

DEVELOPMENT AND FEASIBILITY TESTING
OF SUSTAINABLE EDUCATIONAL
INTERVENTION FOR ATTITUDE TOWARDS
RECYCLING, LITTERING AND WASTE
MANAGEMENT BEHAVIOR AMONG
COLLEGE STUDENTS



by

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Islamabad
January, 2024

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A Research Thesis submitted to the
DEPARTMENT OF PSYCHOLOGY
in partial fulfillment of the requirements for the degree of
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Capital University of Science & Technology,
Islamabad
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CERTIFICATE OF APPROVAL

It is certified that the Research Thesis titled "Development and Feasibility Testing of Sustainable Educational Intervention for Attitude towards Recycling, Littering and Waste Management Behavior among College Students" carried out by Farwa Aman, Reg. No. BSP201028, under the supervision of Ms. Sadaf Zeb, Capital University of Science & Technology, Islamabad, is fully adequate, in scope and in quality, as a Research Thesis for the degree of BS Psychology.

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Attitude towards Recycling, Littering and Waste Management Behavior among
College Students**

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DEDICATION

Dedicated to every happy and struggling moment of my life and to the miracles that happened out of my mistakes.

DECLARATION

It is declared that this is an original piece of my own work, except where otherwise acknowledged in text and references. This work has not been submitted in any form for another degree or diploma at any university or other institution for tertiary education and shall not be submitted by me in future for obtaining any degree from this or any other University or Institution.

Farwa Aman

BSP201028

January, 2024

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I acknowledge the support from all authorities who allowed me to conduct study in their college and students who were part of this study.

ABSTRACT

In rush of advancements and fully surrounded with facilities in world, we are not even paying our debt of living in terms of giving back to environment what we are gaining from it. Every day, production of waste is growing along with population and we can address this problem by involving college students who will act as influencers for making change. Pakistan has gained only 1% of change from last 10 years on managing waste. This study aimed to develop sustainable educational intervention and see its effectiveness targeting attitude towards recycling, littering and waste management behavior among female college students age ranges from 17-19 years. This study used quasi experimental design using mix-method approach; experimental and control group including pre and post testing of each group, convenient sampling was used. Total 40 participants were part of this study (N=40). Each group consisted of twenty participants; control and experimental group. Two sections of 12th grade were selected for the application of intervention. The instruments Zero Waste Management Scale, Littering Attitude Scale and Attitude Towards Recycling Scale were used to collect data and was analyzed using Statistical package for Social Sciences (SPSS version, 26). The results were found to be significant for increasing recycling attitude, waste management behavior and reduce littering attitude in post testing comparable with pre testing as well in experimental and control group. Developed intervention can be part of educational policy nationwide and it played its part for Sustainable Developmental Goal 12; responsible production and consumption. Future studies with large sample size inclusive of other genders and mix method approach; qualitative plus quantitative for collecting data is recommended. This study will contribute in existing literature to bridge gap in the field and has implications for improving sustainability, lowering environmental pollution, advancing students' knowledge.

Keywords: Sustainability, Recycling Attitude, Waste Management Behavior, Littering Attitude

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Chapter 1

Introduction

With the growing population of world, the waste produced by world is twice as it was producing two decades ago, only 9% of it got recycled globally (OECD, 2022). According to world bank, this issue is tended to increase by 70% by 2050. To cater the issue the focus was shifted towards higher contributors of waste and development of interventions that can change the behavior and attitude of individuals towards sustainability. According to (Tran, 2018), college environment is the most effective one to apply the intervention on. Sustainable interventions including the of waste sorting behavior that will enhance public knowledge, improving waste sorting facilities and include waste sorting education in student's curriculum will be effective ones (Omburo, 2020).

A major cause for destruction of sustainability is “waste” and it is directly related to how it is managed and recycled (Wilson et al., 2015). Waste management is defined as reducing waste through consumption of eco-friendly products that permit usage of natural resources and recycling properly (Valenzuela-Fernández & Escobar-Farfán, 2022). Currently, 2.01 billion tones solid waste is generated and the figures are anticipated to increase by 3.4 billion tonnes by 2050 (Kaza et al., 2018). According to UN, the overall population will be around 10 billion and this will directly affect the amount of waste produced globally (Waste, 2022). Pakistan along with other countries is dealing with this issue and rank on 117th out of 180 globally in solid waste control (EPI Results, 2022). This stat shows alarming situation of Pakistan and urgent steps are required for betterment of

health, reduce land and water contamination sources based on waste management hierarchy.

A five step “waste hierarchy” is given by European Union waste management (waste framework directive). It outlines the preferred methods for waste management and disposal in order to minimize natural resources use and environmental impact, as well as the vision for Pakistan's waste industry. According to the waste management hierarchy model, prevention of waste is given top priority, followed by reuse, recycling, and recovery, with disposal of waste coming in last. (European Commission, 2018). Without intervention, it is not possible to apply this hierarchy of waste management in Pakistan (Solid Waste Management Sector in Pakistan, 2022). The least to do for solving the waste management issue is, start recycling but a lot of people still do not participate in regular recycling; this is one of the major environmental behavior debates that received a lot of attention in recent years but still adopting recycling behavior is very slow (Msengi, 2019).

To apply regular recycling, the college system is a significant producer of waste, accounting for 20 to 35% of all national waste (EPA, 2007), This presents a great opportunity to divert waste into recycled materials. According to a study by Prestin and Pearce (2010), school waste type and quantity, the cafeterias are the source of the majority of waste, which includes recyclable and compostable food packaging like cardboard trays, water bottles, energy drink cans, and chip or cookie bags. Raising public awareness of waste product management requires significant participation from civil society organizations and educational institutions (Vijayan et al., 2023).

The world is developing strategies by involving educational institutes to find sustainable solution to reduce waste (United Nations Statistics Division, 2022). Globally,

the rate of recycling is low to 9% (OECD, 2022). Pakistan generates approximately 30 million tons of solid waste, around 3.3 to 6 million tons of the plastic waste per year, approximately 2.6 million ton (70%) of plastics waste is mismanaged and only 1.3 million ton (30%) is recycled/processed (Ministry of Climate Change Islamabad, 2022). Recycling is crucial for keeping the environment clean for future generations and for reducing the amount of solid waste produced annually. Recyclable material includes; kinds of glass, metal, cardboard, plastic, electronics, textiles and paper. Recycling refers to the 3R method's branches of Reduce, Reuse, and Recycle (TaŞtepe, 2017). According to Environmental Performance Index (EPI Results, 2022), for recycling, Pakistan rank on 113th out of 180 globally and score 13.80 for recycling and brings only 1% change from last 10 years. Younger people are more aware of, engaged in, and concerned about environmental issues than older people, according to a number of studies. However, inconvenience was major influence on college students and consider this as the hinderance making on attitudes for long term behavior of recycling. Environmental knowledge plays a role of an important predictor of environmental concern for adolescents (Gadiraju, 2016). Transforming our relationship with nature is the key to sustainability. The environmental awareness develops more in college time, their attitudes and behavior will directly affect communities near future (Busteed et al., 2009). Studies revealed that younger people, especially those between 17 to 19 years, tend to litter more than older people (Beck, 2007).

