Examining the Feasibility of Increasing Recycled Paper Use in the Dalhousie University Faculty of Science

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ABSTRACT

Dalhousie University currently uses vast amount of paper; between 60 and 65 million each year. The majority of that paper is virgin paper, which contains no recycled content. This means that Dalhousie's current paper use is not sustainable; and not in accordance with the University's own Environmental Policy. The goal of this study was to determine the feasibility, in terms of attitudes, availability and economics, of increasing recycled paper use in the Faculty of Science at Dalhousie University. We used a questionnaire to gather information on faculty member's education and attitudes towards using recycled paper for school purposes. We assessed the current paper use patterns in the Faculty of Science departments, by conducting interviews with department secretaries. We also used interviews with the Dalhousie University Print Centre and Purchasing Department to establish the current paper use at Dalhousie University as a whole, paper related policies and practices, and details of the contracts with paper manufacturers and suppliers. We found that faculty members, department secretaries, and the managers of both the Dalhousie Print Centre and Purchasing Department all supported an increase in the use of recycled paper. This tells us that increasing recycled paper use is feasible in terms of attitudes. We found that recycled paper is now available at the same quantity and quality as virgin paper, which means that using recycled paper is feasible in terms of availability. Finally we found that departments have flexible budgets, and that for all Faculty of Science departments, the price increase associated with using recycled paper would be less than 5.7% of their current paper budget. This says that increasing recycled paper use in the Faculty of Science is also economically feasible as well. With this exploratory research showing an initial 'green light' for each of these three aspects of feasibility, it is clear that the Dalhousie University Faculty of Science should begin to make a change towards using recycled paper.

INTRODUCTION

Background and Setting

Dalhousie University has an Environmental Policy in place which states that the university will take a leadership role in regards to environmental management, and will strive to conduct its activities in ways that do not cause unacceptable degradation of the environment (Dalhousie University Senate, 1990). However, Dalhousie University currently uses between 60 and 65 million sheets of paper a year, with only 2.5% of that paper being recycled paper, and the rest being virgin paper (Adams et al, 2004: 12). The production of virgin paper uses 17 more trees per metric tonne of paper than the production of recycled paper (Campbell and Clarke, 2000), which means that if Dalhousie used only recycled paper, it would save between 4554 and 4933 trees a year.

This clearly shows that Dalhousie's paper use is not in accordance with the University's Environmental Policy. In this study we plan to assess the feasibility of increasing recycled paper use in the Dalhousie Faculty of Science, and then use our results to help provide information to Dalhousie University decision-makers about the possibilities and best ways to increase sustainable paper use on campus by using recycled paper.

Problem Statement

In our Environmental Problem Solving II class (ENVS 3502) a problem was defined as, "some unresolved question which presents unusual difficulties" (Wright, 2005a). Properly stated problems were also defined as being specific, limited in scope (spatially, temporally, and conceptually), related to some empirical reality and amenable to specific evaluation criteria. The problem that we wish to address in this study is that currently there is little paper with recycled content being ordered and used by the Faculty of Science at Dalhousie University. This has major environmental consequences that will be discussed further. For the purposes of this report, the Faculty of Science was defined as the departments of Biology and Marine Biology, Oceanography, Earth Science, Psychology, Mathematics and Statistics, Physics and Atmospheric Science, Chemistry, and Environmental Programs / Dean's Office.

Literature Review

Recycled paper, or paper that contains some post consumer content, is know to be less damaging to the environment than 'virgin' paper, paper that contains no post consumer content. The production of recycled paper causes 74% less air pollution, 35% less water pollution, and uses 58% less water and 64% less energy than the production of virgin paper (Recycling Council of Ontario, 1999). Recycled paper also uses 17 less trees per metric tonne of paper than virgin paper does (Campbell and Clarke, 2000). However, despite all of these clear environmental benefits of using recycled paper, many people (Dalhousie included) still continue to use virgin paper instead.

One possible explanation for this is that there seem to be many lingering misconceptions about the quality of recycled paper. When most people think of recycled paper, they seem to think back to the dark brown, thick, dusty recycled paper that everybody sees as a child. Is that the face of recycled paper today? The problem is that recycled paper has evolved greatly even over the last decade, but people's perceptions of

it seem to have been left behind. Today you can find recycled paper that is of comparable quality in every way to virgin paper. There is now recycled paper that does not have *any* brown colour to it, and that is virtually indistinguishable from virgin paper by sight. In fact, it a little experiment that our research group did while giving a presentation on this topic, we passed around three sheets of paper to our audience; one was virgin paper, one contained 30% post consumer waste, and the other 100% post-consumer waste. We asked the audience to look at the paper and see if they could determine which of the three the virgin paper was, and the 52% of the audience actually chose the 30% recycled paper as the virgin sheet!

There is also a lingering misconception that recycled paper does not perform comparatively to virgin paper in copy machines. In a study done at Dalhousie University last year, the then manager of the Dalhousie University Purchasing Department was quoted as saying, "Currently we are using very little recycled paper. One of the barriers is that the current equipment cannot handle recycled paper due to inconsistent quality and the amount of dust that comes off the paper—this fouls up the printers and copiers". However, recycled paper was not being put through the Dalhousie machines at that time; the manager was speaking in a general manner; from a misconception that too many people still believe. In truth, there have been several controlled tests done in the past few years that have shown that there is *no* difference between the performance of recycled and virgin paper in copier machines. One such study was conducted in 1998 for the United Sates Conference of Mayors, in conjunction with Canon, Hewlett-Packard, Lexmark and the U.S. Government Printing Office. In this study over 2 million sheets of paper were tested on a variety of copier machines, laser and ink jet printers. At the conclusion of the study, they found that recycled paper containing 20-25% or 30% post consumer waste performed *equivalently* in the testing to virgin paper (Conservatree, 2003: 4). Since this study, many others have been done that have also come to the same conclusions. In fact, the United States Government Printing Office even maintains a list of the brand name copy papers that have been tested and determined to be in compliance with the requirements of the government's strict paper standard (United States Government Printing Office, 2004).

With the growing realization that quality problems are a thing of the past, and recognizing that recycled paper is a much more sound environmental option, many institutions have started using recycled paper and have been passing policies to this effect. In 1998 the U.S. General Services Administration (which is responsible for buying and selling paper to federal agencies) decided to purchase and sell o*nly* paper that contained post consumer content (Minnesota Office of Environmental Assistance, 2002). Princeton University also instituted a paper purchasing policy in 2004 that stated that all academic departments had to order 100% post-consumer waste office paper for their office needs (Greening Princeton, 2005).

So why should increasing recycled paper use be an issue at Dalhousie? As previously mentioned, Dalhousie University has an Environmental Policy in place which states that the university will strive to conduct its activities in ways that do not cause unacceptable degradation of the environment, however using up to 65 million sheets of 100% virgin paper a year does not seem to be in accordance with this policy. Dalhousie is also a signatory to several environmental declarations. For example, Dalhousie signed onto the Talloires Declaration in 1999. The declaration states that the university will "set

an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations" (Dalhousie University Senate, 1999). Dalhousie is also a signatory to the Halifax Declaration of 1991 which states that the University is dedicated to "ensure[ing] that the voice of the university be clear and uncompromising in its ongoing commitment to the principle and practice of sustainable development within the university and at the local, national and global levels" (Dalhousie University Senate, 1991). Clearly Dalhousie is not adhering to either of these commitments, or to its own Environmental Policy in regards to paper purchasing and use on campus. This, in conjunction with the fact that clearly some people who make major purchasing decisions at Dalhousie need to be educated about the *current* quality of recycled paper, and also the fact that implementing recycled paper use in institutions similar in function and size to Dalhousie (and even larger) has been very successful, shows that the time has definitely come for Dalhousie to make a move out of the dark ages of using virgin paper.

The goal of this study was to conduct an exploratory study to assess the feasibility, in terms of attitudes, availability and economics, of increasing recycled paper use in the Faculty of Science at Dalhousie University. This would be a relatively simple, yet very important way to help Dalhousie adhere to its own environmental policies and commitments of increasing campus sustainability and increasing awareness.

Objectives

There were three main research objectives of this study. The first was to assess current paper use patterns in the Dalhousie University Faculty of Science departments. Next we wanted to determine how faculty members within the Faculty of Science feel about using recycled paper for school purposes (their views on why or why not it may be desirable to use recycled paper and their personal willingness to use it). The final objective was to examine the current Dalhousie paper use patterns and principles of the Print Centre and Purchasing Department. This allowed us to examine the overall feasibility (in terms of economics, availability, attitudes and copier requirements) of eliminating paper waste at the source by increasing recycled paper use in the Faculty of Science.

Definition of Terms

The following terms require clarification for the purposes of this experiment. Nominal definitions define what a concept means, or what you are after, while operational definitions are indicators or *how* you will capture what you are after (Palys, 2003: 57).

Nominal:

- **Dalhousie University**: *Only* the Studley Campus of Dalhousie University.
- **Faculty of Science**: comprised of the following eight departments; Biology and Marine Biology, Oceanography, Earth Science, Psychology, Mathematics and Statistics, Physics and Atmospheric Science, Chemistry, and Environmental

Programs / Dean's Office (because they function rather like one department, sharing the same budget and space etc).

