Understanding the Effect of Information Sources on College Students’ Recycling/Reuse Behavior towards Clothing and Textile Products

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Abstract: This study investigated how college students’ exposure to recycling/reuse information through various sources, such as education, media, and interpersonal communication sources, affects their subjective norms, recycling/reuse attitude, intention and behavior. A self-administered online survey was conducted to ask questions about exposure frequency to recycling/reuse information sources, subjective norms, attitude, intention, and behavior based on the Theory of Reasoned Action (TRA). The final sample consisted of 725 participants from MTurk. Structural equation modeling was used to test six hypotheses. The results showed that obtaining recycling/reuse information through media sources led college students to have a positive attitude, positively affecting their recycling/reuse intention and behavior, whereas the information obtained from college education sources positively influenced their intention and behavior via inducing either positive subjective norms or positive subjective norms and subsequently attitude. Interpersonal communication sources were neither effective in developing positive subjective norms nor recycling/reuse attitude. Significant findings may provide important insights into how educators, environmental agencies, and brand managers can more effectively manage information sources to promote college students’ recycling and reuse attitude, intention, and behavior.

Keywords: clothing and textile products; recycling/reuse attitude; intention; behavior; college education sources; media sources; interpersonal communication sources; subjective norms; textile waste

1. Introduction

An increasing amount of clothing and textile waste has recently been identified as a serious problem worldwide due to its major contribution to landfill, ultimately causing environmental degradation. In 2017, 11.2 million tons of clothing and textile waste were landfilled [1], which accounted for eight percent of all municipal solid waste landfilled. In the same year, the total amount of clothing and textile waste discarded in the U.S. was estimated to be 16.9 million tons, of which about 15% was recycled, 19% was incinerated for energy recovery, and the remainder was sent to landfill. The clothing and textile waste not only costs cities approximately $45 per ton [2], but also causes many problems of landfill, such as the production of toxins, leachate, and greenhouse gases [3]. One of the desirable solutions for these problems is to recycle or reuse clothing and textile waste, bringing about environmental and economic benefits, such as pollution minimization and energy saving.

Recycling and reuse behaviors learned and adopted during college years are more likely to develop into life-long habits, and college students have a higher inclination towards being fashion opinion leaders who strongly influence their peers, as well as other consumer groups, to take part in collective sustainability efforts [4]. Thus, information about the necessity and importance of recycling and reuse of clothing and textile products needs to be effectively provided through appropriate sources to college students for them to develop a positive attitude and behavior towards recycling and reuse.
Multiple sources can provide college students with valuable information regarding recycling and reuse. Social media used to disseminate information across online communities helps to cultivate recycling behavior [5]. Educational and informative programs can give them information to enhance recycling [6]. Interpersonal communication is also utilized to improve people’s recycling and reuse behavior [7].

According to the Theory of Reasoned Action (TRA), attitude toward a behavior and subjective norms are two determinants of behavioral intention and actual behavior [8]. Social norms are important because they serve as standards of behaviors and reinforce attitude and behaviors [9]. Attitude is considered important because it is a good predictor of behavior [10]. Shaping a positive attitude and reinforcing social norms are important to improve recycling and reuse behaviors because attitude and social norms play essential roles in influencing people’s recycling behaviors [11]. How consumers’ attitude and subjective norms improve intention and behavior may depend on the type of information sources to which they are exposed [12]. For example, media sources, such as social media, can be considered more influential in shaping a positive attitude because of its interactive nature (i.e., enabling various communications between the producers and users of media contents) [13,14]. Understanding how information sources influence attitude and social norms in different ways will ultimately help educators, environmental agencies, and brand managers develop efficient strategies to improve college students’ recycling and reuse of clothing and textile products.

However, there has been a very limited number of studies investigating the effect of information sources on apparel recycling and reuse behavior of college students. This study investigated how different information sources influence college students’ subjective norms, attitude towards apparel recycling and reuse, intention, and behavior. An online survey was employed to examine the influence of different information sources on subjective norms, recycling/reuse attitude, intention, and behavior of college students. A structural model describing the relationships among these components was constructed based on the Theory of Reasoned Action (TRA). These data were analyzed using structural equation modeling to test the hypotheses. These data were used to evaluate the proposed model. This study may provide important insights into how educators, environmental agencies, and brand managers can more effectively manage information sources to promote college students’ attitude towards recycling and reuse, intention to participate in these activities, and actual behavior.

2. Theoretical Framework and Literature Review

2.1. Innovation Adoption Theory (IAT)

In his Innovation Adoption Theory (IAT), Rogers defined innovation as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” [15], p. 12. He proposed five stages for adopting an innovation, which include awareness, interest, evaluation, trial, and adoption. In the awareness stage, individuals are exposed to a new idea or practice, which raises their awareness. In the interest stage, they develop an interest in an idea or practice. In the evaluation stage, they evaluate or judge an idea or practice based on what they have previously experienced. In the trial stage, the idea or practice is transformed into a test trial. In the adoption stage, they decide whether to adopt a new idea or practice based on their trial results.

The IAT has been applied to the context of adopting sustainability attitudes and sustainability behaviors in previous studies. For instance, Franson [16] investigated the effect of sustainability course contents on students’ sustainability attitudes and behaviors based on this theory (e.g., developing sustainability attitudes and practicing sustainability behaviors). She found that sustainability education had a positive effect on college students’ sustainability behaviors. Additionally, Craig and Allen [17] used this theory to find positive relationships among information knowledge, employees’ perceptions of sustainability’s importance, and their interest in learning about sustainability.

In parallel to these previous studies, the researcher contended that the IAT is an appropriate theoretical framework within which to study the relationships among college
students’ exposure to recycling/reuse information, recycling/reuse attitude, intention and behavior. The IAT predicts that exposing college students to information regarding recycling and/or reuse of clothing and textiles will raise their environmental awareness and develop their interest in recycling/reuse practices. Then, they will develop a positive recycling/reuse attitude and ultimately adopt pro-environmental practices, which include participating in recycling programs and/or activities.