When it comes to litter, there are now more environmental concerns than just aesthetic ones. According to Ojedokun (2015), littering is throwing waste in public places rather than properly disposing it off. Numerous factors, such as a lack of social pressure to stop littering, a lack of effective fines or consistent enforcement, social unrest, and

ignorance of the harm that littering causes to the environment, can cause public littering rates to increase. Other factors include poorly designed commercial product packaging, the amount of trash already lying around a particular location, the presence and wording of signs warning against littering, and the quantity and design of trash cans at the location (Al-Khatib et al., 2009). Considering all issues discussed above UN made seventeen universal goals to achieve sustainability.

The Sustainable Development Goals (SDGs), also referred to as the Global Goals, are a set of seventeen objectives that expand upon the Millennium Development Goals (MDGs) and serve as a global call to action. The goals are interrelated, and solving problems that are frequently connected, will be essential to achieving the other goals. The SDGs encourage cooperation and pragmatism in order to make the best decisions now to sustainably improve life for future generations. Notably, this is our best chance to enhance the quality of life for future generations. Being one of the first nations in the world to endorse the 2030 Agenda for Sustainable Development in 2015 shows Pakistan's admirable commitment to the initiative (SDGs Pakistan, n.d.).

The SDGs are an open-ended agenda that targets particular goals by subdividing them into smaller goals in order to best achieve the targets. Some of the targets of Sustainable Development Goal 12 (SDG 12) Responsible Production and Consumption are directly addressed by our research. There's an urgent need to change the way we produce and consume goods and resources in order to achieve economic growth and sustainable development. Important targets for achieving this goal include the disposal of toxic waste and pollutants and the efficient management of our shared natural resources. Encourage recycling and waste reduction among businesses, consumers, and the general public. Help

developing nations switch to more sustainable consumption habits. Responsible Production and Consumption's specific sub-targets include: sustainable management and use of natural resources, managing natural resources sustainably and effectively, and significantly reduce waste production from a significant amount through waste prevention, reduction, recycling, and reuse, encourage business adoption of sustainable practices and sustainability reporting; Promote widespread awareness of sustainable lifestyles. Assuring that everyone has access to the necessary knowledge and awareness of sustainable development and environmentally friendly lifestyles (Responsible Consumption and Production, n.d).

Although an individual is constantly being stimulated by external information transmission and feedback, the individual's cognition for the environment will be altered, which will cause attitudes and willingness to change to some extent and help form targeted behavior. (Chen et al., 2018). A prevalent type of intervention used to encourage individual environmental behavior change is educational intervention. Sustainable educational interventions have been used for a long time; with effective results; educational intervention for global citizenship involves developing analytical and understanding, empathetic and effective skills as well as promoting sustainability and justice and see how these deliberate educational interventions are measured and accounted for in a managerial policy environment (O'Flaherty & Liddy, 2018).

A study by Saqib et al., (2020) uses perceptions of sustainability held by students and teachers to assess the effectiveness of education for sustainable development (ESD) implementation in Pakistani higher education institutions (HEIs). Education and outreach programs are found effective for sustainable development and to reduce littering (Torres.,

2019). A significant increase in recycling bins and public awareness about littering particularly is found effective in the fight against persistent littering (Burgess et al., 2019). These studies targeted different sustainable behaviors to educate about sustainability and according to our knowledge not a single study is on sustainable educational intervention targeting waste management behavior, attitude towards littering and recycling in Pakistan. There previous studies majorly explore the education; people have about sustainability and applied interventions on other sustainable behavior. Internationally, Behavior Change Wheel is considering one of the major aspects on the basis of which one can develop interventions. So, notably this study targeted to change attitudes and behavior by applying Behavior Change Wheel BCW as a methodological approach for intervention development in Pakistan.

Literature Review

While focusing on sustainable solutions for the land pollution causing long term effects to our environment, researches target youth as change makers to educate about significance of environmental issues, by involving college students and making them aware about importance of correctly contributing to environmentally sustainable waste management we can make the difference. This study mainly targeted attitude towards recycling, littering and waste management behaviors among college students.

A study by Rada et al. (2016) assessed school's production of waste, the study highlighted poor recycling practices (separate waste collection) and contributions of school children and faculty to the total waste generated amount in particular region. They found that educational activities related to environmental issues is essential because it can help improve them, the education to young people and school children is instilling good

behavior in them, as it also benefits their families to indulge themselves in such behavior, the waste management adopted by schools were evaluated and schools were taken as case study. The findings of this study revealed that generation of waste was not only affected by institute's size and occupants' number, but was also by the activities type conducted rather than regular classes and what are the habits of students and staff and last finding suggested to clearly define separation of waste for recycling. Recycling facilities presence is a contributing factor on waste management behaviors (Coskun, 2022).

The recycling visibility and knowledge that others can manage waste and recycle exerted social pressure and have had positive effect on recycling behavior. Understanding recycling behavior in light of its increasing normalization. One paper considered recycling as norm and investigate its impact of habits, norms and recycling behavior identities. It considered what behaviors can normalize this recycling behavior and help people adopt and do more recycling and sustainable behavior. The available facilities like recycling bins also made it easy for particular behavior to perform and an important role normative effect targeting and putting out recyclables for collection has encouraged recycling in people. Additionally, recycling chores have typically evolved into simple, ingrained into routines that require little effort. Norms and the influence of identity are closely related. If recycling is one of our personal standards, then recycling will be a part of who we are (Thomas & Sharp, 2013) and to actually bring a change focus was on college students as they are the ones having high influence and increased likelihood of becoming leaders in future to lead a society and make a change (Lee, 2008)

College students age is influential when children begin to understand environmental challenges, they face hence environmental awareness is beneficial. A study,

was conducted to assess environmental behavior and attitudes of students with focusing on recycling. The findings indicate that apathetic student recycling attitudes were contribution of both internal and external environment. There were number of factors involved to influence students' motivation to participate. Firstly, they do not believe that they can play a role in community, and believe their efforts are unappreciated. Secondly, they had lack of sense of personal responsibility. Although they were aware of recycling's global implications, they do not believe their small efforts can make a huge difference. All of these elements work together to make students generally uninterested in recycling, which prevents participation (Busteed et al., 2009).

