that actions initiated by the individual can help alleviate the threat and restore the values (in other words, the assumption of responsibility for the consequences of one’s actions).³ Values are oriented around three basic sources: the self, other people, or all living things.¹⁵

Similarly, Lindenberg and Steg suggest that the multiplicative combination of three personal behavioral incentives guide environmental behavior: the hedonic goal “to feel better right now” (minimize effort, seek improvement in self-esteem); the gain goal “to guard and improve one’s resources;” and the normative goal “to act appropriately.”¹⁶ In this context, the individual choice to recycle paper is likely to be evaluated based on the personal effort and financial cost required and the extent to which such an act is perceived as “the right thing.” Based on this premise, two factors are necessary to motivate pro-environmental behavior: highly abstract societal norms (“do not harm others”) must be linked to specific individual behaviors (print less); and the hedonic and gain goals must be compatible with the normative goal or weakened in relative importance.¹⁶ Considering the instability of these incentive structures, the normative goal is unlikely to support pro-environmental behaviors for any length of time without incentives, such as appropriate technologies, that support the hedonic and gain goals.⁶

The multiplicative combination of personal behavioral incentives informed the development of the research framework employed in the current study. Our project focuses on the combined effect of information availability, individual effort, habitualized behavior, behavioral prompts, and institutional barriers.

Methods

This study involved several methods of social research, including an online survey, focus groups, and behavioral experimentation. In the first stage of our research, we wanted to develop a benchmark of attitudes and behaviors regarding paper consumption at the University of Alberta. We invited all SPH staff, both academic and administrative (105 in total), to participate in an online survey. The purpose of this component was to characterize the environment within which paper purchasing and printing decisions are made. The survey included closed-ended questions intended to determine such variables as conservation behaviors, paper consumption, sustainability knowledge and performance, and perceived barriers. Descriptive findings for these variables and statistical analysis of their interactions were obtained using SPSS v17.0 (Chicago, IL).

To explore the paper purchasing and printing environment in depth, we conducted focus groups with a handful of individuals representing each of three main categories of SPH personnel—academic staff, support staff, and students. The focus groups were conducted both immediately prior to and immediately following our experimental phase. Potential participants were invited to join the focus group either by e-mail or telephone. The focus group meetings took place in a room within the SPH and were audio-recorded, usually lasting for about one hour. We then transcribed the meeting recordings, and organized the data into several themes.

Our experimental phase involved the implementation of several behavioral prompts designed to encourage changes in paper use. Two audits were conducted to assess the changes, the timing of which was not revealed to the participants: one was prior to the experimental phase (pre-audit, November 2008), the second at the end of the experimental phase (post-audit, March 2009). Each audit was conducted over the course of one week. Both weeks were similarly placed in the academic calendar, approximately one month prior to the end of term. Research participants in focus groups confirmed comparability of these time periods for the purpose of monitoring paper consumption. At the preparatory stage, we made an inventory of all printers, copiers, paper storage rooms, and recycling bins within the school. A total of 12 central printers, four copiers, and 25 individual printers were identified. We measured volumes of paper consumed and kinds of paper used during each audit week.

For the pre-audit, we took the paper usage records twice from seven central printers (i.e., network printers connected to several users), four photocopiers, and three individual printers, between three and seven working days apart, to establish an average daily consumption rate. We extrapolated

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from this data to estimate total average daily paper use, based on the total number of central and individual printers and copiers located in the SPH. During the post-audit, we monitored seven central printers and four copiers again. Individual printers were not monitored due to technical issues. However, one of the central printers monitored during the pre-audit was out of service at the time, so observations were taken on a different central printer. Without the ability to monitor individual printers post-audit, we held consumption rates for individual printers constant; thus our calculations of change in paper consumption may be conservative.

All statistical analyses were conducted in SPSS v17.0. We were investigating changes over time in the same devices, which likely had individual random effects. Therefore, we used a repeated measures general linear mixed model, in which time was a factor within subjects and printer type was a factor between subjects. This allowed us to determine whether paper use was systematically different between central printers and copiers.