- **Faculty**: *Full-time* Dalhousie University Faculty, including professors (with the status of 'Professor', 'Associate Professor', or 'Assistant Professor' *only*), lab coordinators and course coordinators.

- **Paper**: all forms of paper material that can be used in a printer and/or photocopier, excluding envelopes.

- **Recycled paper**: Paper containing 30 percent or greater post-consumer waste

- **Paper use**: The paper used (or paper materials requested to be printed or copied) by the Faculty of Science departments for all course and/or departmental purposes. This includes printing and/ or copying done both internally (within the department on department machines) for the department and externally (using the Print Centre or another source) for the department.

- **Paper waste**: Not using recycled paper when it is feasible to do so (quality/ cost/ availability/ machine-wise) as this requires new tree resources when post-consumer resources are available.

- **Sustainability**: Being sustainable, i.e. having a minimal negative impact on the environment; something that is sustainable does not degrade the environment at a faster rate than it can be naturally replenished.

- **Virgin paper**: Paper containing 100% virgin material and no recycled material.

- **Feasibility**: Being feasible; capable of being done, including economically, in terms of resources availability, and also in terms of peoples attitudes (are they willing to make a change?).

<u>Operational</u>:

- **Paper use**: Measured by purchase requisition forms and/ or records for each Faculty of Science department.*

- **Paper waste**: Measured by the total amount and percentage of *virgin* paper ordered/ used by the Faculty of Science department as reported by purchase requisition forms/ and or records of each department*

*All statistics were gathered for the 2003/2004 year.

METHODS

Design of the Study

The research process was designed to help us fulfill the objectives of the study and to do so there were three main aspects to the design of our study. First we wanted to determine the current knowledge that faculty members within the Faculty of Science had on recycled paper availability, and also gain information on how they feel about using recycled paper for school purposes. We designed a questionnaire to gather this data. Next, we wanted to assess the current paper use patterns in the eight specified Dalhousie University Faculty of Science departments, by conducting interviews with department secretaries. Finally, we wanted to assess current paper use at Dalhousie University as a whole, and learn Dalhousie's paper ordering and purchasing policies and practices, details of the contracts that Dalhousie has with paper manufacturers and suppliers, as well as the general attitude of Dalhousie regarding the use of recycled paper. This was accomplished by conducting interviews with both the Dalhousie University Print Centre and Purchasing Department.

1. Questionnaire for Faculty Members

Purpose

After obtaining ethics approval (see Appendix H), a self-administered questionnaire was distributed to Faculty of Science full-time faculty members (see Appendix A). The goal of this questionnaire was to help us determine if faculty valued the purchase and use of recycled paper within the university by obtaining qualitative descriptive information on the attitudes of faculty members about using recycled paper for school purposes. This was important to determine how conscious faculty members were of the type of paper they used, as well as their attitudes towards personally making a switch to using recycled paper, and if they felt that Dalhousie University should make a greater effort to increase recycled paper use. This data was essential to gather because faculty members are the heart of any department, and as such their opinions on University practices are of no small importance.

Justification of Instrument

A questionnaire was an appropriate measure to use to obtain this data for several reasons. Questionnaires in general are an easy way to; ensure anonymity of respondents, amass a lot of data quickly, cut costs as they are inexpensive as compared to interviews, and compile responses, as structured questions also make data coding and compilation simple (Palys, 2003: 153). More specifically, self- administered questionnaires were an appropriate method because face-to-face contact typically ensures higher response rates (we had only one person decline to participate in the questionnaire), and also allowed us to be present to clear up any uncertainty about the questions that the participants expressed. Self-administered questionnaires also allowed the respondents some privacy to answer the questions. (Palys, 2003: 153). We chose to include both open-ended and structured questions. Structured questions allow the respondent a small range of options for their response (for example checking 'yes' or 'no', or checking off a category box), and as such involve some pre-judgements from the researcher about what is important

data to obtain (Palys, 2003: 175-176). These types of questions were appropriate for determining if faculty knew if recycled paper was available at Dalhousie and whether or not they currently used it**.** Open-ended questions allow the respondent to answer any way they chose and as such, allow for the responses to reflect the opinions of the respondents on a topic. Open-ended questions are particularly useful in exploratory research where the researcher is not quite sure what the range of responses may be (Palys, 2003:176). This type of question was appropriate for determining how respondents *felt* about using recycled paper and about Dalhousie's current practices. This allowed us to see the whole range of opinions of faculty members in their own words, with minimal effect or influence from our preconceptions or bias as researchers. This also helped to give us a better sense of the general trends of opinions, and how we could focus our research to better address faculty members concerns, opinions, or general misconceptions. We also chose to make this questionnaire confidential. We did this so that faculty members could feel confident that they could respond honestly, without any worry that someone may see their responses.

Sampling Method

We desired a formally representative sample of the full-time Faculty of Science faculty members, and as such, used probabilistic sampling techniques (Palys, 2003: 128). More specifically, we used proportional stratified random sampling to gather a sample. We obtained a stratified random sample by determining the total number of full-time faculty within the Faculty of Science, and then dividing this population into the eight departments specified by the total number of full-time faculty within each of these departments (with this information coming from the Dalhousie University 2004/ 2005 Calendar). This gave us a stratified population with eight strata. We used a proportional method by using the same sampling ratio within each of the eight strata. We used this method because we wanted the conclusions from this questionnaire to be applicable to the population of faculty members of Dalhousie's Faculty of Science (Palys, 2003: 134).

However, this method also had limitations as it impaired the ability to make comparisons between strata because a department with a very small number of faculty members may only have one of those members included in the overall sample (for example Environmental Programmes/ Dean's Office had only one representative in the sample). As such, any result that comes from this sample of only one would have a huge margin of error associated with it, and therefore would not be suitable for comparison purposes (Palys, 2003: 136). However, because comparisons between departments were not the focus of our study, this restraint did not affect our research.

Once we determined the sampling ratio for each stratum, and our sample size, we conducted simple random sampling within each stratum. Simple random sampling requires that the selection process be governed by chance, and that every sampling unit have an equal probability of being selected (Palys, 2003: 130). We accomplished this by obtaining a sampling frame for each department and putting the names of all faculty members in a department in a hat, and then randomly drawing names until the strata ratios were met.

We chose to limit this questionnaire to only full-time faculty members because these are the people that are most often on campus for full days, and because they have full-time positions, lists containing these faculty members are more often updated and

reliable. For example, if we had chosen to also include adjunct professors, we may have run into some problems in gathering a reliable sampling frame, and ensuring that our sampling method was truly random. This is because adjunct professors are people that most often have a primary appointment outside of the university; therefore lists of these professors can change often. Also, because his or her primary job is often outside of the university, adjunct professors tend to spend only a few hours at the university each week. This is not always true, but often is and as such, there certainly would have been a much lower probability on average that these professors would be in their offices (or even on campus) during designated sampling times, and this would have surely lead to their under-representation in the sample. So to avoid all of these potential problems, we included only full-time faculty members in our population.

Procedure

1. Divided Faculty of Science into eight strata according to the eight departments under study
2. Determined the sampling ratio to be used for all strata
3. Used the simple random sampling technique discussed above to draw the appropriate sample from each strata
4. Questionnaires were self-administered by group members between March 9, 2005 and March 16, 2005. The selected individuals were approached at their offices by single researchers and asked to participate in the study. Each participant was given an information letter containing details of the study and researcher contact information, and asked to sign a consent form (Appendix B).
5. At the time an individual agreed to participate by signing the consent form, they were given a respondent number (recorded on both the questionnaire and the consent form), to be used for the remainder of the study. The researcher remained present as the participant filled out the questionnaire (taking approximately two minutes), and answered any questions the participant had.
6. Questionnaire content was recorded in an electronic database, and all original copies and consent forms were kept at Beth Sampson's residence to be shredded within three weeks of completion of the project (April 8, 2005).
7. Questionnaire content was analyzed using both 'a priori content specific' and 'grounded a posteriori context sensitive' methods.

Justification of Methods of Analysis

A priori content specific analysis entails deciding what information you are specifically looking for before you start actually looking at the data (Wright, 2005b). This was appropriate particularly for analyzing the structured questions on the questionnaire, question 1 and 2a (see Appendix A), because there was a limited number of response options and we were looking for very specific information from those questions. Grounded a posteriori context sensitive analysis entails working with the language of the respondent in that you first look over the response data and make note of anything that is mentioned often, and then you can chose to make this a theme or focus of analysis. This method was appropriate for questions 2b and 3 (see Appendix A) because these were open-ended questions with the purpose of discovering how faculty members felt about the issue of using recycled paper. Therefore we wanted to see how people

responded in their own words, and then create themes or categories based on common (or uncommon) responses.

2. Interviews with Faculty of Science Department Secretaries

Purpose

Face to face interviews were conducted with each of the Faculty of Science department secretaries (see Appendix C). The goal of the interviews was to determine the current paper usage patterns within each department in terms of the amount of paper ordered, and the cost of the paper. We also wanted information on how the paper ordering process works for each department, purchasing policies of the department, how much of the copying for the department is done in-house, and service records for the department copiers (so there could be some base-line and comparative data on if using recycled paper increases the need for maintenance and decreases the lifetime of the machines).

