An Instrument to Measure the Recycling Attitudes and Beliefs of Undergraduate Students

at a Large Northeastern University

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Abstract

The results of this study of 168 first year university students are consistent with the literature and emphasized the strong motivating factor of social norms. Four characteristics of recyclers are identified using a 23-item measurement instrument-- sorting, location, importance and social norms-- which account for 29.7%, 14.0%, 8.9% and 7.1% of the variance explained respectively. The evidence of the influence of the social norm on attitudes and behavior is a valuable tool in helping motivate students to recycle and to have pro-recycling attitudes.

Objectives

The purpose of this study is to quantitatively explore the relationships between the self-reported recycling behaviors and attitudes of college students and the mediating factors that have been identified in the literature. A greater understanding of these beliefs, attitudes, and behaviors will assist in improving recycling programs at universities and also suggest methods to motivate students to increase their frequency of recycling.

Introduction

Conceptual Framework

Environmental knowledge is defined as an individual's ability to understand and evaluate the impact of society on the ecosystem (Gambro & Switzky, 1996). Gambro and Switzky (1996) also state that this knowledge is demonstrated by recognizing environmental problems and the origins, implications and consequences of these problems. Most importantly, this awareness of environmental issues increases the connection between an individual's well being and the environment's well being (Larsen, 1995). Ultimately environmental knowledge is related to environmental behavior (Cheung et al, 1997). It is therefore important to elucidate how an individual's environmental behavior can be influenced and the specific variables that predict pro-environmental behaviors, such as recycling (Bratt, 1995).

Larsen (1995) confirmed the relationships between environmental awareness, attitudes and recycling behavior in a study of university students. Specifically, a high correlation between attitudes and recycling behaviors was observed. The presence of convenient recycling bins was related to a positive perception of recycling (Barker et al,

1994). Thus, when recycling was easier, the attitude or perception of an individual became more positive in regards to recycling. Another important factor discussed was the relationship between a sense of personal responsibility and recycling behavior. Larsen (1995) also observed that many of the students felt that it was the responsibility of the institution and not their personal responsibility to recycle. In order to better facilitate recycling, it is therefore important to explore the attitudes and behavior of the recycler and the non-recycler.

Procedural Knowledge

Procedural knowledge describes knowledge that relates to the actions and protocols involved in an outcome or observed behavior. For example, procedural knowledge of a desired behavior, like recycling, would include information that is necessary in order to recycle. As describe by Austin et al (1993), people who recycle have procedural knowledge that can be broken into groups of characteristics. First, they are better informed about what materials are recyclable. Secondly, they know where they can recycle. Thirdly, it is important to note that an individual who recycles understands the importance of recycling better than non-recyclers. These factors are interrelated and the amount of recycling will not increase unless all three of the factors are elucidated.

In order to increase procedural knowledge, and the amount of recycling, an individual must receive education that addresses the three key factors of procedural knowledge. For example, people who recycle have the procedural knowledge of which items that they can recycle. This aspect or factor is one of many that compose the body of procedural knowledge of a recycler. In order to make education successful, it must address the specific factors that will most increase an individual's procedural knowledge.

Clarification of which factors to focus education on is not as easy as it initially appears since other influences such as gender and age must also be considered. Understanding the factors that affect procedural knowledge <u>and</u> individual influences will improve the success of educational attempts to increase recycling in the university setting (Ludwig et al, 1998).

Individuals tend to select different means for showing their environmental concerns. Often they are engaged in some facets of pro-environmental action and not in others (Vining & Ebreo, 1992). There is evidence to support the idea that the general attitudes about the environment may indirectly affect specific environmental issues. As described by Vinning and Ebreo (1992), there is also evidence that a specific attitude can often be related to a specific behavior; however, the resultant actions are additionally modified by social norm. These norms can prevent or interfere with an individual's ability to act on their personal attitude. Thus, an individual may want to recycle, but if it is not the norm of their peer or social group, this fact may strongly inhibit the desired behaviors.

<div align="center">Survey Methodology</div>

The survey instrument was intended to quantitatively explore the relationships between the self-reported recycling behaviors and attitudes of college students and the mediating factors that have been identified in the literature.