Wan et al. (2017) have suggested that promoting recycling behavior as a socially desirable trend instead of highlighting its benefits could be an effective strategy. They focused on norms and attitudes that influence recycling intention by interaction of subjective norm and attitude. The findings revealed that experiential attitude and instrumental attitude that are subjective norms; the influence of recycling intention is by the interaction of these two terms, suggesting that subjective norms play an important part in motivation of recycling behaviors. Also, for those who have a positive experiential outlook on recycling, subjective norms may increase their likelihood of doing so as well as inspire those who are unaware of the advantages of recycling behaviors (Wan et al., 2017).

In one controlled laboratory experiment by Khawaja and Shah (2013), they looked into whether internalizing the social cost of littering would make people stay away from it. They investigate whether punishing littering in comparison to not punishing it reduces its prevalence using microeconomic theory. The results demonstrate that when the cost of producing litter is internalized, the level of littering decreases, and when there aren't any

nearby trash cans, people tend to litter more (Khawaja & Shah, 2013). A study conducted by Asmui et al. (2017) investigates the association between a litterer's profile and behavior. They measured various aspects of littering behavior include trash can accessibility, public littering, and awareness campaigns. The findings revealed that first-time visitors littered more than frequent visitors did, the lack of trash cans encourages positive littering behavior, and there is a significant relationship between litterers' age and their behavior.

Littering is more frequent in situations when the item is not recyclable. A study conducted to get a more thorough understanding of what they thought about the prevalence, behavior, and effects of littering in the country as well as litter prevention and reduction. In Survey, people who had seen people littering were asked, "When have you seen people litter?" Commitment to educating the public and encouraging them to not litter is one area that has seen rapid growth over a long period of time. Targeted education initiatives (often found in schools or extracurricular activities) and behavior modification campaigns that focus on particular anti-social behaviors offer a solid foundation for change. Similarly, public education campaigns targeting the general public, frequently used by state and local departments of transportation, tourism, environmental protection, or economic development, can be successful when emphasizing the charm and pride of the communities they support. It may take a while for these programs to have a significant impact on changing people's attitudes, behaviors, and beliefs that underlie their tendency to litter (Keep America Beautiful, 2020).

A study found that younger litter more than older people. It presents the findings of a thorough investigation into littering behavior. The focus was on any item littering, even though a separate sample on littering by only smokers is also reported. The observed

cigarette butt littering rate among smokers was 65%. According to the overall observations of littering, 17% of all observed disposal behaviors produced litter. A multilevel modelling analysis of statistics showed that age was a poor predictor of individual littering. Existing litter's presence (in a positive way) and the availability of trash cans (in a negative way) were predictors of littering at the site level (Schultz et al., 2013). Youth have a strong potential to affect community change because they are acutely aware of the site-specific environmental and personal factors that contribute to littering.

In another study it was found that majority of young people attributed littering by others to dispositional traits like laziness while attributing their own littering to environmental traits like improperly placed trash cans. Students' observations of teachers and parents had an impact on their behaviors and willingness to take action when it came to littering. For education and outreach programs to be effective in reducing littering, they must firstly, offer opportunities for ongoing assessment of complex littering topics. Secondly, coordinate visual and written or verbal messages. Thirdly, lessen actor/observer bias related to littering behaviors; and lastly support adult role models. (Torres et al., 2019). The city's environmental services division sought to boost recycling in public schools. The staff's efforts to promote pro-recycling knowledge, attitudes, and behaviors among junior high and high school students in the city will be aided by the formative research from this study. With an emphasis on college students, a review of the literature on the factors that influence recycling behavior is presented using a social marketing framework. Some major findings and recommendations from study is to establish a reliable and easily accessible recycling infrastructure. The second is to increase students' awareness of the importance of recycling and the difference between recyclable and non-recyclable materials. The third is

to consider a two-step flow approach using youth to promote recycling to adults rather than enhancing adolescent concern for social acceptance. Fourthly, college students may be more globally aware and future-focused than adults may presume (Prestin & Pearce, 2010).

In one article, the systematic development and subject matter of a program that integrates sustainable development education into routine physical education are described.

The Intervention Mapping approach was used as a methodological framework for program

design. As part of the process, workshops were held with experts and pertinent

stakeholders. Four main behavioral outcomes were attained, taking into account the

multiple goals of the physical education curriculum: a decrease in clothing consumption, a change in diet, a change in trash disposal, and an increase in bike/public transportation use.

Techniques for behavior modification that are suitable for physical education were chosen specifically. The created use-cases complied with the physical education curriculum. It was

based on the application of intervention mapping as a framework for program design in the area of sustainability behavior and the similarly specialized context of physical education

(Bucht et al., 2022). To examine any connections between intervention-based research and research on recycling determinants, as well as to evaluate the efficacy of interventions,

social modelling and environmental changes were found to be the most effective interventions in a random-effect. Investigation into the underlying factors used to design the interventions also showed that some of them were rarely taken into account (Varotto & Spagnolli, 2017).

Educational intervention including promoting recycling and involved in activities that lead towards recycling (Wan et al., 2017), provide opportunities to recycle and to manage waste by providing dust bins at appropriate places and provide recycling bins along

with their usage (Torres et al., 2019), outreach and informative programs to use those bins effectively to create a difference and proper disposal of waste (Rada et al., 2016) have effects to reduce littering attitudes while increase waste management behavior and recycling attitudes.

Theoretical Framework

Michie et al., (2011) introduced the behavior change wheel. This theory is rooted in behavior change theory (COM-Behavioral model) and have evidence-based intervention functions that has the ability to change behavior of targeted setting and population, particularly can alter recycling behavior.

According to the COM-B model, any behavior (B) has three components: capability (C), opportunity (O), and motivation (M). One must have the psychological and physical capacity to perform a particular behavior (C), the social and physical opportunity (O), and the desire or need to do it more than other competing behaviors (M) in order to perform specific behavior. As a result of the interdependence between each of these elements, intervention must focus on one or more of them in order to produce and maintain effective behavior change (Gainforth et al., 2016).

In current study, the model is applied using sustainable educational intervention to enhance attitude towards littering, recycling and waste management behavior. Where, changing behavior is targeted to the development of sustainable educational intervention using BCW; COM-Behavior model (Capacity, Opportunity and Motivation) in which capability, mean whether we possess the knowledge, abilities, and skills required to engage in a particular behavior, having two components; psychological and physical components. In this study, capability referred to attitude towards littering that how much students are

able to litter, what do they think about it and how much they have knowledge about littering and their attitude towards it. Opportunity refers to the external factors that allow a specific behavior to be carried out. Physical and social opportunity are its two components. In this study opportunity is linked with recycling attitude that; is there any social or physical opportunity available for students to engage them in recycling attitudes. The internal processes that influence our decision making and behaviors are referred to as motivation. It consists of up of two components: reflective motivation and automatic motivation. For our study motivation is waste management behavior that by engaging in capacity; littering attitude and opportunity; recycling attitude, motivation will automatically be enhanced to carry out the particular behavior.