Justification of Instrument

The interviews were conducted face-to-face because this method has a very high response rate (80 or 90 percent) and also tends to increase the quality and clarity of the responses as it allows both the researchers and participants to elaborate on the questions and answers (Palys, 2003: 159). Therefore interviews were an ideal choice because we not only wanted single response facts from the secretaries, but also some more detailed information as well.

Sampling Method

Because we wanted very specific information from specific people, the secretaries were purposively sampled. Purposive sampling occurs when "people or locations are intentionally sought because they meet some criterion for inclusion in the study" (Palys, 2003: 142). A group member approached the main office of each department and asked to speak to the person in charge of ordering paper for that department.

Procedure

1. Interviews with secretaries were conducted from March 11, 2005 to March 18, 2005. A group member visited the main office of each of the eight departments and asked to speak to the person in charge or ordering paper for that department.
2. A meeting with that secretary was arranged for later in the week, and she (all secretaries were female) was left with a copy of the questions to be asked during the interview. This was done because many of the questions required some computer searching to answer, so leaving the secretary with a copy of the questions ensured that the actual interview process went much more quickly.
3. A researcher arrived at the meeting time and presented the secretary with an information letter containing details of the study and researcher contact information (Appendix D). Also permission was requested to audio tape the interview (to assist in the time efficiency and accuracy of the interview process).

4. Interviews were conducted in a very open format and participants were encouraged to add in any information they felt would be useful or necessary, as well as any comments.
5. Interviews were transcribed from the audio tape by the researcher who conducted the interview. Once a complete record of the interview was complied in an electronic document, the tapes were stored at Beth Sampson's residence to be erased within three weeks of the completion of the project (April 8, 2005).
6. Interview content was mainly analyzed using an 'a priori content specific' method.

Justification of Methods of Analysis

A priori content specific analysis was the major appropriate method of data analysis for the secretary interviews because the purpose of the interviews was to obtain very specific information. Any other information we learned in the course of the interviews that did not directly answer those questions, was certainly noted, appreciated and taken into consideration, but the primary concern of this research tool was not to gather this extra information.

3. Interview with Dalhousie Print Centre

Purpose

An interview was conducted with the manager of the Dalhousie University Print Centre, Mr. David Doyle (see Appendix E). The goal of this interview was to ascertain how much paper Dalhousie University used in the past year in terms of the amount of each type of paper ordered and cost, Print Centre ordering and purchasing policies and practices, details of the contracts that Dalhousie has with paper manufacturers and suppliers, capabilities of the Print Centre copy machines to use recycled paper, and the general attitude of the Print Centre regarding the use of recycled paper. We also wanted to obtain service records for the Print Centre copiers (again, to collect quantitative data on how often the machines need maintenance now that they are using only virgin paper). It was hoped that this interview could also provide correlational information for the department interviews in terms of how much copying the Print Centre does for the Faculty of Science departments

Justification of Instrument and Sampling Methods

This interview was conducted face-to-face for the same reasons previously stated. An interview was a particularly appropriate method to gather this data because we required a lot of information, with the majority of it being explanations of processes that require more elaboration than a questionnaire can allow. We also had little to no idea what the responses would be beforehand so it would have been unwise to use a questionnaire for this task. Also, because we were looking for very specific information that only a certain individual could provide, purposive sampling was used.

Procedure

1. An individual group member made initial contact by appearing at the Print Centre and asking to speak to Mr. Doyle. They set up a meeting time (for all three group

members to attend) for later in the week, and Mr. Doyle was left with a copy of the questions to be asked during the interview. Again, this was done because many of the questions required some computer searching or forethought to answer, so leaving Mr. Doyle with a copy of the questions ensured that the actual interview process went much more quickly.

2. The interview with Mr. Doyle was conducted on March 17, 2005. At the beginning, Mr. Doyle was presented with an information letter containing details of the study and researcher contact information. The letter was essentially the same as for the secretary interviews (see Appendix D). We also requested permission to audio tape the interview
3. Interview format was very open and Mr. Doyle was encouraged to add in any information he felt would be useful or necessary, as well as any comments.
4. The interview was transcribed from the audio tape and the tape was stored at Beth Sampson's residence to be erased within three weeks of the completion of the project (April 8, 2005).
5. Interview content was mainly analyzed using an 'a priori content specific' method, following the reasoning previously stated.

4. Interview with Dalhousie Purchasing Department

Purpose

An interview was conducted with the manager of the Dalhousie University Purchasing Department, Mr. Ron Taylor (see Appendix F). The goal of this interview were much the same as the Print Centre interview: to determine the ordering and purchasing policies and practices of Dalhousie, details of the contracts that Dalhousie has with paper manufacturers and suppliers, and to gather information on the Interuniversity Services Incorporated consortium (an organization that we broadly knew was responsible for paper contracts, but that we wanted to learn more about). We hoped that the Purchasing Department interview could also provide correlational information for both the Faculty of Science departments and Print Centre interviews in terms of how much copying the Print Centre does for the university, and how much paper Dalhousie University used in the past year, in terms of the amount of paper, and the associated cost of that paper. We also hoped to use this interview to understand the general attitude of the University regarding the use of recycled paper. This interview was conducted face-to-face, and used purposive sampling for all of the same reasons previously stated.

Procedure

1. An individual group member made initial contact with Mr. Taylor via telephone, and set up a meeting time for later in the week.
2. The interview with Mr. Taylor was conducted on March 29, 2005, with two group members in attendance. The interview took place in Mr. David Doyle's office in the Print Centre at Mr. Taylor's request, and Mr. Doyle was also present for this interview. At the beginning, Mr. Taylor was presented with an information letter containing details of the study and researcher contact information (see Appendix D). We also requested permission to audio tape the interview and the format was again very open.

3. The interview was transcribed from the audio tape and the tape was stored at Beth Sampson's residence to be erased within three weeks of the completion of the project (April 8, 2005).
4. Interview content was mainly analyzed using an 'a priori content specific' method, following the reasoning previously stated.

Triangulation

We triangulated all of our major data sets by using a combination of questionnaires, interviews and literature review. For our data regarding current use and ordering patterns, asked the same set of questions to each Faculty of Science department, the Print Centre and the Purchasing Department to help correlate or find discrepancies in the data. We used the same method for identifying University policies regarding paper purchasing at these various levels to see if they all have a consistent environmental policy (or lack thereof). We also used a combination of literature review, and interviews with the department secretaries and Print Centre to determine of the copier machines are able to use recycled paper without a substantial increase in the number of paper related problems.

Reliability and Validity

The reliability of our methods and data was shown through our triangulation approaches of asking the same questions several times to different participants. We consistently got the same answers for each of our approaches and methods, and this shows that our research questions provide reliable data. Our study is also representative because we included qualitative data into our study on how members of the Faculty of Science feel about using recycled paper. Our methods are valid because the operationalizations we chose are rational measures of the variables we are looking at and they have also been used by others. For example, the amount of paper purchased in a year for a particular department as measured by their purchase requisition forms or records is a common-sense measure of paper use for that department for the year.

Because we are looking at the issue of paper use in the Faculty of Science from three different perspectives within the University (departmental, Print Centre and Purchasing Department), this should correctly map the phenomenon in question, and hence allow for internal validity (Wright, 2005c). External validity can be assessed by the correlation of our results to results found in other universities where similar studies have been done. Finally, our study will hopefully have catalytic validity because we have attempted to structure it in such a way as to make recommendations to all of the participants involved in an effort to facilitate an increased understanding for these individuals and departments of the issues surrounding recycled paper use. *(Authors note: As of the submission date of this paper, we have already started to see some change as a result of this study. The Director of Facilities Management, Jeff Lamb, sent Dr. Wright an e-mail the day after seeing our presentation saying that Facilities Management will no longer be using virgin paper!)*

Limitations and Delimitations of the Study

Limitations are variables that are beyond a researcher's control, while delimitations are variables that can be controlled (Wright, 2005c). It is important to recognize both the limitations and delimitations involved in a study to better interpret results and manipulate experimental design. In this study, some limitations were: the higher costs of recycled paper in some cases, and time- -as we only had one semester to complete this project and we were a small group of only three people. Other limitations include a somewhat limited budget of the University/ departments to implement any recommendations and the interest and willingness of Faculty of Science departments to implement changes (especially is it requires spending more of the budget on paper). Also, because we were relying of interviews for a lot of our information gathering process, we were sometimes limited by how cooperative the participants were and how much time they had to get us the specific information we wanted (it terms of exact numbers for paper used and money spent etc.). Another limitation that needs to be recognized is that all three of the researchers are also environmental science students which means that we hold a similar certain set of views on environmental issues. While we made a conscious effort to try not to let our biases become too apparent in our questionnaires or interviewing techniques, all of the people we encountered knew that we were environmental studies students and that may have had some effect on our data and the responses we got.

The delimitations of this project fall into three categories, spatial, temporal and conceptual. Our spatial delimitation was looking only at the Studley campus and at eight of the Faculty of Science departments. A temporal delimitation was looking only at purchasing behaviour for the 2003-2004 school year. Conceptual delimitations included looking only at reducing paper waste at the source (i.e. getting people to use less virgin paper in the first place), and not at recycling habits or trying to get people to use less paper in the first place.