2.2. Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA), first proposed by Fishbein and Ajzen in 1975, focuses on the theoretical constructs related to individual motivational factors as predictors of the likelihood to perform a specific behavior. The TRA consists of two independent determinants of behavioral intention: attitude toward a behavior and subjective norms. In the TRA, beliefs about a behavior and normative beliefs precede attitude toward a behavior and subjective norms, respectively. Subjective norms represent the social norms by which a person perceives the approval or disapproval of other members of the society regarding a particular behavior. Subjective norms can be understood as normative beliefs and motivation to comply with this norm. Subjective norms can also influence behavioral intention, which in turn most likely leads to actual behavior [8]. In previous studies, recycling attitude affected recycling behavior positively because attitude was a main predictor of behavioral intention and behavior [10]. Subjective norms were found to have a direct impact on recycling behavior [18]. Accordingly, the researcher posited recycling/reuse attitude and subjective norms as antecedents of recycling/reuse behavioral intention and actual recycling/reuse behavior in this study.

2.3. Recycling/Reuse Behavior

Post-consumption clothing and textile waste is referred to as any type of garment or household article made from textiles that the owner no longer needs and decides to discard [19]. This waste is thrown away because they are worn out, damaged, outgrown, or out of style. In general, consumers show three post-consumption behaviors regarding a clothing and textile product when contemplating disposition: keep it, get rid of it permanently, or dispose of it only temporarily [20]. Keeping it means using it for the original purpose, converting it to serve a new purpose, or storing it. When getting rid of it permanently, the consumer can throw it away, give it away (to family or friends, or to charity), trade it, or sell it. Disposing of it only temporarily refers to renting it to someone who needs it. In 2017, 16.9 million tons of clothing and textiles were thrown away, of which 15% were recyclable, according to the Environmental Protection Agency (EPA) Office of Solid Waste. The ways of recycling clothing and textile waste include donating them to a charity organization, repurposing them to a new style or items (e.g., using them as filling materials or wiping cloths), whereas ways of reusing clothing and textile waste include repairing old clothing, reusing small parts of them (such as zippers or buttons), swapping them with friends/family, reselling unwanted clothing and textile products, using take-back programs, and handing them down (clothing and shoes) [21–23]. Before the pandemic, young consumers tended to dispose of their unwanted clothing and textile products through diverse recycling channels. During the pandemic, charity organizations have closed down and have been unable to collect unwanted garments for reselling them to secondhand stores [24]. This situation prevents young adults from donating their unwanted clothing and textile products to charity organizations. Instead of making donations, they tend to engage in recycling/reuse behavior in different ways, making sure to work with people whom they can trust to avoid contracting the coronavirus. For example, they tend to hand down their unwanted clothing to their friends or family members. In addition, the pandemic has caused many young people to get laid off due to the economic recession. This financial crisis has changed the ways young people dispose of their unwanted clothing and textiles. Instead of throwing away their unwanted clothing and textiles products, they choose to recycle or reuse them in a more economical and environment-friendly
manner. The recycling process consists of three steps: collecting (through drop-off centers, curbside collection, door-to-door collection, and in-store collection), sorting, and cleaning and preparing for recycling. Rather than disposing clothes and textiles, recycling and reusing them would be environmentally beneficial because it can prolong product usage and material life cycle. The recycling and reuse of clothing and textile products results in environmental and economic benefits by reducing landfill burden.

2.4. Relationship between Information Sources and Subjective Norms

Well designed information obtained through recycling/reuse sources can serve as a motivation for recycling [25]. Various information sources with a focus on sustainable and environmental issues may include public education sources, media sources (i.e., internet, printed media, mass media, etc.) and interpersonal communication sources [17,26,27]. For example, public education curricula are designed as a useful information source to motivate pro-environmental behaviors [28]. Environmental education is mainly aimed at assessing environmental issues, finding feasible solutions to such problems, and encouraging pro-environmental behaviors. Media is used as an influential source to obtain information regarding sustainable apparel behavior [13]. Over the last few decades, mass media, such as television and newspapers, has been utilized to advertise a variety of environmental issues, including greenhouse emission, global warming, ozone depletion, as well as water and air pollution [29]. Nowadays, the role of social media has grown as an effective communication tool to influence behavior change with interactive characteristics [30]. Online influencers use their social media platforms to endorse the importance of sustainability in people’s consumption behaviors [31]. Interpersonal communication with peers, family, and others is considered as another information source that facilitates eco-friendly apparel behavior [32]. Nixon and Saphores [33] found that U.S. households who obtained recycling information from interpersonal communication sources (i.e., family/friends) were 3.2 times more likely to recycle than those who didn’t. Rogers and Storey [34] found that personal communication sources are considered more credible to motivate behavior than mass media communication sources.

According to subjective norms in TRA, an individual has a greater intention to perform a certain behavior when he or she perceives that it is important that significant other people think he or she should do a certain behavior. In a study that correlates social media with subjective norms, Sujata et al. [5] found the positive effect of social norms and social media usage on recycling intention and behavior with a sample of Malaysian consumers. Subjective norms (e.g., social pressure to recycle, positive attitude about recycling of important people, important people’s opinion that we should recycle and the recycling example of close family members) is one of the influencing factors of recycling behavior which is targetable by education [35]. Based on these previous studies, the researcher proposed that college students’ information exposure through college education, media and interpersonal communication sources may affect subjective norms which make an impact on their environmental protection behavior (e.g., recycling/reuse). Therefore, the following was hypothesized.

**Hypothesis 1a.** Information exposure through college education sources is positively related to subjective norms.

**Hypothesis 1b.** Information exposure through media sources is positively related to subjective norms.

**Hypothesis 1c.** Information exposure through interpersonal communication sources is positively related to subjective norms.