According to this model, in order to promote efficient and long-lasting behavior change, one or more of its elements must be changed. A person's motivation to engage in a particular behavior can be influenced by altering both perceived capabilities and opportunities, which can lead to behavior change. If the modification is significant enough, it will have an impact on the individuals' behavioral determinants, causing them to favor the modified behavior over the old one, reinforcing long-term behavior change. The intervention used from BCW was “Educational” and policy category includes “Environmental/ Social Planning”. Thus, in this study sustainable education is theoretically based on the BCW.

This study used Behavior Change Wheel guidelines to develop intervention, the steps for developing intervention are defined under chapter of methodology; intervention development section.

Figure 1: COM-Behavioral Model

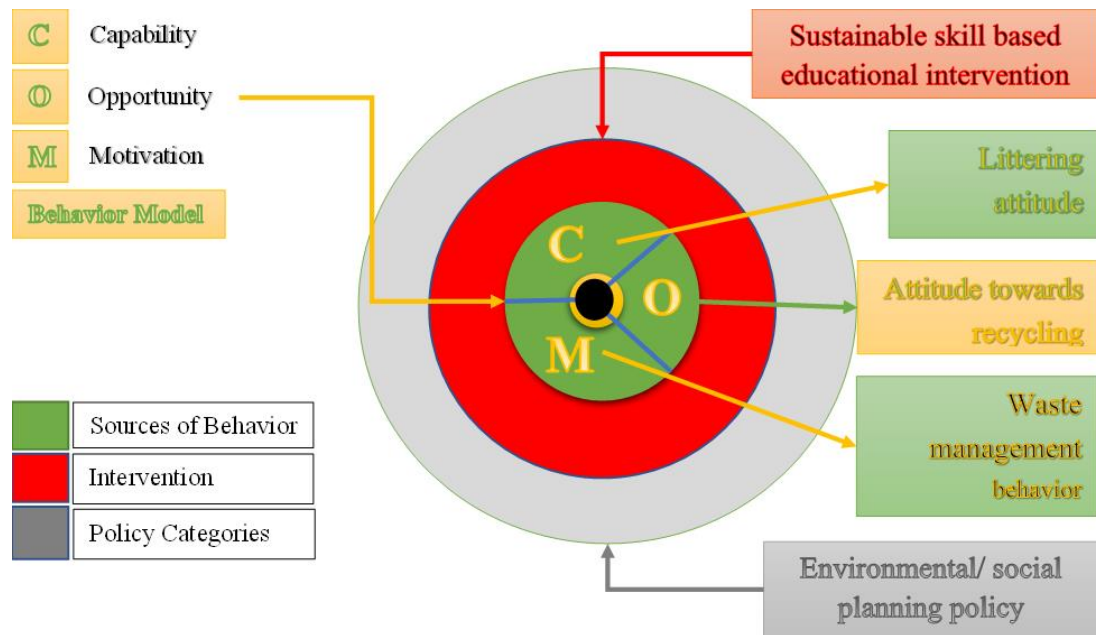


Figure 2: Behavior Change Wheel using COM-Behavior Model.

Rationale

Waste pollution is increasing with increase in population and countries like Pakistan are struggling with it, where people do not have clear understanding of sustainability, recycling and especially recycling bins that how; by using them we can manage waste and save our earth. This research is specifically targeted to educate college students about sustainability by targeting on attitudes about recycling, littering, waste management behavior also about using recycling bins; its importance and negative impact of waste on environment. A study by Ugulu, Yorek, and Baslar (2015) discovered that a recycling education program resulted in considerable changes in students' recycling behavior and (Liao & Li, 2019) discovered enhancing waste separation behavior among students. Among all the approaches educational interventions are proven for effective results in changing recycling behavior (Xia et al., 2023). Adolescents of age 17-19 are target of this research because according to Maharroof et al., (2022) it is the group at high risk of engaging in unsustainable waste management practices like littering.

This research is also a contribution for global Sustainable Developmental Goals, specifically targeting goal number twelve which is “Responsible cities and communities” given by United Nations. Sustainable resource management and use, significant waste reduction, encouraging adoption of sustainable practices and sustainability reporting, and promoting global understanding of sustainable lifestyle are the sub-targets for this research. Additionally, this research is based on Behavior Change Wheel (BCW) that is used for development of sustainable educational intervention.

Study Objectives

1. To develop sustainable educational intervention targeting attitudes towards recycling, littering and waste management behavior among college students.
2. To explore the effectiveness of sustainable educational intervention on attitudes towards recycling, littering and waste management behavior among college students.
3. To explore the difference between experimental and control group at pre and post testing among college students.

Hypotheses

H1: There will be a significant increase in recycling attitude score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

H2: There will be a significant increase in waste management behavior score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

H3: There will be a significant increase in negative attitudes towards littering score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

Chapter 2**Methodology**

This chapter includes design of research, ethical considerations, population and sample, sampling strategy, sampling criteria, scales, procedure to follow for collecting data, intervention development and setting.

Research Design

This research is quasi experimental design. It used both between and with-in subject design. Experimental and control group was employed in the study.

Ethical Considerations

Ethical approval from Department of Psychology, Capital University of Science and Technology was taken. Written formal approval from college principal was also taken. The written approval consists of purpose of study, development and application of intervention, estimated duration of intervention and weeks to apply the intervention. Permission from the scales author was also sought. Keeping in mind the guidelines of American Psychological Association, ethics and code of conduct (2017); the informed consent and information sheet for parents and students were prepared and it was a clear mention of participants right to withdraw, confidentiality and anonymity of results.

Population and sample

The population of our study was college students, all participants were female, age range from 17-19 years and sample was college students from same class (12th grade); 2

sections were taken as control and experimental group. The sample size of our study is 40. Twenty students in control group and twenty students in experimental group.

Sampling strategy

Convenient sampling was used to recruit participants for this study. The sample was drawn from college. Where two sections of 12th grade were assigned for this research purpose specifically. We set one as experimental and other as control group.

Sample Selection Criteria

Inclusion criteria

College students of 12th grade, age range from 17-19 years; only those students whose parental informed consent was signed.

Exclusion criteria

Those students who were not present at the time of first session.

Research Instruments

Demographics

The data was collected for demographics on age and living area. (based on literature)

Zero Waste Management Scale

The zero-waste management scale was developed by Coskun (2022), designed to investigate waste management practices that lead to zero waste. The aim of this scale was to help in understanding the sensitivity of the established concept of zero waste. It can verify use of other degradable sources rather than natural resources. The age range of this

scale is 15-80 years. It is scored on 5 points Likert scale and total 15-items to measure the zero waste management behaviors. A 5-point Likert scale where 1 is strongly disagree, 2 disagree, 3 neither agree or disagree, 4 agree, 5 strongly agree. The scale possesses high validity and reliability in Cronbach's alpha 0.91 (Coskun, 2022).