RESULTS

1. Questionnaire for Faculty Members

The results for the responses to each question that was on the questionnaire are below. Because we were working with a sample of the population of faculty members, confidence intervals are included for all results. However, we should point out a possible source of error in our statistical calculations. As previously stated, one of the goals of this questionnaire was to have data that was statistically representative of the population by using proportional stratified random sampling. To ensure that all eight strata were represented in our sample, we were required to sample at least 26 percent of the population. However, when we calculated the confidence intervals for responses, we used a simple one-proportion z-interval (see Appendix G) because that was all that was within our relatively meagre statistical abilities to do. However, this test has as one of its base assumptions the "10 percent condition" which states that, "if the sample exceeds 10 percent of the population, the probability of a success changes so much during the sampling that the Normal model may no longer be appropriate" (DeVeaux et al., 2005:

378). Because we violated this assumption, this method of calculating our confidence intervals was not the most accurate, and this may account for some skew in the data.

Question 1. *"Is it possible to order recycled paper at Dalhousie University?"*

Figure 1 shows that of the fifty-two faculty members that participated in the questionnaire, 29 percent responded that "Yes"; they were aware that recycled paper is an option for their use. The remaining 71 percent were unsure whether or not recycled paper was an option available to them. Zero percent of participants answered 'No" to this question. Performing statistical analysis on the largest category of response, we can be 85 percent confident that between 62 and 80 percent of all faculty members are unsure if it is possible to order recycled paper at Dalhousie.

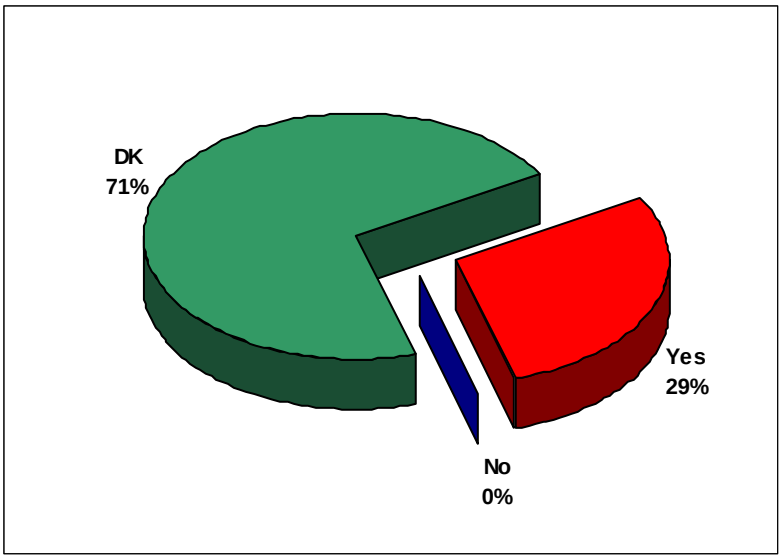

Figure 1. Faculty Responses to Question 1: "Is it possible to order recycled paper at Dalhousie University?"

Question 2a. *"Do you use recycled paper for school purposes?"*

The respondent's answers were distributed more evenly for question 2a than for question 1. 35 percent of participants said "No" when asked if they used recycled paper for school purposes. 25 percent "Didn't Know" what they were using, and 40 percent of respondents (the largest group) said "Yes", they did use recycled paper for school purposes (see Figure 2a.). However, we were suspicious that these results were slightly skewed, because of a misunderstanding with what the question was asking. We observed from speaking with participants that some respondents considered using recycled paper to include "reusing paper that had been previously used", instead of the meaning that we actually intended which was "using paper containing post-consumer recycled content". In the process of investigating the types of paper used by each department, the research uncovered that only two departments actually supply recycled paper to their faculty members: Oceanography and Environmental Programmes/ Dean's Office. Because these two departments accounted for only 7 individuals being surveyed with the questionnaire,

we can say with certainty that only 7 of the 21 respondents that answered "Yes" actually *do* use recycled paper, and that the remaining 14 misinterpreted the question (unless of course they buy their own paper individually from an outside source, which is *highly* unlikely). This information was used to recalculate the answers to this question and these modified responses can be seen in Figure 2b.

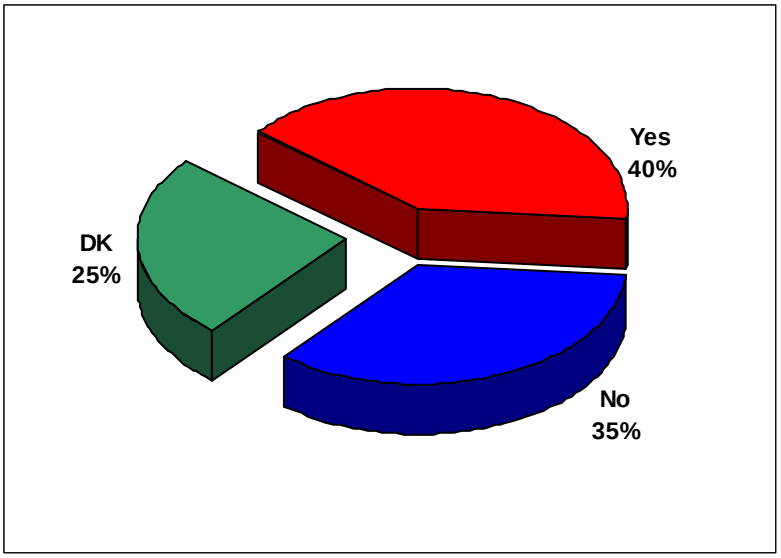

Figure 2a. Faculty Responses to Question 2a: "Do you use recycled paper for school purposes?"

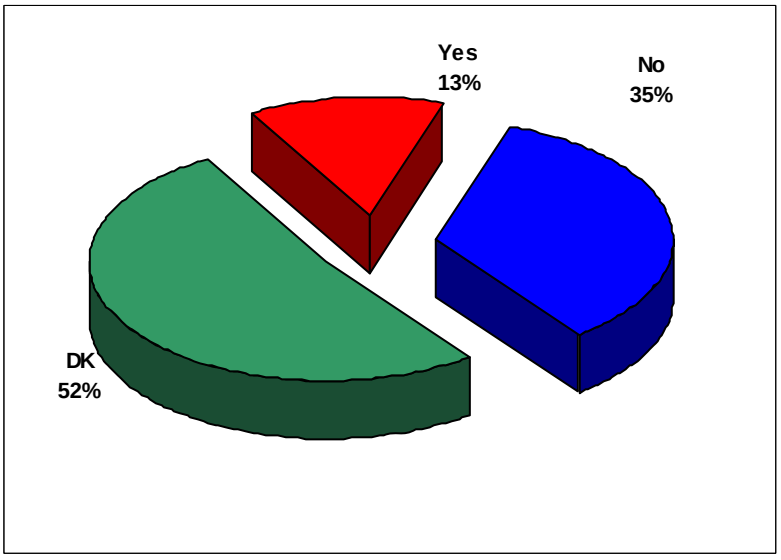

Figure 2b. Modified Faculty Responses to Question 2a: "Do you use recycled paper for school purposes?"

These modified results show that only 13 percent of faculty members use recycled paper for school purposes, and the remaining 87 percent either don't know or answered no to the question. Therefore we can be 90 percent confident that between 79 and 95 percent of all faculty members either do not use recycled paper, or are unsure of what kind of paper they use for school purposes.

Question 2b. ***"If you don't currently use recycled paper, or are unsure of the paper type you use, would you consider using recycled paper for school purposes?"***

When the respondents were asked if they would consider using recycled paper if they didn't already, 73 percent answered that they would, while the remaining 27 percent did not answer the question because it was non-applicable (Figure 3).

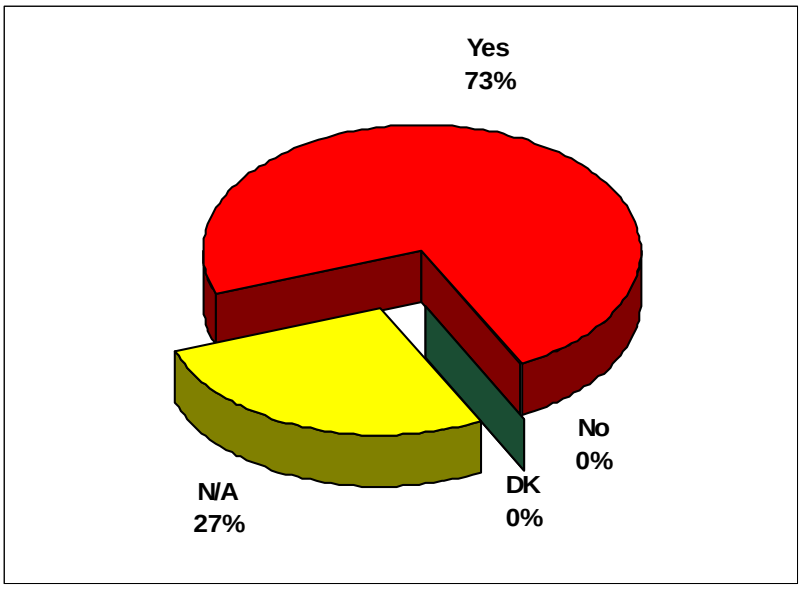

Figure 3. Faculty Responses to Question 2b: "If you don't currently use recycled paper, or are unsure of the paper type you use, would you consider using recycled paper for school purposes?"