2.5. Relationship between Information Sources and Recycling/Reuse Attitude

Ever since there was an increased concern about environmental issues in the 1970s and 1980s, recycling/reuse has been one of the key factors of environmental preservation...
in various areas of our society. Young consumers may be exposed to recycling-related information offered by information sources such as education, mass media, social media, and interpersonal communication, etc. [5,25,33]. For example, social media empowered by the internet and mobile technology are used as a socialization agent to address social issues or problems to a social group [36].

An attitude has been defined as a “psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” [37], p. 1. Researching people’s attitude can be a useful vehicle in designing environmental education programs [38]. According to the literature in psychology, attitude can be formed by information from different sources as well as cognitive and affective experiences, as empirically supported in previous studies [39]. Moreover, previous studies have shown what types of information sources are effective for changing attitude and/or stimulating certain behaviors [13,26,28,40]. Education can be an effective tool for the success of any recycling scheme [40]. Kong et al. [26] reported that Korean fashion consumers’ social knowledge (i.e., one’s knowledge of shared social expectations or actions depending on conventional norms) and effectiveness knowledge (e.g., one’s knowledge of how effectively sustainability activities can lead to cost-saving benefits) obtained from corporate marketing information sources can help them develop positive sustainability attitudes towards fashion products, leading to positive sustainability behavioral intentions. Another study conducted on young adults showed that information obtained from social media sources (e.g., exposure to social media contents of sustainable organizations, eco-activists and sustainable apparel brands) imparts a positive effect on intention to purchase sustainable apparel via attitudes [13]. In Kim et al.’s [41] study with a sample of U.S. college students, they found that social media sources (e.g., Blogs, Facebook, and Twitter) used by undergraduate students and news sources (e.g., Radio, TV, online news) used by graduate students were most effective in enhancing sustainability awareness. Ho et al. [42] found that interpersonal communication served as a positive channel in predicting pro-environmental behavior within a sample of Singaporeans. Based on these previous studies, the researcher proposed that college students’ information exposure through public education, media, and interpersonal sources positively correlates with their attitude towards recycling/reuse of clothing and textile products. Therefore, the following was hypothesized.

**Hypothesis 2a.** Information exposure through college education sources is positively related to recycling/reuse attitude toward clothing and textile products.

**Hypothesis 2b.** Information exposure through media sources is positively related to recycling/reuse attitude towards clothing and textile products.

**Hypothesis 2c.** Information exposure through interpersonal communication sources is positively related to recycling/reuse attitude towards clothing and textile products.

### 2.6. Relationships among Subjective Norms, Recycling/Reuse Attitude and Intention

Previous studies have shown that an individual’s recycling intention and behavior are affected by the social norms of people or social groups that are important to them [5,18]. Sujata et al. [5] found that recycling attitude and social norms of Malaysian consumers had a significant impact on their intention to recycle. In Ramayah et al.’s [18] study with a sample of Malaysian consumers, consumers’, subjective norms were found to have the greatest impact on recycling behavior. Park and Ha [43] found an indirect and positive relationship between subjective norms and recycling intention through attitude toward recycling within a sample of U.S. consumers. In the study examining how subjective norms (in terms of cultural pragmatism in a country) influences sustainable attitudes and behaviors, Minton et al. [44] found that people in France (the moderate pragmatic country) show more positive sustainable attitudes than ones in the U.S. (the least pragmatic country). As such, this study suggests that young consumers’ subjective norms can affect
their attitude towards recycling/reuse of clothing and textile products and their intention to recycle/reuse them. Based on these previous findings, the following hypothesis was developed.

**Hypothesis 3.** Subjective norms are positively related to recycling/reuse attitude toward clothing and textile products.

**Hypothesis 4.** Subjective norms are positively related to recycling/reuse intention toward clothing and textile products.

### 2.7. Relationships among Recycling/Reuse Attitude, Recycling/Reuse Intention and Behavior

Shim [45] found a direct, positive effect of consumers’ environmental attitudes on environmentally motivated reuse within a sample of U.S. college students. Park and Oh [46] investigated the effect that the level of environmental consciousness has on environmental attitudes and recycling behaviors. They found that Korean fashion consumers who had a high level of environmental consciousness had positive environmental attitudes and recycling behaviors. Ramayah et al. [18] later found that consumers’ recycling attitudes were positively related to their recycling behaviors with a sample of Malaysian college students. In Park and Ha’s [43] study with a sample of U.S. consumers, they found a positive connection between the consumers’ attitude towards recycling and their intention to recycle. Malaysian consumers’ recycling intention had a significant impact on their recycling behaviour [5]. Based on these previous findings, the following hypotheses were developed.

**Hypothesis 5.** Recycling/reuse attitude is positively related to recycling/reuse intention toward clothing and textile products.

**Hypothesis 6.** Recycling/reuse intention is positively related to recycling/reuse behavior toward clothing and textile products.

In this study, a conceptual model was developed to reflect six hypotheses that investigate the relationships among information exposure through sources, subjective norms, recycling/reuse attitude, recycling/reuse intention and behavior, as shown in Figure 1.

![Structural model and path estimates](image-url)

**Note:** *p<0.05, **p<0.01, ***p<0.001

**Figure 1.** Structural model and path estimates.
3. Method
3.1. Data Collection and Sample

To examine the effect of college students’ recycling/reuse information sources on their recycling/reuse attitude, subjective norms, intention and behavior towards clothing and textile products, a self-administered online survey was conducted, using Amazon Mechanical Turk (see Mturk.com) via a research posting for one week in November, 2020. An incentive ($1) was awarded to participants who completed the online questionnaire within seven days from the initial posting.

Completed responses (n = 725) from undergraduate and graduate students were used for data analyses. Respondents age ranged from 18 to 39 years (m = 21), male (66%), female (34%), Asian (41.9%), Caucasian (40.6%), African-American (4.7%), freshmen (5.6%), sophomores (5.5%), juniors (40.0%), seniors (38.2%), and graduate students (10.7%). The yearly taxable income ranged with the highest percentage in the categories, such as less than $10,000 (26.5%) and $25,000 or more (30.4%) (see Table 1).