Participants

The sample set consisted of 168 first year university students who responded to a 23 item Likert scale online survey, as shown in Appendix A. These students were members of the first year experience class (FYE), that all new first year students are

required to take. As part of their participation grade, the students were asked to complete the Recycling Attitudes and Beliefs of Undergraduate Students survey.

Instrument

The survey contained three sections, as shown in Appendix A. The first section contained two questions "dorm" and "floor" to determine the location of student recycling bins: "a single central recycling center in dorm" versus "a center on each floor." The second section contained 12 items that were measured on a Likert scale. Statements related to recycling attitudes and behaviors were given, and the students selected a response - *strongly agree*, *agree*, *disagree*, or *strongly disagree*. The third section contained 8 items that were measured on a Likert scale, and the students filled in the blank in the questions with "*always, usually, sometimes,* or *never.*" Erroneously, items 15 and 22 were duplicated, and the item to determine the gender of the respondent was not included when the survey was posted on WebCT.

Analysis

A factor analysis was done to confirm the four factors that effect recycling attitudes and behaviors as elucidated in the literature. Items 15 and 22 were not included in the analysis due to the duplication. A reliability analysis was also carried out for the instrument. Finally, a two-way contingency table analysis was performed to evaluate the study data.

<div align="center">Results</div>

Reliability & Factor Analysis

Principal factors extraction with varimax rotation, as shown in Table 1, was preformed using SPSS on 23 of the items for the Recycling Attitudes and Beliefs of

Undergraduate Students instrument. Principle components extraction was used prior to the principal factors extraction to estimate the number of factors, presences of outliers, absence of multicollinearity, and factorability of the correlation matrices. With an $\acute{\alpha} =$ .001 cut-off level, none of the 186 student produced scores that identified them as outliers. A reliability analysis was conducted for the instrument (Cronbach's alpha= .75).

A factor analysis using an eigen value of .40 as the criterion, extracted four factors, as shown in Table 1. With this cut-off, item 10 did not load on any factors. As shown in Table 2, Factor 1 (location), factor 2 (norms), factor 3 (sorting) and factor 4 (importance) accounted for 29.7%, 14.0%, 8.9% and 7.1% of the variance explained respectively. The mean factor scores were .75 for factor 1, .71 for factor 2, .73 for factor 3 and .75 for factor 4.

Two-Way Contingency Table

A two-way contingency table analysis was carried out to evaluate the study data. Pearson's chi-square test for independence was used to test the null hypothesis that the row classification factor and the column classification factor are independent. The first item considered was 'My friends_ recycle'. This analysis elucidated the perception of an individual of their peers and therefore the perceived social norm. There was a positive relationship between this question and 'I know what I can recycle' (Pearson χ^2, p= 0.038), 'Recycling is time consuming' (likelihood ratio χ^2, p= 0.042), I know how to sort my recyclables (likelihood ratio χ^2, p= 0.047), 'I redeem cans, bottles and containers outside UConn for money' (Pearson χ^2, p= 0.020), 'I ___ recycle paper products and newspaper' (Pearson χ^2, p< 0.001), 'I ___ recycle cans bottles and glass' (Pearson χ^2, p< 0.0001), 'I____ remove staples from paper products before I recycle them.' (Pearson χ^2,

p= 0.0001), and 'I_____ put recyclables in the trash' (Pearson χ^2, p< 0.001). Thus, students appeared to try to report their behavior as conforming to that of the perceived norm.

The 'Are there recycling bins in your dorm?' item analysis addressed whether a student thought that recycling bins were visible, and, ultimately, if they believed that recycling was the norm. There was a positive relationship between this question and 'Recycling bins are easily located on campus' (Pearson χ^2, p= 0.000), 'I know what to put in each of the different recycling bins' (Pearson χ^2, p= 0.005), 'It is easy to recycle at UConn' (Pearson χ^2, p= 0.036), 'Recycling bins on campus are clearly marked' (Pearson χ^2, p= 0.030), 'I have received enough information about recycling at UConn' (Pearson χ^2, p= 0.005), 'I ___ recycle paper products and newspaper' (Pearson χ^2, p= 0.016), 'My friends recycle' (Pearson χ^2, p= 0.026), 'I can ___ find a bin at UConn when I want to recycle' (Pearson χ^2, p= 0.003), and 'Are there recycling bins on your floor?' (Pearson χ^2, p< 0.001). Again, this question highlighted the strong role of perceived social on reporting behaviors and observations that conformed to this norm.