This means that of the total number of people that responded to the question, 100 percent said that they would consider using recycled paper. If we were to calculate a confidence interval for this response, we would grossly violate another main assumption of the test statistic, the 'Success/failure' condition (DeVeaux et al., 2005: 378), and would find that we could say with 100 percent confidence that 100 percent of faculty members would consider using recycled paper if they do not already. However, because this is in such gross violation of the test conditions, this statistic is not reliable.

Respondents were also asked to explain their response. The general consensus for those who gave an explanation is that recycled paper is a good idea, but the reasoning for this opinion varied. Explanations were generally divided into two categories: those that would absolutely consider using recycled paper (Group One), and those that would consider using recycled paper only under certain circumstances (Group Two) as seen in Table 1.

Table 1. Respondent Explanations as to Why They Would Use Recycled Paper.

Group	Explanation	Percentage of Respondents
Group One	Environmental	21%
	Ethical	15%
Group Two	Activity/Quality	29%
	Costs	35%

Group One's explanations generally pertained to ethical and environmental considerations and this group represented a smaller proportion of respondents. Group Two's reasons for why they would use recycled paper were based more on certain conditions. The largest concern for this group was the quality of recycled paper and whether or not it would be acceptable for certain activities, which included: creating lab manuals, long term filing and letter writing for example. The other concern was the cost of using recycled paper; if there was no significant increase in costs or the costs were less, recycled paper was considered acceptable. If there was a large increase in costs they would not want to use it. However there was no dollar amount included with the respondent's answers to establish what they considered a significant increase /decrease to be.

Question 3. *"Do you believe the Faculty of Science should make a greater effort to use recycled paper?"*

The most common response to this question was "Yes", with 85 percent of the respondents agreeing that the Faculty of Science should make a greater effort (see Figure 4). Again, respondents were given space to explain their responses and there was a wide range of explanations as to why faculty members held this opinion. Respondent #49 emphasized the need to 'close the loop' of recycling at Dalhousie by saying, "Lots of paper seems to GO to recycle, little comes back."

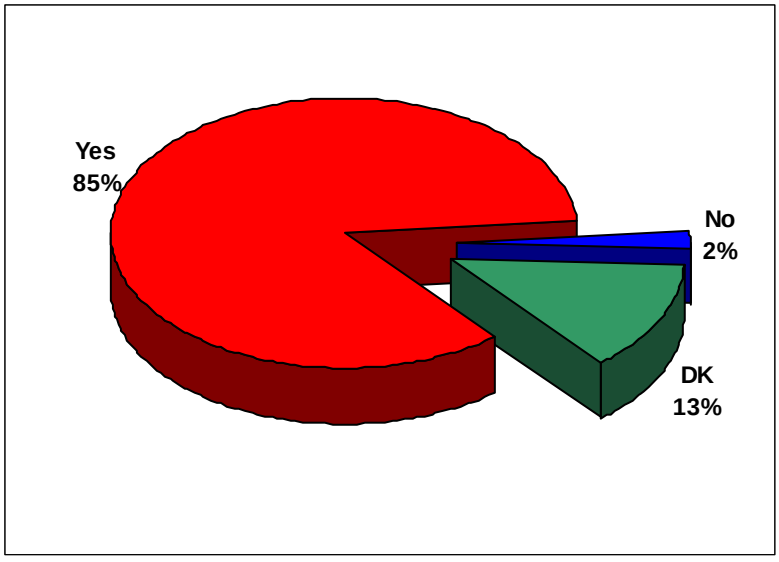

Figure 4. Faculty Responses to Question 3: "Do you believe the Faculty of Science should make a greater effort to use recycled paper?"

Other respondents expressed the opinions of: ordering more would lower the cost of recycled paper for all, ethical correctness, and minimising the impact on the environment. Two respondents explained how switching to recycled paper could demonstrate sound environmental practices to students, faculty and staff at Dalhousie, and that the University should be an example that others can follow. 13 percent of the respondents answered that they didn't know if the university should increase their efforts. The respondents who gave this answer commented that they were unsure of the current practices and policies that the university has regarding this issue, and also some were unsure that recycled paper actually reduces negative impacts on the environment. Only 2 percent responded "No". This single respondent also explained that he or she was unsure that making recycled paper actually uses fewer resources than making virgin paper. Using statistical analysis, we can be 90 percent confident that between 78 percent and 93 percent of all faculty members believe that a greater effort should be made by the Faculty of Science to use recycled paper.

2. Interviews with Faculty of Science Department Secretaries

Current Use

Table 2 shows a summary of the information gathered from the eight interviews conducted with the department secretaries in regards to current paper usage patterns within each department in terms of the total amount of paper ordered, the total cost of the paper, and if the department uses recycled paper or not. Note that these numbers include paper use *within* each department only, and not any paper used for jobs done for each department at the Print Centre. Also, the percentage of copy jobs done at the Print Centre varies greatly between departments, but all large scale jobs (like lab manuals etc.) are done at the Print Centre, regardless of the department.

Table 2. Summary Information on Paper Use and Cost for Faculty of Science Departments.

Department	Paper Used (# sheets per year)	Cost ($ per year)	Recycled? Yes or No
Biology & Marine Biology	750,000	$5241	No
Psychology	742, 000	$5101	No
Math & Statistics	485,000	$3447	No
Chemistry	485,000	$3447	No
Physics & Atmospheric Science	420,000	$3234	No
Oceanography	400,000	$2954	Yes
Earth Science	175,000 – 210,000	$1244 - $1493	No
Env. Programmes/ Dean's Office	93,480	$628	Yes
Total	3,457,000 - 3,492,000	$25,296 - $25,545	

The table shows that the eight FOS departments combined currently use 3.5 million sheets of paper costing approximately $26,000 a year. The table also shows paper usage by department in descending order from most to least, with the Biology and Marine Biology department using the most, and Environmental Programmes/ Dean's Office using the least. We can also see form Table 2 that only two departments in the Faculty of Science currently use recycled paper, Oceanography and the Environmental Programmes/ Dean's Office (both of these departments currently use recycled paper with 30% post

consumer waste). It is interesting to note however, that none of the eight departments currently have a written policy about paper purchasing. We can also see from Table 2 that recycled paper accounts for only 14% of the total Faculty of Science paper use in a year.

Using the data from Table 2, and also determining how much each department pays for type of paper it uses, Table 3 was constructed to show the projected cost differences associated for changing to 30% post consumer recycled paper for each of the six departments that currently use virgin paper.

Table 3. Projected Cost Differences Associated with Using Recycled Paper

Department	Projected savings or increase from using 30% recycled paper ($ per year)	Price differential for using 30% recycled paper (% per year)
Biology & Marine Biology	+ $300	+ 5.7%
Psychology	+ $291	+ 5.7%
Math & Statistics	+ $181	+ 5.3%
Chemistry	+ $181	+ 5.3%
Physics & Atmospheric Science	- $132	- 4.1%
Earth Science	+ $48 - $58	+ 3.9%

Not all departments that use virgin paper use exactly the same type, and this accounts for the price differentials between departments in terms of increased savings or expense. The price range for a box (5,000 sheets, 8½ by 11) of virgin paper was found to be between $34.94 and $39.35, whereas the price of the 30% post consumer recycled paper that Oceanography and Environmental Programmes/ Dean's Office uses is $36.93 a box. Table 3 shows that the department of Physics and Atmospheric Science would save approximately $132 (or 4.1%) a year if they switched to using recycled paper. For the remaining five departments a change would mean an increase in price ranging from $300 a year for Biology and Marine Biology to between $48 and $58 a year for Earth Science. However, all of these price differentials are within 5.7% of the current yearly budget spent on paper.

We also gathered information on and service records for the each department's copiers so there could be some base-line and comparative data on if using recycled paper increases the need for maintenance and decreases the lifetime of the machines. This data is summarized in Table 4. It should be kept in mind however that some of these are estimates from the department secretaries, and not the exact numbers from service records (which often were not directly available).

Table 4. Summary Information on Copier Service Records for Faculty of Science Departments

Department	# of Service Jobs a Year (per machine)	Most Common Reason(s) for Servicing
Biology	6	paper jams, black spots, maintenance
Math and Statistics	6	paper jams, printing black spots etc
Physics & Atmospheric Science	6	paper jams etc
Chemistry	5	paper jams, printing black spots etc
Earth Science	4	paper jams etc
Env. Programmes/ Dean's Office	4	majority are for cleaning/ lubricating jobs (maintenance)
Psychology	4	regular paper jams etc
Oceanography	2	usually just for yearly maintenance

Paper ordering Process

Through the secretary interviews, we found that paper ordering is done independently by each department, and that all departments order paper directly from the Dalhousie Print Centre. Also, secretaries typically hold the most power when it comes to paper purchasing for a department because they are the people who decide what to order for department use, and then that paper gets used in the department copiers and distributed to faculty members on request. However, we discovered that faculty members can also influence these decisions. For example, the Earth Sciences secretary told us that they had previously (a few years ago) used recycled paper based on the strong insistence from just *one* professor in the department. But that professor has since retired, and now the department no longer uses recycled paper.