Table 1. Sample characteristics.

|                          | Percentage (N = 725) | Percentage (N = 725) |
|--------------------------|----------------------|----------------------|
| Age                      |                      |                      |
| 18–19                    | 1.3%                 | Male                 |
| 20–29                    | 93.3%                | Female               |
| Over 30                  | 5.4%                 |                      |
| Ethnic group             |                      |                      |
| White, non Hispanic      | 40.6%                | Married/living with partner |
| Native American          | 3.2%                 | Not married           |
| African American         | 4.7%                 | Other (divorced etc.) |
| Asian                    | 41.9%                |                      |
| Hispanic/Latino          | 8.7%                 |                      |
| Other                    | 0.9%                 |                      |
| Marital status           |                      |                      |
| Married/living with partner | 59.7%            |                      |
| Not married              | 39.1%                |                      |
| Other (divorced etc.)    | 1.2%                 |                      |
| Academic year            |                      |                      |
| Freshman                 | 5.6%                 | Total income         |
| Sophomore                | 5.5%                 | Under $10,000        |
| Junior                   | 40.0%                | $10,000 to $14,999   |
| Senior                   | 38.2%                | $15,000 to $19,999   |
| Graduate Student         | 10.7%                | $20,000 to $24,999   |
|                          |                      | $25,000 or more      |

3.2. Measurements

The researcher measured the frequency at which the college students were exposed to recycling/reuse information sources. Three information source categories, such as college education sources, media sources, and interpersonal communication sources were used. The researcher used 3 items to measure college education source exposure (e.g., college lectures—knowledge-based recycling/reuse instruction) [47], 6 items to measure media source exposure (e.g., recycling/reuse blogs in social media) [13,27,41] and 3 items to measure interpersonal communication source exposure (e.g., interpersonal communication with peers) [33], utilizing a 4 point-scale (0: never, 1: rarely, 2: sometimes, and 3: frequently). To measure their recycling/reuse attitude, the researcher used 6 items, such as “Recycling/reuse clothing and textile products is bad or good” [48]. To measure subjective norms, the researcher used 3 items, such as “My friends expect me to engage in recycling/reuse behavior” [18]. To measure their recycling/reuse behavioral intention, the researcher used 2 items, such as “How likely is it that in the near future, you will recycle/reuse clothing and textile products?” [48,49] using a 7-point Likert scale (1 = very unlikely, 7 = very likely). To measure their actual recycling/reuse behavior, the researcher used 10 items, such as “I donate my unwanted clothing and textile products to charity organization (e.g., Salvation Army, Goodwill, etc.)” [22,23]. All items except information source exposure, attitude, and
intention were assessed utilizing the 7-point Likert scales (1 = strongly disagree, 7 = strongly agree). Attitude was assessed on a 7-point semantic differential scale (see Table 2).

Table 2. Principal component analysis: loadings and reliability of measurement scale items.

| Constructs                            | Sample Scale Items                                                                 | Cronbach’s Alpha/Composite Reliability |
|---------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------|
| **Recycling/reuse information sources**| 1. College education sources
   1. College lecture (knowledge-based recycling/reuse instruction) (0.84)
   2. College co-curricular activities (recycling/reuse campaigns, workshops, seminars, etc.) (0.80)
   3. College lecture (problem-solving based recycling/reuse instruction) (0.76)
   Media sources
   1. Printed Media (recycling/reuse advertising in fashion magazines) (0.80)
   2. Mass Media (e.g., TV, Radio, etc.) (0.76)
   3. Celebrities who promote recycling/reuse in social media (Facebook, Twitter, Instagram, YouTube, LinkedIn or other social media platforms) (0.74)
   4. Journal articles (0.70)
   5. Recycling/reuse blogs in social media (Facebook, Twitter, Instagram, YouTube, LinkedIn or other social media platforms) (0.67)
   6. Internet (0.61)
   Interpersonal communication sources
   1. Interpersonal communication (with others) (0.80)
   2. Interpersonal communication (with peers) (0.79)
   3. Interpersonal communication (with parents) (0.69) | 0.72/0.84                              |
| **Subjective norms**                  | 1. My friends expect me to engage in recycling/reuse behavior (0.84)
   2. My family expects me to engage in recycling/reuse behavior (0.82)
   3. People who are important to me expect me to engage in recycling/reuse behavior (0.82) | 0.77/0.87                              |
| **Recycling/reuse attitude**          | Recycling/reusing clothing and textile products is
   1. Bad/Good. (0.78)
   2. Unnecessary/necessary (0.77)
   3. Unpleasant/Pleasant (0.76)
   4. Uncomfortable/comfortable (0.75)
   5. Unwise/Wise (0.72)
   6. Difficult/Easy (0.67) | 0.83/0.88                              |
| **Recycling/reuse intention**         | 1. How likely is it that in the near future, you will recycle/reuse clothing and textile products? (0.88)
   2. How likely is it that in the near future, you will plan to take part in recycling/reuse activities for clothing and textile products? (0.88) | 0.70/0.87                              |
| **Recycling/reuse behavior**          | 1. I use take-back programs for my unwanted clothing to receive some incentives (e.g., discounts for purchasing new clothing in exchange for turning in used clothing. (0.74)
   2. I recycle (i.e., repurpose) my unwanted clothing and textile products to new styles or items. (0.74)
   3. I resell my unwanted clothing and textile products to consignment/vintage stores, or online (e.g., eBay, etc.) (0.72)
   4. I repair my old clothing and textile products (0.71)
   5. I hand down my unwanted clothing to friends/family (0.70)
   6. I swap my unwanted clothing with friends/family (0.69)
   7. I place my unwanted clothing and textile products into storage (0.69)
   8. I make an effort to find and use recycling bins for my unwanted clothing and textile products (0.67)
   9. I donate my unwanted clothing and textile products to charity organizations (e.g., Salvation Army, Goodwill, etc.) (0.67) | 0.85/0.89                              |
4. Results and Discussion

4.1. Validity and Reliability

A principal component factor analysis with varimax rotation was conducted to measure each construct. The researcher deleted one item (i.e., throwing away into the waste) from the recycling/reuse behavior measurement scale because of a low factor loading below 0.60. Except for the deleted item, the factor loadings were above 0.60, indicating acceptable convergent validity (see Table 2). The researcher confirmed uni-dimensionality for all scales.