Littering Attitude Scale

The Littering Attitude Scale is a new self-reporting tool for accessing attitude towards littering and serve as an index of a person's attitudes towards littering. This scale is developed by Ojedokun (2015). The age range for this scale is from 17-65 years. There are total 24 items scoring on Five-point Likert scale: 5 is strongly agree; 1 is strongly disagree, where higher scores signify negative attitude towards littering. Nine items in this scale were reverse scored including, 2, 3, 5, 11, 14, 16, 18, 19, & 23. The scale possesses high validity and reliability in Cronbach's alpha 0.87 (Ojedokun, 2015).

Attitude Towards Recycling Scale

TaŞtepe (2017) developed the attitude towards recycling scale to assess high school students' cognitive, affective, and behavioral attitudes towards recycling, which involves reducing, reusing, and recycling packaging wastes. Scale's age range is between 14 and 19 years. There are a total of 10 items with a 5-point Likert scale, where 5 is for strongly agree and 1 is for strongly disagree. This scale has good validity and reliability with a Cronbach's alpha of 0.84 (TaŞtepe, 2017)

Procedure

The intervention was delivered by the researcher herself. There were total two groups in our study; experimental group and control group. Experimental group was given

the intervention and pre- testing was held after first session of introduction. Intervention was consisted of 5 sessions, within two weeks. A gap of two days after every session was provided. The intervention was consisted of brief information regarding targeted variables, quick quiz, facts to post on notice board (in the gap between two sessions the facts were posted on noticeboard in class for two days and after providing information about other variable; the facts we changed related to other variable for the next two days and so on). It took 15-20 minutes to deliver the intervention. The intervention was given to only experimental group but recycling bins were exposed to both groups. Following completion, a post-test was administered.

The data collection was carried out through following steps.

Step 1: Brief introduction of research and obtain informed consent.

Step 2: Pre-testing of targeted variables in both the experimental and control groups

Step 3: Recycling bins were placed in both the experimental and control group's classroom.

Step 4: A series of activities were carried out (set of knowledge on waste management and sustainability, quick quiz, logos for recycling bins to make their understanding of usage of recycling bins (which item to throw in which bin), a kind of activity to check their understanding on usage of recycling bins, facts on waste issues and sustainable developmental goals (pasted on notice board).

Step 05: Post-testing of targeted variables in both the experimental and control groups

Intervention development

The method followed to develop intervention was behavior change wheel (BCW) for changing behaviors of individuals. This study used these discussed steps to develop intervention. Given are three stages with their sub-stages to develop intervention.

1. Understand the behavior
 - 1.1. Define the problem in behavioral terms
 - 1.2. Select target behavior
 - 1.3. Specify the target behavior
 - 1.4. Identify what needs to change
2. Identify intervention options
 - 2.1. Identify intervention functions
 - 2.2. Identify policy categories
3. Identify content and implementation options
 - 3.1. Identify behavior change techniques
 - 3.2. Mode of delivery

This was in hierarchical way but we go back and forth in steps when developing intervention; when discover any issues or obstacles.

Explanation of intervention development process

First thing to understand the behavior was defining problem in behavioral terms, specifically to targeted sample (individual or group, setting) or to define the behavior itself, it was identified that students were less encountering to such problems and didn't bother by the waste they throw on ground, so students were unable to behave in a certain manner about littering, recycling and waste management. To address the problem, specifically we found out the problematic area as due to lack of discussion on topic and lack of awareness regarding it as this was our main concern, behaviors had the link with each other. One behavior might be the reason of other behavior to perform. They have a system; so, when consider a behavior to intervene, then look upon other relevant behaviors as well that can

perform by target population. We focused on providing with the brief information by targeting our variables and to give some basic knowledge of why waste management is important and how we can do it. How recycling can be done by managing waste and providing the information regarding bins showing which item to be placed in which bin (either dust bin and recycling bin).

The behavior selected to target were aligned with our variables, littering attitude, waste management behavior and recycling attitude. After targeted behavior with its details are selected, including; who needs to perform the behavior, what other actions must be taken to produce the desired results, when, where and how often they did it. Found out what needs to be altered in a person or an environment in order to affect the desired change in behavior. Researcher delivered the intervention herself, placement of recycling bins to produce desired results and with gap of two days the intervention was delivered within two weeks.

A vast range of interventions can be used to develop intervention using Behavior Change Wheel as it enables comprehensive approach. In this, term intervention “function” was used rather intervention “type or category”, so it can have more than one functions.

For this, dimensions to consider in developing intervention have been identified, termed as “APEASE” criteria that was: Affordability, Practicality, Effectiveness and Cost-Effectiveness, Acceptability, Side-effects/safety and Equity. Before implementing the intervention, this criterion was used to identify the intervention functions, policy categories, behavior modification techniques, and delivery methods that were most suitable for the context and thus most likely to be implemented and have an impact. For policies, the decisions were made by authorities to support delivery of intervention function.

After completing all above steps, next was to identify the behavior change technique and mode of delivery and for this, we again looked into APEASE criteria. This was the last and active component of our intervention design to change behavior by using appropriate technique of behavior change and mode of delivery for giving intervention to the targeted setting.

Data Analyses

The latest version of Statistical Package for the Social Sciences (SPSS version 26.0) was used for cleaning, processing and analysis of data. There were no missing values found in data. Sample characteristics were determined using descriptive statistics. The distribution of data was analyzed through measure of central tendencies, normality testing (Shapiro-wilk) and histogram. Frequencies and percentage of sample characteristics based on categories was administered. Psychometric properties of scales were analyzed. Descriptive of all targeted variables were determine and normality was checked through Shapiro Wilk test, skewness, kurtosis and histograms. In the end to run inferential statistics, according to normality of data tests were applied. Mann Whitney for comparing mean scores of control and experimental group and Wilcoxon signed rank test for pre and post testing were used to test the hypotheses.

Chapter 3**Results**

The aim of present study was to develop and carry out feasibility study of sustainable-educational intervention for attitudes towards recycling, littering and waste management behavior among college students. This chapter presents the results including descriptives of demographics (age and living area of participants), recycling attitude, littering attitude and waste management behavior in control and experimental group at pre-testing and post testing. It also includes the inferential statistics from which we have drawn conclusions about our data and made predictions about future by examining the difference between control and experimental group including difference in test scores at pre-testing (T1) and post-testing (T2) of control and experimental group.

Sample characteristics

The total sample of 40 participants, where 20 participants were in each group; experimental and control group. All recruited participants were female. Below is the table for descriptives of demographic variables.