We also learned that department budgets have great flexibility. In all departments there were no strict limitations on either the percentage of the entire department budget, or on the dollar amount that could be spent on paper. One of the most interesting discoveries we made from the department interviews with secretaries was that recycled paper is not an option listed on the Print Centre request forms. For a secretary to even know that it is an available option, they must specifically ask for it. In fact, many secretaries were very surprised to hear that the Print Centre does not use recycled paper, and didn't even know until we asked them exactly what kind of paper they were using in their department (i.e. whether it was recycled or not).

3. Interview with Dalhousie Print Centre

The interview conducted with Mr. Doyle gave us some very valuable information for our project. We learned that on average Dalhousie University uses between 60 and 65 million sheets of paper each year, with most of that being 8½ by 11 bond paper, and that the Print Centre buys for and distributes paper to all of Dalhousie University.

For the 2003/2004 year the budget for purchasing paper was approximately $265,000 and this made up between 15-20% of the Print Centre's total budget for that year. The remainder of the budget went towards contracts for the copiers, salaries and benefits for the employees, and other consumables. In addition we were informed that there are no limitations in the budget pertaining to how much can be spent on paper because the Print Centre operates like a business, with the departments as customers.

This means that they order paper based on demand and thus there are no limitations from the Print Centre on what kinds of paper can be ordered (or how much money can be spent on that paper). Essentially if the departments can afford to order it, then the Print Centre can buy it for them. Because of this supply and demand relationship, the print Centre does not have a written policy on paper purchasing.

Mr. Doyle informed us that it can be very hard to estimate how much paper the Print Centre orders from year to year because as previously stated, the paper ordering is based on demand. We also learned that unfortunately, it is impossible to track the jobs done at the Print Centre for the Faculty of Science departments because of an inefficient computer tracking system. The system they currently have uses the name of the *individual* ordering the paper (Ex. Mr. David Smith) and not the department name or account number to log requests & orders. This would make it a very confusing and time-consuming task to get the information on Print Centre use for all eight departments.

It was also found that the two main companies or suppliers that the Print Centre orders paper from are Cascades and Unisource. With regards to the copiers run by the Print Centre there are two main types: the convenience copiers and the fast copiers, all of which were installed in July 1997. Currently in the Print Centre there are two fast copy machines which are Xerox 5690s, and these copiers are designed to handle large scale jobs that require large quantities of paper. In contrast, the convenience copiers are the copiers that are installed in each of the departments (which the Print Centre is also responsible for in terms of financing and other details), and these are used for non-production small scale jobs. The contracts for these machines are renewed every 5-6 years. Mr. Doyle also told us that the vast majority of the print jobs done on the fast copy machines in the Print Centre are done on virgin paper. Despite this fact, the Print Centre has no objection to using recycled paper in their copiers (they just never get the request for jobs to be done on recycled paper). Mr Doyle said that the Print Centre has never had a problem with using recycled paper in their copy machines (although they rarely, if ever use it), and also stated that departmental copy machines in which recycled paper is used also do not seem to have any problems with it. He also stated that to the best of his knowledge, using recycled paper in the fast copy machines would not void their warranty. Also, when asked about the fact that recycled paper is not currently an option listed on the Print Centre request forms, the Mr. Doyle seemed very open to the idea of making it a clearly listed option on those forms.

4. Interview with Dalhousie Purchasing Department

Shortly after beginning this interview, we realized that the Print Centre and the Purchasing Department were much more interconnected than we initially realized. The Print Centre is essentially a part of the Purchasing Department, and because of this, much of the information we were intending to get from the Purchasing Department, we had already gathered from the Print Centre interview. However, the Purchasing Department Interview was not for naught. Through this interview with Mr. Taylor, we found that the Purchasing Department engages in contract negation for paper each year through Interuniversity Services Inc. (ISI), with main suppliers like Domtar and Unisource, therefore securing prices for the year. He explained that the ISI is a consortium of all 17 Atlantic universities that was established to increase purchasing power, and that the ISI

negotiates contracts for several different things, paper being one of them. Dalhousie is by far the largest member of the ISI, accounting for over 50% of the buying power of the consortium; therefore the other 16 universities in the ISI largely take advantage of Dalhousie's purchasing power to secure the best paper prices.

We learned that the Purchasing Department has a detailed list of specifications in terms of paper weights and sizes that is considered before paper is ordered. Along with this there is also a specific evaluation criterion with regards to service, quality, price, etc. of the paper supplier that is considered by the Purchasing Department before it is determined where they will order paper from. Mr Taylor also mentioned that within this evaluation criterion there is an environmental factor that they take into consideration, but that in the end, they often have to make a trade off in this regard (i.e. not look into buying recycled paper) to get a reasonable price. One last interesting thing that we learned from this interview was that departments, while they are certainly not encouraged to, are also not prohibited from ordering paper outside of the Print Centre.

DISCUSSION

The goal of this study was to assess the feasibility, in terms of attitudes, availability and economics, of increasing recycled paper use in the Faculty of Science at Dalhousie University. We sought to determine the current knowledge that faculty members within the Faculty of Science had on recycled paper availability, and also to gain information on how they feel about using recycled paper for school purposes through the use of a questionnaire. We also wanted to assess the current paper use patterns in the eight Faculty of Science departments, by conducting interviews with department secretaries. The third main goal was to assess current paper use at Dalhousie University as a whole: to learn Dalhousie's paper related policies and practices, details of the contracts with paper manufacturers and suppliers, as well as the general attitude of Dalhousie regarding the use of recycled paper, by conducting interviews with the Dalhousie University Print Centre and Purchasing Department.

1. Questionnaire for Faculty Members

The Faculty questionnaires revealed some very interesting facts about faculty member knowledge regarding recycled paper use at Dalhousie. Over two thirds (71%) of the sampled faculty members had no idea that recycled paper was an option for use in their offices. This shows that there is an obvious need for the University to increase awareness among faculty members that recycled paper is an option that is available to them. We also learned that we may have been too vague in our language on the questionnaire. The responses to question 2a (Figures 2a and 2b) showed that people were confused with the wording of this question. It never occurred to us that people would think of the term 'recycled paper' as including 'paper that you recycle or reuse'. However, a significant proportion of people did indeed make this misinterpretation. We can see now that this was a result of the vagueness of the question wording; we should have instead re-worded it to say 'Do you use paper containing recycled content for school purposes?', or something to that effect.

Results of the questionnaire also showed that there is a strong feeling from faculty members that the Faculty of Science needs to increase the use of recycled paper within its departments. 100 percent of respondents indicated that they would consider using recycled paper for school purposes (Figure 3), and 85 percent indicated a belief that the Faculty of Science should make a greater effort to increase recycled paper use (Figure 4). However, from individual faculty member responses, we also found that there are still concerns about the quality of recycled paper. There were also concerns about how durable recycled paper really was compared to virgin paper. This shows that there also needs to be more updated education for Dalhousie faculty members about not only availability of recycled paper, but also on quality. This mirrors what we see in the literature about lingering misconceptions on the quality of recycled paper.

2. Interviews with Faculty of Science Department Secretaries

Current Use

As Table 2 shows, the department that uses the most paper per year is Biology/ Marine Biology followed by Psychology, Mathematics and Statistics, Chemistry, Physics and Atmospheric Science, Oceanography, and Earth Sciences, with Environmental Programmes/ Dean's Office using the least amount of paper a year. This information tells us that paper usage is not directly proportional to how large the department is. The departments in order of largest to smallest (as determined by number of faculty members) are:

1. Biology/ Marine Biology
2. Psychology
3. Chemistry and Math/ Statistics (tied for third largest department)
4. Oceanography
5. Physics and Atmospheric Science
6. Earth Science
7. Environmental Programmes / Dean's Office.

From this we can see that the department of Atmospheric Science uses more paper than would be expected by department size, while the department of Oceanography uses less than would be expected. However, it should again be pointed out that these data are for *within* department use only (as these were the only numbers available from the secretaries), so this count does not include any of the paper that departments use when they have copy jobs done at the Print Centre. Because the Print Centre is used for large scale jobs, and quite often by some departments (in particular Psychology, Oceanography and Biology, who all approximate that they use the Print Centre for over 50% of their copy jobs), this makes our data for number of sheets of paper used per year actually quite a bit lower than they should be if Print Centre jobs were factored in.

Table 2 also reveals that the only departments to currently use recycled paper are Oceanography and the Environmental Programmes/ Dean's Office, with both of these departments using recycled paper with 30% post consumer waste. These two departments have each been using recycled paper for approximately two years, and started doing so because they made a conscious choice to ask for it. However, the fact that only two departments use recycled paper, in conjunction with the fact that *none* of

the eight departments currently have a written policy about paper purchasing tells us that while some departments *are* thinking about where their paper is coming from, and making a choice to use a product with a lower environmental impact, even these departments have not made the conscious decision that this choice is important enough to be made official department policy.

Looking at the projected cost differentials of changing to recycled paper for each of the six departments that do not currently use it (Table 3), we see that it would actually save the department of Physics and Atmospheric Science approximately $132 a year to make the switch to recycled paper, yet they still use virgin paper. This is particularly curious in light of the fact that the secretary commented during the interview that "more professors are concerned about the environment; more are asking to get double sided printing done". From this information it would seem that the department would want to make a change to recycled paper, especially since it would be cheaper for them. However, because they have not, one reasonable explanation seems to be that it's something they just have not looked into. This leads us to believe that the paper type they use, and the possibility of recycled paper, is something that most Faculty of Science departments at Dalhousie just do not think about.