Next, the researcher performed confirmatory factor analysis (CFA) using AMOS 27.0 to validate the measurements of information sources, subjective norms, recycling/reuse attitude, intention, and behavior. The results showed a significant chi-square statistic ($\chi^2 = 1831.167; df = 413; \chi^2/df = 4.434; p = 0.000$). The ratio of chi-square statistic/df was less than five indicating that the model showed a satisfactory fit to the data. The CFI (0.90) and IFI (0.90) values indicated a reasonable model fit. The RMSEA estimate (0.07) was lower than 0.1, indicating moderate data fit to the model [34]. The standardized factor loadings were considered adequate (ranged from 0.50 to 0.74) with statistical significance ($p < 0.000$), indicating construct validity. Reliabilities with Cronbach’s alphas for college education source, media source, interpersonal source, subjective norms, recycling/reuse attitude, intention, and behavior constructs were 0.72, 0.80, 0.70, 0.77, 0.83, 0.70, and 0.85, respectively. The composite reliability ranged from 0.81 to 0.89 (see Table 2). The average variance extracted (AVE) for college education sources, media sources, interpersonal communication sources, subjective norms, recycling/reuse attitude, intention, and behavior was equal to or greater than 0.5, confirming construct validity. The correlation coefficients (ranged from 0.25 to 0.69) between constructs in the model were less than 0.8, indicating discriminant validity [50] (See Table 3).

### Table 3. Correlation matrix of measurement model.

| Factor  | CES | MS  | ICS | SN  | RA  | RI  | RB  |
|---------|-----|-----|-----|-----|-----|-----|-----|
| CES     | 0.64| 0.51|     |     |     |     |     |
| MS      | 0.68|     | 0.58|     |     |     |     |
| ICS     | 0.69| 0.67|     | 0.58|     |     |     |
| SN      | 0.58| 0.57| 0.57|     | 0.68|     |     |
| RA      | 0.25| 0.34| 0.28| 0.39| 0.55|     |     |
| RI      | 0.39| 0.39| 0.36| 0.58| 0.53| 0.77|     |
| RB      | 0.57| 0.57| 0.55| 0.69| 0.45| 0.61| 0.50|

Note: CES = college education sources, MS = media sources, ICS = interpersonal communication sources, SN = subjective norms, RA = recycling/reuse attitude, RI = recycling/reuse intention, RB = recycling/reuse behavior. Average variance extracted (AVE) is on the diagonal.

4.2. Hypothesis Testing

Single group structural equation modeling (SEM) with maximum likelihood estimation using AMOS 27.0 was performed to evaluate the effect of three information sources on subjective norms, recycling/reuse attitude, intention, and behavior. Overall, the results showed a reasonable model fit ($\chi^2 = 1888.922; df = 419; \chi^2/df = 4.508; p = 0.000; CFI = 0.90; IFI = 0.90; RMSEA = 0.07$). Squared multiple correlations in subjective norms, attitude, intention, and behavior constructs were 0.612, 0.262, 0.882, and 0.755, respectively. The path coefficients were evaluated to test H1 through H6. The path coefficient (0.398, $p < 0.01$) from college education information sources to subjective norms was statistically significant, indicating that education sources positively influenced subjective norms.

Therefore, this result supported H1a, strongly suggesting that educating college students about the importance of recycling/reuse through lectures and co-curricular activities leads them to win the approval of people who are important to them. The positive impact that college education had on students’ subjective norms towards recycling/reuse was also shown to subsequently shape their attitude towards recycling, develop their intention to recycle, and ultimately encourage them to translate these into actual behavior. However,
the coefficient for the path \((0.036, p > 0.05)\) from media information exposure to subjective norms was not statistically significant. Therefore, H1b proposing that information exposure through media sources is positively related to subjective norms was rejected. In addition, the coefficient for the path \((0.330, p > 0.05)\) from interpersonal communication sources to subjective norms was also not statistically significant, rejecting H1c stating that information exposure through interpersonal communication sources is positively related to subjective norms. The coefficient for the path \((-0.002, p > 0.05)\) from college education sources to recycling/reuse attitude was not statistically significant. Therefore, H2a describing how positive information exposure through college education sources and recycling/reuse attitude are related, was not supported. However, the path coefficient \((0.518, p < 0.05)\) from media sources to recycling/reuse attitude was statistically significant, supporting H2b. The college students’ exposure to information via media sources positively affected their recycling/reuse attitude, which was one of determinants of recycling/reuse intention and behavior. This is also supported by Oke and Kruijzen’s [25] findings that recycling information accessed through print, broadcast, or online media (internet, social media, etc.) had a significant effect on recycling behaviors in the U.K. The coefficient for the path \((-0.554, p < 0.05)\) from interpersonal communication sources to recycling/reuse attitude was statistically significant, but its coefficient was negative, which is not consistent with the direction (positive) predicted by H2c. Therefore, H2c proposing that information exposure through interpersonal communication sources is positively related to recycling/reuse attitude was not supported. The coefficient for the path \((0.546, p < 0.001)\) from subjective norms to recycling/reuse attitude was statistically significant, supporting H3. The results confirmed that subjective norms contribute to recycling/reuse attitude positively. The path coefficient \((0.277, p < 0.001)\) from recycling/reuse attitude to recycling/reuse intention was statistically significant, supporting H5 which proposes how positive recycling/reuse attitude and intention are related. These results are consistent with those of Park and Ha’s study [43], which showed positive relationships among consumer’s perceptions of subjective norms, their recycling attitude and intention. The coefficient for the path \((0.775, p < 0.001)\) from subjective norms to recycling/reuse intention was statistically significant, supporting H4 which states that subjective norms are positively related to recycling/reuse intention. College students’ perception, that people who are important to him or her think that he or she should recycle/reuse clothing and textile products, affected their recycling/reuse intention positively. These results are also consistent with those of Sujata et al.’s study [5], which showed that social norms of Malaysian consumers had a significant impact on their intention to recycle. The coefficient for the path \((0.869, p < 0.001)\) from recycling/reuse intention to behavior was statistically significant. Therefore, H6 describing that recycling/reuse intention is positively related to behavior was supported (see Table 4). These results are also supported by those of Sujata et al.’s study [5], showing that recycling intention and behavior were positively related.