Table 1. 1

Descriptives of Age and Living area of participants in both experimental (N=20) and control group (N=20)

Variable	Group	N	M	Median	Mode	SD	S	K	S-W (p)
	Control								
Age	Group	20	2.20	2.00	2	0.41	1.62	0.70	.49 (.00)
	Experiment							-	
	Group	20	2.30	2.00	2	0.47	0.94	1.24	.58 (.00)
Living	Control								
area	Group	20	1.10	1.00	1	0.31	2.89	7.04	.35 (.00)
	Experiment								
	Group	20	1.20	1.00	1	0.41	1.62	0.70	.49 (.00)

Note: N= no of participants in each group, M= Mean, SD= Standard Deviation, S= Skewness, K= Kurtosis, S-W= Shapiro Wilk test and p= Significance level.

The above table 1.1 illustrated descriptives of age and living area of participants. The sample consisted of N= 40 participants, 20 participants in control group and 20 participants in experimental group. For age, in control group and experimental group the value of skewness is 1.62 indicates right skewed and 0.94 shows slightly right skewed data.

The value of kurtosis at control group is 0.70 depict platykurtic distribution and at experimental group kurtosis is -1.24 that is also platykurtic distribution and the normality test of Shapiro wilk test also shows insignificant value 0.00 hence the data is non-normal for age in control and experimental group. Regarding living area, the data for control and experimental group, the values of skewness indicate right skewed data for control group and slightly skewed data in experimental group and kurtosis of both groups is platykurtic, the data Shapiro wilk test value $p=0.00$ that is less than 0.05 and this is evident from all statistics that distribution of data for living area is non-normal.

The histograms for demographics age, gender and living area of participants in control and experiment group at pretesting and post testing with normal curve display can be seen in below figures.

Figure 1. 1

Histogram of Age distribution in control group (N=20)

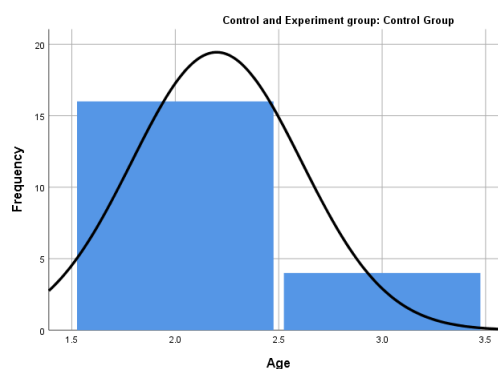
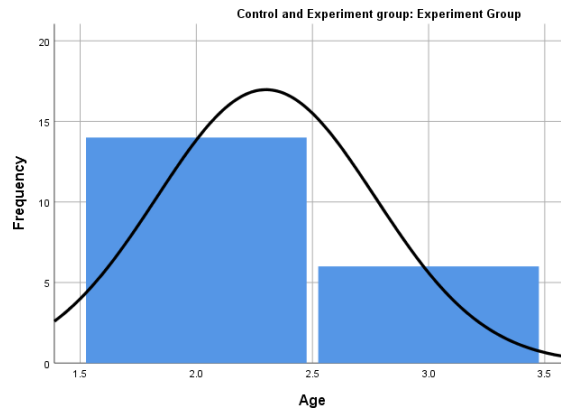


Figure 1. 2

Histogram of Age distribution in experiment group (N=20)

**Figure 1. 3**

Histogram of participants living area distribution in control (N=20)

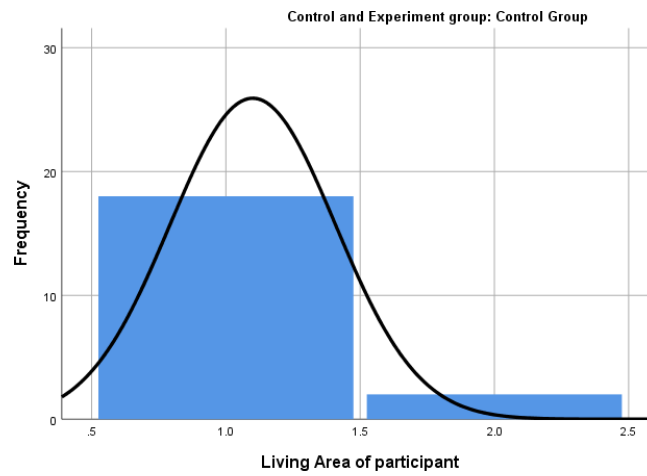
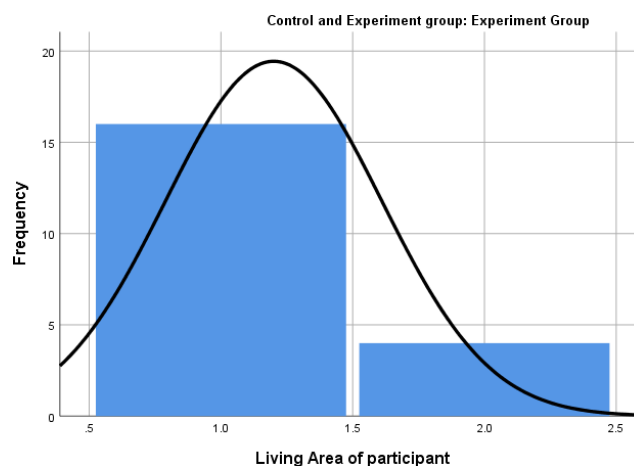


Figure 1. 4

Histogram of participants living area distribution in experiment group (N=20)



In order to precise the context, the specific target was given to the demographics on which results were clearly applicable, the categories of age and living area of participants were formed.

Table 1. 2

Demographic characteristics of control (N=20) and experiment group (N=20)

Demographic characteristics	Control Group		Experimental Group	
	n	%	n	%
Age				
18	16	53.3	14	46.7
19	4.0	40	6	60
Living area				
City	18	52.9	16	47.1
Town	2	33.3	4	66.7

Note: N= 40, n= (20 in each condition) frequency and %= percentage

The above table illustrated demographic characteristics of sample from which we can interpret that from 40 overall participants in control and experimental group, the age of (53.3%) n=16 participants in control group and (46.7%) n=14 participants in experimental group were of 18 years in age whereas (40%) n=4 participants in control group and (60%) n=6 participants in experimental group were 19 years of age. Regarding living area, (52.9%) n=18 participants in control group and (47.1%) n=16 participants of experimental group were living in city comparingly (33.3%) n=2 participants of control group and (66.7%) n=4 participants of experimental group were living in town. Overall, the sample doesn't have any missing value and balanced distribution across age and living area.

Descriptive statistics of scales

Recycling Attitude

In this study, recycling attitude was measured through recycling attitude scale (RAS). The following table present descriptive statistics including mean (M), median, mode, standard deviation (SD), skewness, kurtosis of control and experiment group at pre (T1) and post testing (T2).