Table 3 also shows that the price differentials for the other five departments (for which it would be more expensive to purchase recycled paper) are all within 5.7% of their current budget. This means that for any of these five departments, it would cost them a relatively small amount of money to make the change to using only recycled paper. The fact that they have not again suggests a lack of either awareness of this fact, or a lack of willingness to spend that relatively small amount of extra money. However, as most secretaries have expressed to us that their budgets are very flexible, and we have seen that most faculty members agree with increasing the use of recycled paper, we would conclude that this fact is more indicative of lack of knowledge and education on purchasing options and pricing.

In Table 4 we see information on service records for the each department's copiers. We gathered this data for two main reasons. One was to see if the machines in the departments that are currently using recycled paper required a lot more maintenance than machines in departments that used virgin paper. We see from Table 4 that in general, they do not. However, it would be unwise to try and compare this data between departments more rigorously for this purpose, because of the highly variable individual quality of photocopiers (Conservatree, 2003: 8), and also because of other things like age of the machines etc. The second, and in our view more important reason for collecting this data was to gather base-line numbers for each department, so that if they begin using recycled paper in the future, they will have available data for comparisons on if using recycled paper increases the need for maintenance in their machines. However, we will again mention that some of the numbers in Table 4 are estimates from the department secretaries, and not the exact numbers, so these comparisons could only be general in nature.

Paper Ordering Process

The most important thing that we learned from the secretary interviews in this respect is how easy it typically would be for a department to make a change to using recycled paper. Both of the departments that currently use recycled paper are doing so

because their secretaries made a choice and decided to start ordering it one day, simple as that. Also, because secretaries are the ones who typically make decisions about paper ordering, it tells us that any kind of movement towards increasing recycled paper use within a department should be primarily directed towards the secretary of that department. The example of the single Earth Sciences faculty member influencing the department to use recycled paper is also a very strong indicator both of just how easy it can be to make the change to using recycled paper, and also of how there needs to be more education and push for the use of recycled paper, because it's just as easy to make the change back to using virgin paper if there's not at least one strong advocate within the department, or if the decision to use recycled paper is not included into written department policy.

3. Interview with Dalhousie Print Center

From this interview many interesting things can be elaborated on. Because the Print Centre operates like a business with the departments as customers, if the Print Center is asked by a department to buy a certain type of paper and if they can get it, they will. So if more departments started deciding that they wanted to use recycled paper, there would be no financial limitation on the Print Centre's end in terms of getting that paper.

We also found that it was impossible to track the Faculty of Science use of the Print Center for print jobs because of the inefficient system which is not designed to 'work backwards' to get information such as this. Not being able to obtain this information had major implications for our project because it meant that the paper use we calculated for each department is much lower than what the true amount should be, if we were able to track *all* of the paper the departments use in a year. This is because the in-department paper use is typically only a fraction of what gets done in the Print Center by virtue of the fact that the Print Centre is used for large-scale jobs.

With regard to the concern that the use of recycled paper in copier machines causes them to break down more often, it appears that we have more confirmation that this is truly an out-dated myth. Mr. Doyle stated that the Print Center copier machines as well as the departmental copiers have not been known to have problems with using recycled paper. Also, there are currently no regulations from the manufacturers of the copy machines stating that recycled paper cannot be used in the machines.

Overall, it was found that the Print Center does not discourage the use of recycled paper but that they do not advertise it either. However, Mr. Doyle actually seemed very receptive to the idea of adding 'recycled paper' as an option on the Print Centre request forms. This again suggests to us that the barriers to getting the Faculty of Science departments to use more recycled paper are not that hard to break through. In the end it is the departments, who are the customers of the Print Center, that have the final say as to whether or not they want to purchase recycled paper, and currently only Oceanography and Environmental Programmes/ Dean's Office choose to make this decision. This only reinforces our feeling that more education is needed for the departments themselves.

4. Interview with Dalhousie Purchasing Department

From this interview we gained some very useful knowledge. For example, we learned that it is the Interuniversity Services Inc that compiles all the end requirements with regards to paper for all seventeen Atlantic Canadian Universities and then negotiates a contract based on these numbers. Because the ISI is in charge of securing the contracts, this means that it may be a good idea to try and increase education at the ISI level to get them to more greatly consider recycled paper when they engage in contract negotiations. This was outside of the scope of our project, but is something to consider for the future.

Also, because Dalhousie University is the largest member of the ISI and they make up about 50% of the total purchasing power of the consortium, this means that if Dalhousie made a shift to using more recycled paper, it could significantly lower the cost of recycled paper for all other sixteen universities as well. This has *major* implications in regards to Dalhousie's environmental commitments. These environmental declarations generally state that Dalhousie will strive to be a leader in environmental decision making; and as it turns out, paper purchasing would be a prime way to accomplish this. Because Dalhousie holds so much financial power in this situation, not only would a change to increasing recycled paper use show ethical leadership to the other sixteen universities, it would show financial leadership as well, and as universities are often concerned with their financial bottom line, this would be a huge example to set.

However, Mr. Taylor expressed the concern that if the Print Centre ordered nothing but recycled paper that this would cost more than purchasing virgin paper, and this would in turn drive the price offered to the departments up. He felt that if departments were essentially forced to buy recycled paper from the Print Centre at this higher cost, that most departments would likely go buy virgin paper from an external supplier where the cost of the paper would be cheaper. And although this practice would not be encouraged, it is also not currently prohibited. Mr. Taylor feared that this could in effect drive the paper business 'underground'. This seems like a logical fear from his perspective, however, we feel like this situation could be avoided rather simply. For example, price is an issue that *can* be negotiated. Princeton University, while in the process of changing over to using only recycled paper, began negotiations with its paper supplier about reducing its recycled paper price if every department in the University agreed to switch its copying paper to 100% recycled paper. In the end, an agreement was reached where if all Princeton departments switched to 100% recycled paper the price would come down significantly from the supplier (Greening Princeton, 2005). There is no conceivable reason why a similar agreement could not be reached between the ISI and its paper suppliers, especially since the ISI represent not one, but seventeen universities.

Overall, the results of this interview show that much more education is needed at all levels of Dalhousie University (and even the ISI) on the benefits of using recycled paper. Also, it seems that it is one option that has never seriously been looked into; and it is all too easy to say that something cannot be done or is too much time or hassle if it has never even been tried. All the literature seems to point to the fact that instituting the use of recycled paper is not a very hard thing for an institution like Dalhousie to do and so we feel that it is time that Dalhousie at least looked into the process seriously.

CONCLUSION

Through our study, we set out to determine the feasibility, in terms of attitudes, availability and economics, of increasing recycled paper use in the Faculty of Science at Dalhousie University. We found increasing recycled paper use is feasible in terms of attitudes; faculty members, department secretaries, and the managers of both the Dalhousie Print Centre and Purchasing Department alike *all* supported an increase in the use of recycled paper. We found that this is also feasible in terms of availability; recycled paper is now available at the same quantity and quality as virgin paper. Finally, we found that increasing recycled paper use in the Faculty of Science is also feasible in terms of economics; the departments have flexible budgets, and it was found that for all departments, the price increase associated with using recycled paper would be less than 5.7% of the current paper budget. So with no economic limitations from the Print Centre, using recycled paper in the Faculty of Science is economically feasible as well. With this initial exploratory research showing an 'green light' in each of these three aspects of feasibility, it is clear that the Dalhousie University Faculty of Science should begin to make a change to using recycled paper.

Recommendations

Based on our research study, we would make the following recommendations for Dalhousie University:

1. There should be increased education for Dalhousie University faculty members and particularly department secretaries, on the current quality and availability of recycled paper.
2. All departments should form a *written* policy on paper purchasing that reflects environmental purchasing practices. This is especially true of the departments that currently use recycled paper (Oceanography and Environmental Programmes/ Dean's Office). These departments are leaders in environmental purchasing practices, and should cement this leadership role by pioneering a written policy on environmental paper purchasing. This will also help to ensure that these paper purchasing practices survive any change in faculty or administrative staff.
3. The Print Centre should make recycled paper a *clear* option on their request forms to ensure that customers (the departments) are aware of its availability. They may also consider making recycled paper the default option when an order for paper is placed. This would mean that a department would have to specifically ask for virgin paper if they wanted to continue using it.
4. All departments should implement the use of recycled paper if the price increase is within 6% of the current department spending on paper. This is a decision that amounts to a relatively small dollar amount increase for the departments, but can have huge positive consequences for the environment.
5. Lastly, departments should absolutely implement the use of recycled paper if it costs less than the virgin paper type they are currently purchasing. Not only does this make good business sense, but it makes excellent environmental sense as well!

Authors note: These recommendations will indeed be formally be made to the appropriate individuals following the completion of this project.

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APPENDICES
APPENDIX A
Questionnaire for Faculty of Science Faculty Members

1. Is it possible to order recycled paper at Dalhousie University? (Please circle one)

   Yes No Don't know

2. Do you use recycled paper for school purposes?

   Yes No Don't know

   ⟶ If you don't currently use recycled paper, or are unsure of the paper type you use, would you consider using recycled paper for school purposes?