### Table 4. Results of hypotheses testing.

| Hypotheses                                      | Path Coeff. (β) | S. E. | t-Value | Results   |
|-------------------------------------------------|-----------------|-------|---------|-----------|
| H1a: College education sources → Subjective norms | 0.398           | 0.231 | 2.794 **| Supported |
| H1b: Media sources → Subjective norms           | 0.036           | 0.272 | 0.228   | Not supported |
| H1c: Interpersonal communication sources → Subjective norms | 0.330           | 0.371 | 1.668   | Not supported |
| H2a: College education sources → Recycling/reuse attitude | −0.002         | 0.262 | −0.010  | Not supported |
| H2b: Media sources → Recycling/reuse attitude    | 0.518           | 0.360 | 2.551 * | Supported |
| H2c: Interpersonal communication sources → Recycling/reuse attitude | −0.554         | 0.438 | −2.431 *| Not supported |
| H3: Subjective norms → Recycling/reuse attitude  | 0.546           | 0.099 | 5.631 ***| Supported |
| H4: Subjective norms → Recycling/reuse intention | 0.775           | 0.046 | 13.362 ***| Supported |
| H5: Recycling/reuse attitude → Recycling/reuse intention | 0.277           | 0.032 | 6.777 ***| Supported |
| H6: Recycling/reuse intention → Recycling/reuse behavior | 0.869           | 0.082 | 14.449 ***| Supported |

Note: $\chi^2 = 1888.922$, df = 419, CFI = 0.90, IFI = 0.90, RMSEA = 0.07, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. 
These results showed that the information obtained from college education (e.g., lectures and co-curricular activities) influenced subjective norms, which positively affected recycling/reuse intention and behavior either directly or indirectly by influencing the attitude first. Information exposed through media sources directly influenced attitude, and then recycling/reuse intention and behavior. However, information obtained from interpersonal communication influenced neither subjective norms nor attitude.

5. Conclusions

This study investigated how college students’ exposure to recycling/reuse information through education, media, and interpersonal communication sources affects their subjective norms, recycling/reuse attitude, intention, and behavior. When college students accessed such information via college education sources, they had positive subjective norms, which directly affected their recycling/reuse intention and behavior or indirectly affected their intention and behavior through positively shaping their attitude. On the other hand, when they were exposed to recycling/reuse information through media sources, they had a positive attitude, which positively affected their recycling/reuse intention and behavior. Interpersonal communication sources were effective in developing neither positive subjective norms nor recycling/reuse attitude, and thus it did not contribute to enhancing the recycling/reuse intention and behavior.

6. Implications and Limitations

The first main result implied that college students’ subjective norms are shaped mainly by the information to which they were exposed during their college education, and their positive subjective norms improve their recycling/reuse intention and behavior. This result is corroborated by Popescu et al.’s previous study [35], which showed that efficient education is an important resource to improve people’s pro-environmental and recycling behaviors by way of inducing subjective norms. Therefore, it is advisable that college students are exposed to recycling/reuse information from college education sources as frequently as possible.

Among college education sources, an education program based on problem solving can be very effective. Case studies involving a problem-solving component can promote student-centered experiential learning [51] by giving students an opportunity to apply their knowledge of recycling/reuse issues to real-life scenarios and study the impact of sustainable post-consumption and disposal practices. Another effective education program can be a student-centered experiential learning program, such as project-based learning [52]. By creating their own projects, they will pose interesting questions about recycling and reuse issues, set their own objectives to answer these questions, and take unique initiatives in addressing these issues and participating in recycling/reuse endeavors.

The second main result indicated that the information obtained from media sources positively influences recycling/reuse attitude rather than subjective norms, and then it eventually improves recycling/reuse intention and behavior. This result is partially supported by some studies [9,53,54] in the literature. Arias [9] addressed that public transmission of information through media helps develop positive norms and attitude, which is consistent with the current finding that information from a public source (media source) helps college students shape a positive attitude, which in turn positively affects their recycling/reuse intention and behavior. Grodzińska-Jurczak et al. [53] and Omran et al. [54] stated that the use of media can improve public participation in recycling of solid waste with a limited level of success by enhancing attitude. In contrast to information obtained through college education sources, information from media sources does not facilitate the development of college students’ subjective norms. This is presumably due to the fact that media sources rarely depict exemplary recycling/reuse behaviors of their close family members and friends, but instead, they disseminate general recycling information to the public. Nevertheless, various media platforms, such as the internet, blogs in social media, mass media, fashion magazines, etc., play an important role in reinforcing college students’ recycling/reuse
attitude and behavior. Particularly, social media has recently been a useful communication tool to connect people with common interests. It has been reported that social media can influence recycling behavior among wider communities by improving attitude, social norms, and self-efficacy [5] because it is useful to develop ideas, collaborate with other like-minded individuals, and disseminate information across like-minded individuals. Therefore, this finding implies that media platforms, including social media, can provide environmental agencies and brand managers with useful tools to disseminate recycling/reuse information to enhance attitude, and ultimately intention and behavior.

The final main result implied that interpersonal communication with peers, parents, and others is not effective in enhancing college students’ subjective norms and their attitude, and thus their recycling/reuse intention and behavior. It is presumed that this result is partly attributed to the COVID-19 pandemic, which has greatly affected the ways in which people communicate and socialize with others. In particular, lockdowns and self-quarantine measures taken throughout the world during the pandemic have discouraged people from interacting with others in person to exchange information about recycling and reuse.