Table 2. 1

Descriptive statistics of Recycling Attitude Scale for control (N=20) and experimental group (N=20)

Group	M	Median	Mode	SD	S	K	S-W(p)
Control group (pre-testing)	24.95	25.5	15 ^a	5.77	-0.33	-0.93	.95 (0.32)
Control group (post-testing)	24.90	25	25	4.10	-0.26	-0.85	.95 (0.31)
Experimental group (pre-testing)	24.60	25	26	5.21	0.37	-0.43	.95 (0.36)
Experimental group (post-testing)	35.10	36	31 ^a	3.35	-0.83	0.17	.92 (0.09)

Note: T1= Pre testing, T2= Post testing, M= Mean, SD= Standard Deviation, S= Skewness, K= Kurtosis, S-W= Shapiro Wilk test and p= significance level

^a = Multiple modes exist but shorter mode is presented here.

The above table suggest that recycling attitude scale in control group at pre testing (T1) has equal means as in post testing of 24.9, same values for median 25.5 and 25 and multiple modes exist but 15 is the smallest value of mode presented in table. Data for pre and post testing is slightly negatively skewed at -0.33 and -0.26 and standard deviation is high at 5.77 that is highly deviated data from mean comparingly with post testing standard deviation that is 4.10. In both pre and post testing in control group, the data distribution is platykurtic at -0.93 and -0.85.

In experimental group at pre testing (T1) the value of mean is 24.6 that is lower than mean value at post testing 35.10, median is 25 at pre testing and 6 at post testing, mode is 26 and 31 at post testing and high standard deviation of 5.21 in T1 than in T2 3.35 and skewness for T1 is slightly right skewed 0.37 and slightly left skewed distribution in T2 that is -0.83. and platykurtic distribution of kurtosis T1(K= -0.43) and T2 (K=0.17) hence it has also non-normal data distribution

From different measures to check normality of data including standard deviation, skewness, kurtosis, Shapiro-wilk test, histograms shown in above table and from the data below in figures it is concluded that the data of control group in pretesting and post testing is not normally distributed as it is clearly depicted in figures below of histograms.

Figure 2. 1

Distribution of Recycling Attitude scale on control group at pre testing through histogram.

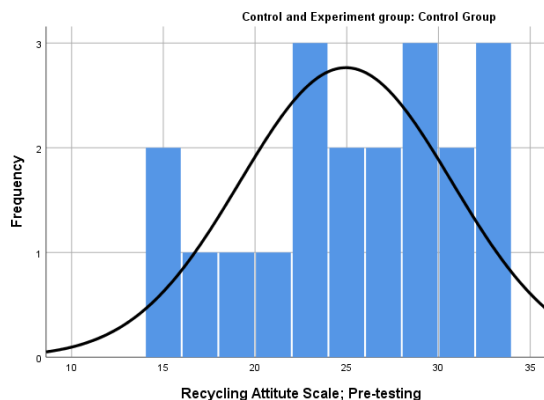
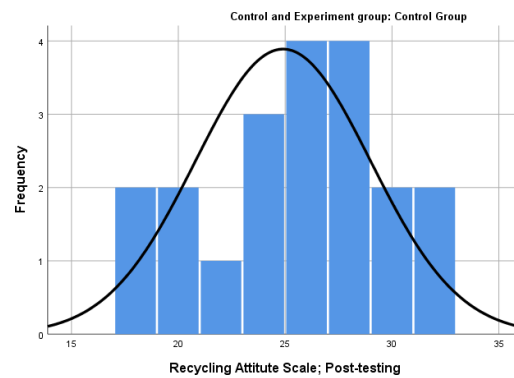


Figure 2. 2

Distribution of Recycling Attitude scale on control group at post testing through histogram.

**Figure 2. 3**

Distribution of Recycling Attitude scale on experimental group at pre testing through histogram.

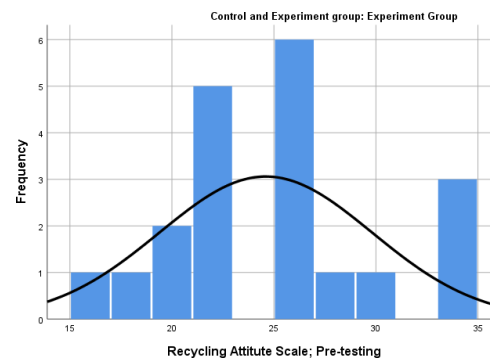
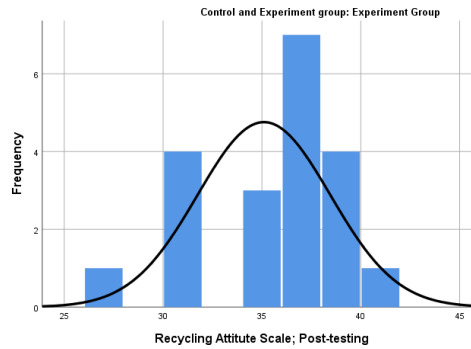


Figure 2. 4

Distribution of Recycling Attitude scale on experimental group at post testing through histogram.



According to above figures showing histograms with normality curve it is clear that recycling attitude scale scores in control and experimental group at pre testing and post testing has non-normal data distribution.

Waste Management Behavior

Waste management behavior was measured through zero waste management behavior scale (ZWMBS). The following table present descriptive statistics of control and experimental group at pre and post testing.

Table 2. 2

Descriptive statistics of Zero Waste Management Behavior Scale for control (N=20) and experimental group (N=20)

Group	M	Median	Mode	SD	Skewness	Kurtosis	S-W(p)
Control group (pre-test)	35.95	36	29	6.19	0.36	-0.06	.98 (0.92)
Control group (post-test)	40.10	41	41	3.86	-0.14	-0.88	.96 (0.51)
Experimental group (pre-test)	34.70	35	34	3.67	0.14	0.22	.94 (0.29)
Experimental group (post-test)	45.20	47	48	4.61	-0.63	-0.38	.94 (0.20)

Note: M= Mean, SD= Standard Deviation, S-W= Shapiro Wilk test and p= significance level

The table 2.2 suggest that waste management behavior in control group at pre testing (T1) mean is 35.9 that is less than 40.10 mean at T2, median is 36 at T1 and 41 at T2; mode is 29 at T and 41 at T2. Data is highly deviated from mean at pre testing as Standard deviation is 6.19 comparingly with post testing 3.86 and skewness value 0.36 that is slightly right skewed and at post testing slightly left skewed data at -0.88 and data is platykurtic distributed in both pre and post testing in control group.

In experimental group of waste management behavior at pre-testing, mean 34.70 is less than 45.2, median 35 is also less than 47 at post testing and mode is 34 at pre testing and 48 at post testing, with standard deviation of 3.67 that is less deviated if compared with

posttest 4.61, with slightly positively skewed 0.14 data at T1 but slightly negatively skewed data in post testing -0.63 and value of kurtosis is 0.22 at T1 and -0.38 at T2 shows platykurtic distribution.