The 'Are there recycling bins on your floor?' item analysis was similar to previous analysis. There was a positive relationship between this question and 'I want to recycle more than I do now' (Pearson χ^2, p= 0.014), 'I know what to put in each of the different recycling bins' (likelihood ratio χ^2, p= 0.030), 'My friends recycle' (Pearson χ^2, p= 0.004), 'I can ___ find a bin at UConn when I want to recycle' (Pearson χ^2, p= 0.042) and 'Are there recycling bins in your dorm?' (Pearson χ^2, p< 0.001). The perception of social norms affects the reported behaviors and attitudes.

The 'I want to recycle more than I do now' item analysis addressed the motivational levels of the individual. There was a positive relationship between this question and 'Information about recycling would be useful for me' (Pearson χ^2, p< 0.001), 'I know what to put in each of the different recycling bins' (Pearson χ^2, p = 0.011), 'It is important to recycle at UConn' (Pearson χ^2, p< 0.001), 'I know how to sort my recyclables' (Pearson χ^2, p=0.002), 'I have received enough information about recycling at UConn' (Pearson χ^2, p= 0.003) and 'I_____ put recyclables in the trash' (Pearson χ^2, p= 0.582). Students that were motivated to indicate that they wanted to recycle more were more likely to report behaviors that would help them acquire the needed environmental knowledge.

The 'It is easy to decide what to recycle at UConn' item analysis again provides insight into the roles of social norms. There was a positive relationship between this question and 'Recycling bins on campus are clearly marked' (Pearson χ^2, p< 0.001), 'I know what to put in each of the different recycling bins' (Pearson χ^2, p< 0.001), 'I know what I can recycle' (Pearson χ^2, p< 0.001), 'It is easy to recycle at UConn' (Pearson χ^2, p< 0.001), 'I know how to sort my recyclables' (Pearson χ^2, p< 0.001), 'Recycling bins on campus are clearly marked' (Pearson χ^2, p< 0.001), 'I ___ recycle cans bottles and glass' (Pearson χ^2, p< 0.001), and 'I can ___ find a bin at UConn when I want to recycle' (Pearson χ^2, p= 0.005`). Perceived social norms are related to the reported attitudes and behaviors.

Discussion

The items were compared in the statistical analysis of the survey data in order to evaluate the links between attitudes and behavior as well as perceived social norms and the self-reported behaviors. This analysis of behavior was consistent with the literature and emphasized the strong motivating factor of social norms.

Students who felt that the norm of their peers was to recycle would report that their friends recycle. As discussed in the literature, perceptions of social norms have a profound affect on an individual's behaviors and attitudes. Students that believed the norm was for their peers to recycle reported a greater knowledge of the recycling procedure and that they conformed to this norm. They have not perhaps internalized this norm since they do find recycling time-consuming and they also have no desire to improve their recycling habits.

Students who felt that recycling centers are easily available to students reported that they had recycling bins in their dorms or on their floors. They also reported higher levels of recycling. As described in the literature, when a student believes that recycling is convenient and easy, not only do they recycle more but they also think more positively about recycling. Thus, those who perceived recycling centers to be readily available demonstrated a more positive recycling attitude and behavior.

Students who had a desire to recycle and felt that this was a positive behavior reported that they wanted to improve their recycling behavior. As confirmed in the literature, these students were more motivated to seek information about recycling. They had a greater confidence in the procedure at UConn and tended to be less likely to dispose of recyclables in the trash.

Students who felt confident about their ability to recycle reported that they understood the recycling procedure at UConn. These students reported understanding of the recycling procedure at UConn and that they themselves were recycling. Thus, students at UConn report that they believe that recycling is a norm on campus and that they conform to the norm. It is important to consider that the survey contained self-reported data and that this often reflects desired behaviors and attitudes and is not unbiased.

Summary

The quantitative evidence of the influence of the social norm on attitudes and behavior is a valuable tool in helping motivate students to recycle and to have pro-recycling attitudes. The perceived norm has a profound effect on the behaviors and choices of college students. Thus a fundamental goal of recycling education would be to create the appearance, and ultimately the reality of pro-recycling students. This norm would make it less socially acceptable for college students not to recycle.