The limitation of this study is that its results cannot be generalized to a larger population due to the small sample size of college students (725 students). Thus, the findings of this study will be reinforced if the sample size is increased in future studies.

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References
1. Environmental Protection Agency. Textile: Material-Specific Data. 2019. Available online: https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/textiles-material-specific-data (accessed on 27 November 2020).
2. Leblanc, R. Textile and Garment Recycling Facts and Figures. 2019. Available online: https://www.thebalnesmb.com/textile-recycling-facts-and-figures-2878122 (accessed on 27 November 2020).
3. Idris, A.; Inanc, B.; Hassan, M.N. Overview of waste disposal and landfills/dumps in Asian countries. J. Mater. Cycles Waste Manag. 2004, 6, 104–110. [CrossRef]
4. Walter, E.E. Textile Recycling Attitudes and Behaviors among College Students. Master’s Thesis, Eastern Illinois University, Charleston, IL, USA, 2008, unpublished.
5. Sujata, M.; Khor, K.-S.; Ramayah, T.; Teoh, A.P. The role of social media on recycling behaviour. Sustain. Prod. Consum. 2019, 20, 365–374. [CrossRef]
6. Mifafodzyevva, S.; Brandt, N. Recycling Behaviour Among Householders: Synthesizing Determinants Via a Meta-analysis. Waste Biomass Valoriz. 2012, 4, 221–235. [CrossRef]
7. Chen, F.; Chen, H.; Yang, J.; Long, R.; Li, Q. Impact of Information Intervention on the Recycling Behavior of Individuals with Different Value Orientations—An Experimental Study on Express Delivery Packaging Waste. Sustainability 2018, 10, 3617. [CrossRef]
8. Fishbein, M.; Ajzen, I. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research; Adison-Wesley: Reading, MA, USA, 1975. [CrossRef]
9. Arias, E. How Does Media Influence Social Norms? Experimental Evidence on the Role of Common Knowledge. Political Sci. Res. Methods 2019, 7, 561–578. [CrossRef]
10. Ramayah, T.; Rahbar, E. Greening the environment through recycling: An empirical study. Manag. Environ. Qual. Int. J. 2013, 24, 782–801. [CrossRef]
11. Ahmad, M.S.; Bazmi, A.A.; Bhutto, A.W.; Shahzadi, K.; Bukhari, N. Students’ Responses to Improve Environmental Sustainability Through Recycling: Quantitatively Improving Qualitative Model. Appl. Res. Qual. Life 2014, 11, 253–270. [CrossRef]
12. Beullens, K.; VandenBosch, L. A Conditional Process Analysis on the Relationship Between the Use of Social Networking Sites, Attitudes, Peer Norms, and Adolescents’ Intentions to Consume Alcohol. Media Psychol. 2014, 19, 310–333. [CrossRef]
13. De Lenne, O.; Vandenbosch, L. Fashion media and sustainable fashion buying behavior. J. Fashion Mark. Manag. 2017, 21, 483–498. [CrossRef]
14. Reilly, A.H.; Hynan, K.A. Corporate communication, sustainability, and social media: It’s not easy (really) being green. *Bus. Horizons* 2014, 57, 747–758. [CrossRef]

15. Rogers, E.M. *Diffusion of Innovations*, 5th ed.; Free Press: New York, NY, USA, 2003.

16. Franson, M. The Impact of Classroom Exposure to Sustainability, Course Content, and Ecological Footprint Analysis of Student Attitudes and Projected Behaviors. Master’s Thesis, Auburn University, Auburn, AL, USA, 2008, unpublished.

17. Craig, C.A.; Allen, M.W. Sustainability information sources: Employee knowledge, perceptions, and learning. *J. Commun. Manag.* 2013, 17, 292–307. [CrossRef]

18. Ramayah, T.; Lee, J.W.C.; Lim, S. Sustaining the environment through recycling: An empirical study. *J. Environ. Manag.* 2012, 102, 141–147. [CrossRef]

19. Chen, H.-L.; Burns, L.D. Environmental Analysis of Textile Products. *Cloth. Text. Res. J.* 2006, 24, 248–261. [CrossRef]

20. Jacoby, J.; Berning, C.K.; Dietvorst, T.F. What about disposition—What do consumers do with products once they have outlived their usefulness, and how does this relate to the purchase of replacement products? *J. Mark.* 1977, 44, 22–28. [CrossRef]

21. Ha-Brookshire, J.E.; Hodges, N.N. Socially responsible consumer behavior?: Exploring used clothing donation behavior. *Cloth. Text. Res. J.* 2009, 27, 179–196. [CrossRef]

22. Lee, J.Y.; Halter, H.; Johnson, K.K.; Ju, H. Investigating fashion disposition with young consumers. *Young Consum.* 2013, 14, 67–78. [CrossRef]

23. Weber, S.; Lynes, J.; Young, S.B. Fashion interest as a driver for consumer textile waste management: Reuse, recycle or disposal. *Int. J. Consum. Stud.* 2017, 41, 207–215. [CrossRef]

24. Ortolan, M. Charities Beg People to Stop Leaving Donations Outside Closed Stores amid Coronavirus Shutdowns. 2020. Available online: https://www.abc.net.au/news/2020-04-04/charities-say-stop-donating-if-shop-closed-due-to-coronavirus/12120046 (accessed on 15 January 2021).

25. Oke, A.; Kruijzen, J. The Importance of Specific Recycling Information in Designing a Waste Management Scheme. *Recycling* 2016, 1, 271. [CrossRef]

26. Kong, H.M.; Ko, E.; Chae, H.; Mattila, P. Understanding fashion consumers’ attitude and behavioral intention toward sustainable fashion products: Focus on sustainable knowledge sources and knowledge types. *J. Glob. Fash. Mark.* 2016, 7, 103–119. [CrossRef]

27. Kokkonen, J.; Karkkainen, S.; Keinonen, T. University students’ information sources of education for sustainable development and their perceptions of environmental problems. *Probl. Educ. 21st Century* 2012, 39, 93–104.