   Yes No Don't know

   Please explain: _____

   _____

   _____

3. Do you believe that the Faculty of Science should make a greater effort to use recycled paper?

   Yes No Don't know

   Please explain: _____

   _____

   _____

4. To which department do you belong?

   ☐ Biology / Marine Biology ☐ Math / Statistics

   ☐ Chemistry ☐ Oceanography

   ☐ Earth Science ☐ Physics and Atmospheric Science

   ☐ Environmental Programs /Dean's Office ☐ Psychology

APPENDIX B

Information Letter

My name is Beth Sampson, and I'm an undergraduate student in Biology here at Dalhousie University. This questionnaire is part of a study that I and two colleagues are conducting for the Environmental Problem Solving II Class: The Campus as a Living Laboratory. The study aims to assess current paper use patterns in the Dalhousie University Faculty of Science departments, and determine the feasibility of eliminating paper waste at the source by increasing the use of recycled paper. This questionnaire is designed to help us gain an understanding of how faculty members within the Faculty of Science feel about using recycled paper for school purposes, and consists of four questions to this effect. The whole questionnaire takes approximately 3 minutes to complete. I hope that you'll answer all questions, but feel free to omit any that you feel uncomfortable about.

Finally, please note that the responses to this questionnaire will be kept confidential; you will be given a respondent number, your name will never be recorded on the questionnaire form, and all information will be entered into an electronic database and the questionnaire form will be confidentially shredded within three weeks of the completion of this project (April 29, 2005). If you'd like to receive a brief summary of the results of this study, or the complete final report after the study is completed, please specify which you'd like to receive, and write your e-mail address or department mailing address on the back of the 'Informed Consent' portion of this form.

You should also be aware that this study has received ethics approval from the Department of Environmental Programmes. If you have any questions or concerns, please don't hesitate to contact me at:
Email: @dal.ca, Phone: , or Dr. Tarah Wright at:
Email: tarah.wright@dal.ca, Phone: 494-3683.

Thank you very much for volunteering your time to participate in this study.

- -

Informed Consent

I have read and understood the information letter and agree to participate in this study.

_____ _____
Signature of Participant Date

I have provided the Participant with a copy of the information letter and have witnessed their signature of this consent form.

_____ _____
Signature of Researcher Date

APPENDIX C

Interview Questions for Faculty of Science Secretaries

1. May we audio record this conversation for time and accuracy purposes, and quote your responses for the purposes of our project?

2. How does the paper ordering process work in your department?
   (i.e. Do professors order paper and you compile and submit orders, or does the department just order paper and then distribute it based on request? Who do you directly order paper from?)

3. How many times a year do you order paper?

4. Does the department have a copy of purchase requisition forms for paper for the last school year, 2003/2004?
   -If so, could we get a summery of this information?

5. What was the department budget for paper in 2003/2004?

6. What per cent of the total department budget is allocated to purchasing paper?

7. Are there limitations on how much of the department budget can be allocated to purchasing paper?

8. Does the department have a written policy about paper purchasing?
   -If so, could we please obtain a copy of it?

9. Of the total amount of printing / copying that the department does, how much of it is done using in-house machines, and how much is done at the Print Centre (or elsewhere)?

10. To the best of your knowledge, has this department ever requested a print job from the Print Centre be done using recycled paper?
    -If so, what was the response? Did they agree to do the job?

11. Roughly how many times a semester do the department copier(s) need to be serviced?

12. Does the department keep service records for these repairs that contain maintenance details?
    - If so, could we please get a copy?
    - If not, do you know where we could get such service records?

13. Is there anything more you'd like to add? (Any comments or concerns?)

14. Would you like a copy of our final report when it is completed?

APPENDIX D

Information Letter

My name is Beth Sampson, and I'm an undergraduate student in Biology here at Dalhousie University. This interview is part of a study that I and two colleagues are conducting for the Environmental Problem Solving II Class: The Campus as a Living Laboratory. The study aims to assess current paper use patterns in the Dalhousie University Faculty of Science departments, and determine the feasibility of eliminating paper waste at the source by increasing the use of recycled paper. This interview is designed to assess the current paper use patterns in your department, and consists of twelve questions to this effect. The interview will take approximately 10 minutes to complete, and will be conducted at your convenience.

Finally, please note that I will record your responses in a written point form and the interview will also be audio recorded (with your permission) to maximize the time efficiency and accuracy of this process. The audio tapes will be stored in a secure location and destroyed within three weeks of the completion of this project (April 29, 2005).

You should also be aware that this study has received ethics approval from the Department of Environmental Programmes. If you have any questions or concerns, please don't hesitate to contact me at:
Email: @dal.ca, Phone: , or Dr. Tarah Wright at:
Email: tarah.wright@dal.ca, Phone: 494-3683.

Thank you very much for volunteering your time to participate in this study.

APPENDIX E

Interview Questions for the Print Centre

1. May we audio record this conversation for time and accuracy purposes, and quote your responses for the purposes of our project?

2. How does the paper ordering process work in the Print Centre?
   (I.e. do departments order paper and you compile and submit orders to the Purchasing Department, or does the Print Centre just order paper and then distribute it based on request? Who do you directly order paper from?)

3. How many times a year do you order paper?

4. Do you have a copy of paper purchase requisition forms for the last school year, 2003/2004?
   -If so, could we get a summery of this information? (We want to know how much paper the Print Centre uses and how much of each type of paper it uses, including if any recycled paper is used).

5. What was the Print Centre budget for paper in 2003/2004?

6. What per cent of the total budget is allocated to purchasing paper?

7. Does the Print Centre have a written policy about paper purchasing?
   -If so, could we please obtain a copy of it?

8. Does the Print Centre have a written policy about what types of paper can be used in the copy machines?

9. Of the total amount of copying that the Print Centre does, how much of it is done for the Faculty of Science Departments (Biology/ Marine Biology, Oceanography, Earth Science, Psychology, Environmental Programs/ Dean's Office, Math/ Statistics, Physics and Atmospheric Science, Chemistry)?

10. What kinds of jobs is the convenience copier vs. the fast copiers used for respectively?

11. Has the Print Centre ever done a print job on the any of the machine using recycled paper?
    -If so, what *specific* type of recycled paper was used?

12. Has there ever been a *request* for a print job to be done on recycled paper?
    -If they answer 'yes' to this, but 'no' to question 9:
    - What were the reasons that you didn't do the print job?

13. Roughly how many times a semester do each of the copiers need to be serviced?

14. Does the Print Centre keep service records for these repairs that contain maintenance details?
    - If so, could we please get a copy?
    - If not, do you know where we could get such service records?

15. What are the make and model of the copiers?

16. To the best of your knowledge, are there any regulations from the manufacturers of the copiers that state what types of paper can and cannot be used in the machines? (We want to know if using certain kinds of paper might void the warranty on the machines, or are discouraged from using in the machines).

17. When did you get these copiers and when is the lease on them up?

18. How often do you get new copier machines?

19. Would you like a copy of our report when it is completed?

APPENDIX F

Interview Questions for the Purchasing Department

1. May we audio record this conversation for time and accuracy purposes, and quote your responses for the purposes of our project?

2. How many sheets of paper did Dalhousie University order for the 2003-2004 school year?

3. How does the paper ordering process work for the Purchasing Department? (I.e. Do people order paper straight from you and you compile and submit orders to the suppliers, or does the Purchasing Department just order paper and then distribute it based on request? Who do you directly order paper from? Who do you directly sell or distribute paper to?)

4. What was the Purchasing Department budget for paper in 2003/2004?

5. What per cent of the total Purchasing Department budget is allocated to purchasing paper?

6. Are there limitations on how much of the Purchasing budget can be allocated to purchasing paper?

7. Does the Purchasing Department have a written policy about paper purchasing?
   -If so, could we please obtain a copy of it?

8. What factors influence the Department's paper purchasing decisions?

9. How much of the paper ordered is ordered for the Print Centre?

10. Who are the manufacturers / suppliers, and how do the contracts with these bodies work?

11. Can you explain a little about how the ISI (Interuniversity Services Inc.) works? I.e. How would increasing demand for recycled paper at Dalhousie University affect purchasing power/ options/ pricing for our university and for the others in the consortium?

12. Are there barriers to using recycled paper at Dalhousie University and if so, what do you feel they are?

13. Can we get contact information for the manufacturers and suppliers?

14. Would you like a copy of our report when it is completed?

APPENDIX G

Example Calculation 1

Parameter being Tested: Proportion of faculty that "Don't Know" if recycled paper can be ordered at Dalhousie University.
Sample Population n = 52
Sample Proportion for "DK" p = 0.71
Sample Proportion for the remaining Population q = 0.29

Standard Error(p) = $SE(p)^2 = \frac{p*q}{n} = \frac{(0.71)(0.29)}{52} = 0.0629$

Confidence Interval of 85%
z* = 1.44
Margin of Error = ME = z* x SE(p) = 1.44(0.0629) = 0.0892
Confidence Interval is 0.71 ± 0.089 or (0.621, 0.799)
Interpretation: We can be 85% confident that between 62.1% and 70.0% of all professors in the Faculty of Science Do not know recycled paper is an option when ordering paper.