The experimental phase ran for 14 weeks, from December 1, 2008 to March 9, 2009. We introduced several “prompts” to SPH staff and students at various time points during the experimental phase that were designed to encourage either the reduction of paper use or the adoption of green paper alternatives, such as recycled paper products and products from forests certified by a forest certification organization. Prompts included the provision of information and motivational encouragement, including an oral presentation of initial findings from the material audit and translation of these data into measures of environmental impact; posters and notices in central printing/photocopying areas reminding users to conserve paper and/or providing instructions on double-sided printing; information on alternative paper products; and regular project updates by e-mail.

Results

Online Survey

Survey findings indicated an inverse relationship between conservation behaviors and effort, as predicted by much of the previous research on pro-environmental behavior. Twenty-two percent of respondents indicated they “always” print double-sided, while another 68 percent do so “sometimes,” and 10 percent chose “never.” A large proportion of respondents (42 percent) were unaware of the type of paper purchased for use in their unit. Sixty-two percent of respondents indicated that their units use conventional paper.

As the literature highlights, several structural constraints can limit engagement in pro-environmental

behaviors. We asked respondents to select all perceived constraints from a list of institutional, economic, and information barriers. Respondents were also invited to indicate any additional perceived barriers in an open-ended question. As indicated in Figure 1, a surprisingly large majority of respondents (58 percent) identified lack of information as a barrier to adoption of sustainable paper consumption practices. Institutional constraints were cited by 22 percent of respondents, while 25 percent indicated economic constraints (perceived higher cost). A third of respondents cited “other” barriers, which largely fell into five categories: insufficient technology, lack of leadership and/or support, mandatory record-keeping requirements, lack of prioritization in respondent’s unit, and habit or individual resistance.

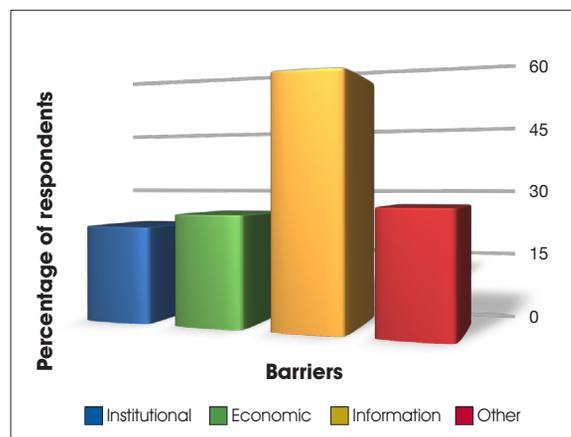


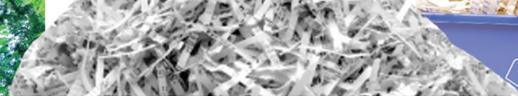
Fig. 1. Perceived constraints limiting engagement in pro-environmental behaviors.

Focus Group Meetings

Our three pre-experiment focus group meetings included support staff, academic staff, and students. Participants from all three groups expressed a desire to make their paper consumption practices more sustainable, and many indicated that they recycle and print double-sided when they can. The primary uses of paper noted by participants included manuscript editing, meeting materials, and funding proposals (academic staff); record-keeping and third party requests (support staff); and requirements set by course instructors/supervisors (students). There was a clear differentiation in the perceived discretion expressed by members of these groups regarding paper consumption, with members of the latter two groups consistently attributing their paper consumption levels to requirements imposed by their superiors.

Our post-experiment focus groups were intended to capture the reactions of SPH personnel to our experimental stage. Participation in the second set of focus groups was much smaller than in our first set. We heard from seven academic staff and one

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student. None of the SPH support staff were able to attend. All of our focus group attendees indicated that participation in the experiment raised their awareness of the environmental impact of their paper consumption, and all indicated that they attempted to adopt sustainable paper use behaviors during the experiment, indicating a sense of responsibility for individual level consumption practices. Furthermore, participants indicated that they intend to continue to do so.