28. Arbuthnott, K.D. Education for sustainable development beyond attitude change. *Int. J. Sustain. High. Educ.* 2009, 10, 152–163. [CrossRef]

29. Riffe, D.; Lacy, S.; Reimold, D. Papers Lead TV in Covering Complex Environmental Issues. *Newsp. Res. J.* 2007, 28, 77–87. [CrossRef]

30. Grainger, M.J.; Stewart, G.B. The jury is still out on social media as a tool for reducing food waste a response to Young et al. (2017). *Int. J. Consum. Stud.* 2017, 122, 407–410. [CrossRef]

31. Siegel, L. Influencers Can Combat Fast Fashion’s Toxic Trend. 2018. Available online: https://www.theguardian.com/fashion/2018/oct/07/fashion-influencers-can-change-fast-fashion-toxic-trend (accessed on 15 January 2021).

32. Sonnemberg, N.; Jacobs, B.; Momberg, D. The Role of Information Exposure in Female University Students’ Evaluation and Selection of Eco-Friendly Apparel in the South African Emerging Economy. *Cloth. Text. Res. J.* 2014, 32, 266–281. [CrossRef]

33. Nixon, H.; Saphores, J.-D.M. Information and the decision to recycle: Results from a survey of US households. *J. Environ. Plan. Manag.* 2009, 52, 257–277. [CrossRef]

34. Rogers, E.; Storey, J.D. Communication campaigns. In *Handbook of Communication Science*; Berger, C.R., Chaffee, S.H., Eds.; Sage Publications, Inc.: Newbury Park, CA, USA, 1987; pp. 817–846.

35. Popescu, S.; Rusu, D.; Dragomir, M.; Popescu, D.; Nedelcu, S. Popescu Competitive Development Tools in Identifying Efficient Educational Interventions for Improving Pro-Environmental and Recycling Behavior. *Int. J. Environ. Res. Public Health* 2019, 17, 156. [CrossRef]

36. Warren, A.M.; Sulaiman, A.; Jaafar, N.I. Understanding civic engagement behaviour on Facebook from a social capital theory perspective. *Behav. Inf. Technol.* 2015, 34, 163–175. [CrossRef]

37. Chakravarti, D.; Eagly, A.H.; Chaiken, S. The Psychology of Attitudes. *J. Mark. Res.* 1997, 34, 298. [CrossRef]

38. Newhouse, N. Implications of Attitude and Behavior Research for Environmental Conservation. *J. Environ. Educ.* 1990, 22, 26–32. [CrossRef]

39. Eagly, A.H.; Mladinic, A.; Otto, S. Cognitive and Affective Bases of Attitudes toward Social Groups and Social Policies. *J. Exp. Soc. Psychol.* 1994, 30, 113–137. [CrossRef]

40. Evison, T.; Read, A.D. Local Authority recycling and waste—Awareness publicity/promotion. *Resour. Consers. Recycl.* 2001, 32, 275–291. [CrossRef]

41. Kim, A.A.; Sadatsafavi, H.; Medal, L.; Ostergren, M.J. Impact of communication sources for achieving campus sustainability. *Resour. Consers. Recycl.* 2018, 139, 366–376. [CrossRef]

42. Ho, S.S.; Liao, Y.; Rosenthal, S. Applying the Theory of Planned Behavior and Media Dependency Theory: Predictors of Public Pro-environmental Behavioral Intentions in Singapore. *Environ. Commun.* 2015, 9, 77–99. [CrossRef]

43. Park, J.; Ha, S. Understanding Consumer Recycling Behavior: Combining the Theory of Planned Behavior and the Norm Activation Model. *Fam. Consum. Sci. Res. J.* 2014, 42, 278–291. [CrossRef]
44. Minton, E.A.; Spielmann, N.; Kahle, L.R.; Kim, C.-H. The subjective norms of sustainable consumption: A cross-cultural exploration. J. Bus. Res. 2018, 82, 400–408. [CrossRef]
45. Shim, S. Environmentalism and Consumers’ Clothing Disposal Patterns: An Exploratory Study. Cloth. Text. Res. J. 1995, 13, 38–48. [CrossRef]
46. Park, H.H.; Oh, S.D. The influence of materialism and environment consciousness on recycling attitude and behavior of clothing. J. Korean Home Econ. Assoc. 2005, 43, 167–177.
47. Hsu, S.-J. The Effects of an Environmental Education Program on Responsible Environmental Behavior and Associated Environmental Literacy Variables in Taiwanese College Students. J. Environ. Educ. 2004, 35, 37–48. [CrossRef]
48. Fishbein, M.; Hennessy, M.; Yzer, M.; Douglas, J. Can we explain why some people do and some people do not act on their intentions? Psychol. Health Med. 2003, 8, 3–18. [CrossRef]
49. Park, N.; Yang, A. Online environmental community members’ intention to participate in environmental activities: An application of the theory of planned behavior in the Chinese context. Comput. Hum. Behav. 2012, 28, 1298–1306. [CrossRef]
50. Meyers, L.S.; Gamst, G.; Guarino, A.J. Applied Multivariate Research: Design and Interpretation; SAGE Publications, Inc.: Thousand Oaks, CA, USA, 2006.
51. Barrows, H.S.; Tamblyn, R.M. Problem-Based Learning: An Approach to Medical Education; Springer: New York, NY, USA, 1980.
52. Grover, K.; Stovall, S. Student-centered teaching through experiential learning and its assessment. NACTA J. 2013, 57, 86–87.
53. Grodzińska-Jurczak, M.; Tomal, P.; Tarabula-Fiertak, M.; Nieszporek, K.; Read, A. Effects of an educational campaign on public environmental attitudes and behaviour in Poland. Resour. Conserv. Recycl. 2006, 46, 182–197. [CrossRef]
54. Omran, A.; Mahmoud, A.; Abdul, A.H.; Robinson, G.M. Investigating households attitude toward recycling of solid waste in Malaysia: A case study. Int. J. Environ. Res. 2009, 3, 275–288.