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Table 1

Rotated Component Matrix for Items on Recycling Attitudes and Beliefs Scale Using Varimax Rotation with Kaiser Normalization .

	Component			
Item	1	2	3	4
5. recycling_bins	**.796**	.184	.132	.104
21. find_bin	**.766**	.020	.166	-.052
11. easy	**.742**	.204	.351	-.055
13. marked	**.727**	.114	.161	-.029
14. info	**.529**	.184	.328	-.407
17. friends	.051	**.778**	.186	-1.305E-05
18. cans_bottles	.175	**.772**	.136	.229
16. paper	-.027	**.729**	.286	.060
20. trash	-.208	**-.669**	-.002	-.062
19. staples	.133	**.605**	-.125	-.093
8. what_can_I	.382	.002	**.764**	.019
12. sort	.097	.248	**.743**	.018
7. Diff_bins	.430	-.020	**.658**	-.070
3. decide	.356	.118	**.644**	.026
6. recycling_info	.126	.008	-.332	**.741**
4. want	-.214	-.081	.036	**.728**
9. recycle_at_Uconn	.094	.310	.248	**.722**
10. time	.051	-.252	-.262	-.307

Note: Rotation converged in 5 iterations, duplicate items #15 and #22 removed, and factor loadings over .4 are in bold.

Table 2

Total Variance Explained for Items on Recycling Attitudes and Beliefs Scales   .

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.341	29.673	29.673	5.341	29.673	29.673	3.214	17.856	17.856
2	2.526	14.032	43.705	2.526	14.032	43.705	2.910	16.168	34.024
3	1.609	8.938	52.643	1.609	8.938	52.643	2.676	14.868	48.893
4	1.278	7.101	59.744	1.278	7.101	59.744	1.953	10.851	59.744

Note: Duplicate items #15 and #22 removed.

Appendix A

Section 1

The first two questions "dorm" and "floor" were to determine out the location of student recycling bins: "a single central recycling center in dorm" versus "a center on each floor."

1.Dorm- Are there recycling bins in your dorm?

2.Floor- Are there recycling bins on your floor?

Section 2

The next items 3-14 were measured using a likert scale: Strongly Agree, Agree, Disagree, Strongly Disagree.

3.Decide- It is easy to decide what to recycle at UConn

4.Want- I want to recycle more than I do now.

5.Recycling_bins- Recycling bins are easily located on campus

6.Recycling_info- Information about recycling at UCOnn would be useful for me

7.Diff_bins- I know what to put in each of the different recycling bins

8.What can I- I know what I can recycle at UConn

9.Recycle at Uconn- It is important to recycle at Uconn

10.Time- Recycling is time consuming

11.Easy- It is easy to recycle at UConn

12.Sort- I know how to sort my recyclables

13.Marked- Recycling bins on campus are clearly marked

14.Info- I have received enough information about recycling at UConn

Section 3

The next items 15-22 were measured using a likert scale: Always, Usually, Sometimes, Never

(#15/#22 duplicated)

15.Redeem1 - I _____ redeem cans, bottles, and containers outside Uconn for money

16. Paper- I _____ recycle paper products and newspapers

17. Friends- My friends_____ recycle

18. Cans_bottles- I _____ recycle cans, bottles and glass

19. Staples- I_____ remove staples from paper products before I recycle them

20. Trash- I ____ put recyclables in the trash

21. Find_bin- I can_____ find a recycling bin at UConn when I want to recycle

22. Redeem2- duplication of redeem 1

Appendix B

Table B1

*Mean, Standard Deviation and Sample Size for Items on Recycling Attitudes and Beliefs of Undergraduate
Students Scale*

(n = 146)

Item	Mean	Std. Deviation
3. decide	2.0000	.75201
4. want	1.8973	.72139
5. recycling_bins	2.3219	.87047
6. recycling_info	2.3562	.74962
7. Diff_bins	1.9315	.80222
8. what_can_I	2.1301	.77249
9. recycle_at_Uconn	1.5822	.69239
10. time	2.8425	.73050
11. easy	2.2123	.78088
12. sort	1.9247	.70550
13. marked	2.1096	.85600
14. info	2.66438	.888838
16. paper	2.6370	.89350
17. friends	2.8904	.74393
18. cans_bottles	2.2192	.89051
19. staples	3.3288	.94766
20. trash	2.8219	.61795
21. find_bin	2.4521	.82280