Participants suggested that our effort to raise awareness had encouraged them to be conscious of their paper use and to print less by reading documents on screen, exchanging electronic files rather than hard copies, or condensing information per page. Focus group participants also indicated that they now use one-side-printed paper for notes or for printing unofficial documents. Finally, in response to our information prompts, several administrative units switched to recycled paper supplies. While some said that conventional paper is still used for documents requiring superior paper quality, others found the quality of recycled paper to be perfectly adequate for their purposes. Several barriers were mentioned, however. Participants noted difficulties in reviewing electronic documents, expressed concern about the security of electronic storage (particularly for personal records), and have hard copy requirements imposed externally by granting organizations and ethics review boards.

Behavioral Experimentation

Comparison of the pre- and post-audits of paper consumption levels suggests that the stated behavioral changes expressed by focus group participants represented broader individual level changes throughout the SPH. Our pre-audit indicated an estimated average weekly consumption rate of 1,093 pages from 25 individual printers, 14,183 pages from 12 central printers, and 8,002 from four photocopiers. At the post-audit, these figures were 12,557 pages per week for the central printers and 4,197 per week for the photocopiers (as mentioned previously, we kept the individual printer figure constant). The differences between the pre- and post-audits indicate an overall decrease in paper consumption of 23.2 percent. There was no statistically significant difference in the level of change between printers and copiers.

The pages per week decreased by an average of 5.2 percent during the entire behavioral change period compared to the pre-change period. This figure, when compared to the much larger decrease noted between the pre- and post-audits (23 percent), which were conducted 14 weeks apart, suggests that efforts to reduce paper consumption increased over time during the behavioral evaluation period. Thus, a paper reduction strategy is a long-term undertaking that may require time for uptake by users.



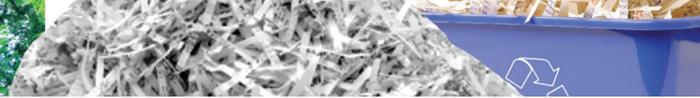
Three of the central printers we monitored included a double-sided printing inventory feature. During the pre-audit, 15 percent of pages in these printers were printed on both sides of paper. In the post-audit, this indicator increased to 26 percent. In addition, while none of the organizational units within the SPH used recycled paper prior to the project, several units have since switched to FSC-certified 30 percent or 50 percent recycled-content paper.

Extrapolating our findings from the School of Public Health to all of the administrative units at the University of Alberta, we estimate that the university could conservatively reduce its annual greenhouse gas emissions by 251,550 CO₂ equivalents kg, halve the volume of paper consumed from 328 to 157.44 tons per year, save 271,266 liters of wastewater, and accrue a savings of more than \$273,000 annually. These estimations were calculated by the Environmental Defense Paper Calculator.¹⁷

Discussion

Most participants in our first set of focus groups expressed a limited ability to affect change at the individual level and suggested the need for change to start “at the top.” To a certain extent the findings from the material audit challenge these expressions of powerlessness. Despite the fact that our experimental phase was directed entirely at the individual level of change and adoption of the recommended strategies was entirely voluntary, a 23 percent reduction in overall paper use was documented. On the other hand, these findings suggest that higher order changes may translate into significantly deeper reductions in paper use. For example, paperless classrooms, paperless storage, and reduction of hard

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copy for meetings would necessarily need to be instigated by instructors and administrators.

According to the individual effort needed to perform conservation action, we noted four primary conservation behaviors: choosing not to print; re-use of paper that has one side printed; double-sided printing; and recycling. Choosing not to print and paper re-use

require considerable effort. Many of the barriers to pro-environmental behavioral change identified by participants in this study revolved around personal habits. Printing of e-mail communications, meeting materials, and journal articles are conducted routinely, for example, as is single-sided printing. Some behavioral changes are based on knowledge and technology, such as the ability to change default settings on printers and

access to photocopiers that readily print double-sided. Others require more effort from the individual, including manually loading the one-side-printed paper into printers or reading documents on a computer. By contrast, recycling requires a minimum of effort since recycling bins are generally available throughout university buildings.

Inducing technological changes in conjunction with increasing awareness was vital to achieving the observed reductions in paper use. Technological changes included setting printer defaults to double-sided printing; awareness strategies included providing electronic information resources by e-mail. Most important, however, focus group participants said that our efforts at raising awareness had encouraged them to be conscious of their paper consumption and to print less by reading documents on screen, exchanging electronic files rather than hard copies, and condensing more information per page. Choosing to invest in newer printers would also be a facilitating condition for paper conservation behavior.⁵ During the behavioral change component, SPH replaced a central printer with a newer model capable of automatic double-sided printing. The replacement of printing and photocopying hardware with recent models can make a significant contribution to sustainability.

In accordance with a large body of social research,^{5,6,10} our study participants acknowledged that their printing behaviors had in many instances become habits. This finding was also confirmed by cross-examination of the survey and material audit findings: while 62 percent of survey respondents assumed that their units use conventional paper, material audit results indicated that 100 percent of paper was conventional. The discrepancy in figures indicates how little conscious deliberation is employed in everyday paper use. Our prompts

induced project participants to reflect on these habits and to overcome some of them. In turn, new behaviors can often become new habits. For example, one post-experimental focus group participant indicated that even the extra effort of manually feeding an older printer had simply been incorporated into that individual's work routine.

Information is key to achieving a behavioral change and replacing old habits with new ones. Despite the previous research indicating that information availability does not in itself guarantee behavioral change,⁶⁻⁹ our findings suggest that although information may not be a sufficient condition for inducing pro-environmental behavior, it is a critical prerequisite. Certain forms of information, particularly when conveyed through avenues of communication that enhance reception, can be vital in stimulating conscious reflection and decision-making. As one participant stated, having the numbers (amount of paper consumed and its associated environmental impact) put in front of one's face was quite an eye-opener.

Many of our behavioral prompts were intended to provide such information although participants were unanimous in their reactions to various prompts. All participants found the council meeting presentation at the beginning of the experimental phase to be the most effective. The impact of a personal message was far more effective than any other form of communication. Participants were less enthusiastic about our visual prompts in central printing areas, and e-mails were considered the least motivating and were readily discarded. E-mail communications were also considered to be too easily lost in the daily e-mail traffic.

Finally, our findings confirmed the argument of some scholars that social and interpersonal factors continually shape and constrain individual behavior.^{5,11} For example, the majority of post-experiment participants expressed the feeling that their individual actions can make a difference, not only in terms of direct outcomes of personal consumption but also as an influence on others. Interestingly, these sentiments were far less pronounced in our pre-experiment focus groups, suggesting that the process itself of engaging in behavioral change enhanced levels of perceived individual level empowerment. In addition, participants from all groups expressed a desire to make their paper use more sustainable, which contrasted sharply with consistently low expressions of personal levels of knowledge and awareness. One possible implication of such contrast is that peer pressure and social norms increasingly favor pro-environmental behavior.

Our survey showed that people's awareness about certification systems before the project was very



Choosing not to print and paper re-use require considerable effort.



low, but most of the respondents were curious to know more about them. The adoption of sustainable paper supplies offers a way to reduce environmental impact by supporting sustainable forest management and supply chain processes that use environmental best practices, with minimal impact on work performance. Sustainable paper supplies are also increasingly cost competitive. After raising awareness through the project in the School of Public Health, the use of recycled, FSC, and other certified papers increased.

Conclusions

This study demonstrates that significant reductions in paper use can be achieved through motivating individual level behavioral change. Using different methods of social research, including survey, focus groups, and behavioral experimentation, we tested current theories explaining pro-environmental behavior with respect to paper consumption in academia. In particular, a voluntary behavioral change strategy that included the provision of information about conservation practices and sustainable product options and motivational prompts communicated in multiple formats resulted in a reduction in paper use of approximately 23 percent.

Participants indicated that realization of the environmental impacts of their behaviors, combined with awareness of options for behavioral change, raised their habitual practices to a level of consciousness that allowed for behavioral change that included the adoption of conservation practices. While the time-frame of the current study was limited to less than a single academic year, many participants indicated that they intended to continue to engage in paper reduction efforts. The individual level, voluntary reductions observed at the School of Public Health are impressive; however, the implementation of higher order changes may translate into significantly greater reductions in paper use at large post-secondary institutions. This study provides the information required to begin a systemic sustainability-based paper use policy.

Author Disclosure Statement

No competing financial interests exist.

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