Note: Duplicate items #15 and #22 removed

Table B2

Correlation Matrix for Items on Recycling Attitudes and Beliefs of Undergraduate Students Scale

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3. decide	—	-.076	.421	-.135	.457	.582	.238	-.126	.564	.377	.300	.351	.246	.259	.227	.048	-.163	.301
4. want		—	-.090	.349	-.119	-.100	.397	-.096	.230	.015	-.093	-.259	.059	-.008	.003	-.081	.067	-.177
5. recycling_bins			—	.056	.377	.348	.236	-.093	.599	.264	.517	.453	.178	.204	.318	.180	-.226	.556
6. recycling_info				—	-.085	-.093	.342	-.035	-.095	-.171	-.083	-.368	-.001	-.004	.130	.057	-.056	.006
7. Diff_bins					—	.649	.097	.029	.464	.490	.393	.432	.167	.207	.147	.012	-.094	.423
8. what_can_I						—	.206	-.110	.503	.537	.375	.406	.189	.169	.189	.007	-.153	.417
9. recycle_at_Uconn							—	-.295	.216	.246	.089	-.005	.266	.232	.440	.106	-.288	.019
10. time								—	-.171	-.237	-.094	.024	-.194	-.146	-.243	-.114	.105	-.053
11. easy									—	.355	.605	.521	.200	.254	.280	.194	-.264	.547
12. sort										—	.219	.267	.306	.273	.279	.192	-.205	.285
13. marked											—	.420	.143	.181	.231	.066	-.224	.458
14. info												—	.245	.163	.163	.165	-.185	.426
16. paper													—	.552	.612	.272	-.343	.084
17. friends														—	.557	.404	-.433	.104
18. cans_bottles															—	.265	-.530	.184
19. staples																—	-.264	.109
20. trash																	—	-.125
21. find_bin																		—

Note: Duplicate items #15 and #22 removed

Table B3

Communalities for Items on Recycling Attitudes and Beliefs Scale Using Principle Component Analysis

Item	Extraction
3. decide	.556
4. want	.584
5. recycling_bins	.696
6. recycling_info	.675
7. Diff_bins	.623
8. what_can_I	.729
9. recycle_at_Uconn	.688
10. time	.229
11. easy	.719
12. sort	.623
13. marked	.568
14. info	.587
16. paper	.617
17. friends	.643
18. cans_bottles	.698
19. staples	.408
20. trash	.494
21. find_bin	.617

Note: Duplicate items #15 and #22 removed

Table B4

Component Matrix for Items on Recycling Attitudes and Beliefs Scale .

	Component			
Item	1	2	3	4
3. decide	.790	-.221	.068	.205
4. want	.692	-.251	.273	-.337
5. recycling_bins	.690	-.119	.157	.425
6. recycling_info	.662	-.139	.180	-.256
7. Diff_bins	.651	-.320	.198	-.237
8. what_can_I	.627	-.228	.087	.340
9. recycle_at_Uconn	.624	-.371	-.240	.044
10. time	.611	.021	.080	-.493
11. easy	.609	-.322	.129	.355
12. sort	.518	.480	-.372	-.079
13. marked	.501	.494	-.287	-.199
14. info	-.463	-.417	.281	-.164
16. paper	.358	.581	.470	-.029
17. friends	.569	.581	-.180	.066
18. cans_bottles	-.240	-.336	-.156	.185
19. staples	-.156	.465	.580	-.077
20. trash	-.100	.473	.512	.423
21. find_bin	.309	.326	-.411	.192

Note: 4 components extracted. Duplicate items #15 and #22 removed.

Table B5

Component Transformation Matrix Using Varimax Rotation with Kaiser Normalization for Items on Recycling Attitudes and Beliefs Scale   .

Component	1	2	3	4
1	.659	.485	.575	.005
2	-.360	.680	-.166	.617
3	.182	-.549	.248	.777
4	.635	.039	-.762	.122

Note: Duplicate items #15 and #22 removed