The above table and below figures illustrated that data is not normally distributed in control and experimental group at pre and post testing. As sometimes values are not depicting properly about normality when sample size is very less so we'll focus on histograms as it is clearly seen that distribution of data isn't normal and data is scattered.

Figure 2. 5

Distribution of Zero Waste Management Behavior scale on control group at pre testing through histogram.

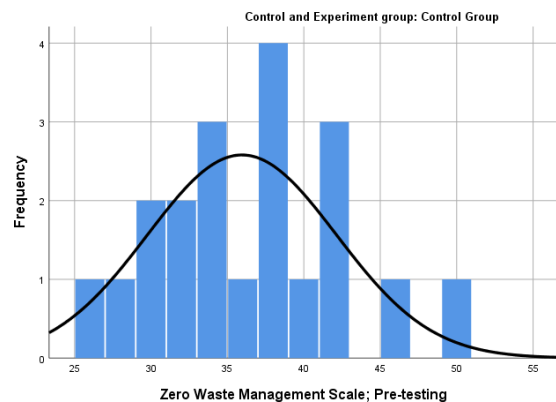
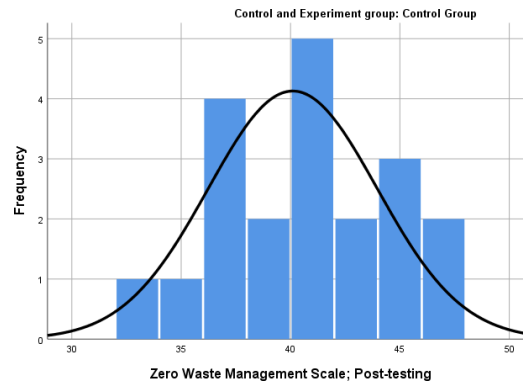


Figure 2. 6

Distribution of Zero Waste Management Behavior scale on control group at post testing through histogram.

**Figure 2. 7**

Distribution of Zero Waste Management Behavior scale on experimental group at pre testing through histograms.

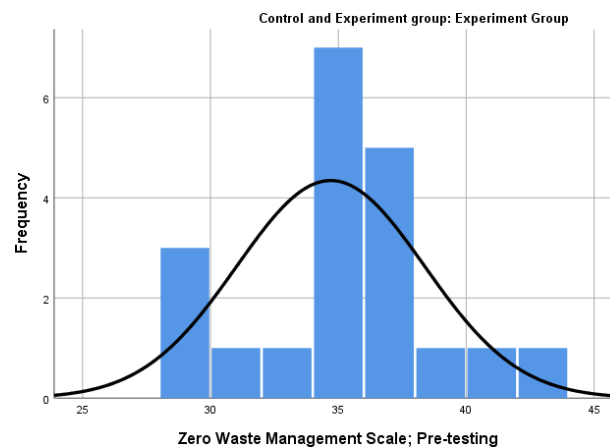
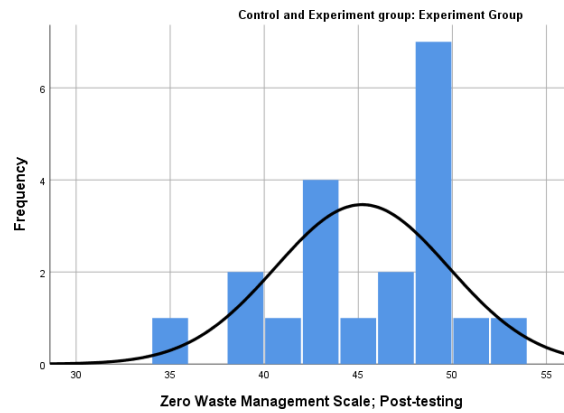


Figure 2. 8

Distribution of Zero Waste Management Behavior scale on experimental group at post testing through histograms.



According to above figures showing histograms with normality curve it is clear that zero waste management scale scores in control and experimental group at pre testing and post testing has non-normal data distribution.

Littering Attitude

Littering attitude was measured through littering attitude scale (LAS). The table below present descriptive statistics of control and experimental group at pre and post testing.

Table 2. 3

Descriptive statistics of Littering Attitude Scale for control (N=20) and experimental group (N=20)

Group	M	Median	Mode	SD	Skewness	Kurtosis	S-W(p)
Control group (pre-test)	57.60	56	56	5.79	0.45	-0.80	.93 (0.18)
Control group (post-test)	58.60	58	51 ^a	6.5	0.43	-1.23	.90 (0.04)
Experimental group (pre-test)	61.45	61	60	7.10	0.32	-0.78	.96 (0.47)
Experimental group (post-test)	69.15	69	68 ^a	2.85	-0.35	-0.47	.95 (0.36)

Note: M= Mean, SD= Standard Deviation, S-W= Shapiro Wilk test and p= significance level

^a = *Multiple modes exist but shorter mode is presented here.*

For Littering Attitude Scale, descriptives shown in above table illustrates control group in pre testing mean is 57.6 whereas 58.60 in post testing, median is 56 in pre testing but 58 in post testing and mode is 56 whereas 51 at post testing with standard deviation showing data in post testing is highly deviated from normal is $T1=6.5 > T2= 5.79$ and slightly right skewed data at 0.45 and 0.43 for post testing with platykurtic distribution of data for kurtosis at 0.08 in pre testing and -1.23 in post testing of control group.

For experimental group, mean is 61 for pretest and 69 for posttest. Data is highly skewed in pre testing with standard deviation of 7.10 but slight deviation in post testing

that is 2.85. Data was slight skewed towards right in pre testing but slight skewed towards left in post testing and data in both groups were platykurtic distributed.

From the data above in the table and below figures it is concluded that the data of control group and experimental group in pretesting and post testing is not normally distributed as it is clearly depicted in histograms.

Figure 2. 9

Distribution of Littering Attitude scale on control group at pre testing through histogram.

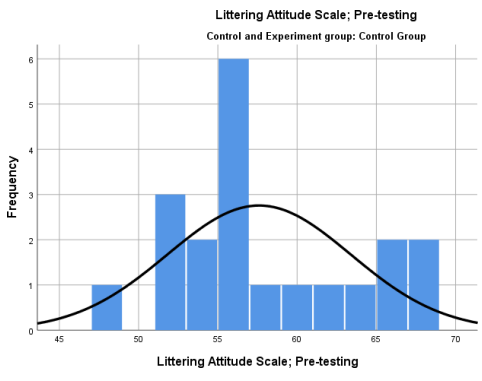


Figure 2. 10

Distribution of Littering Attitude scale on control group at post testing through histogram.

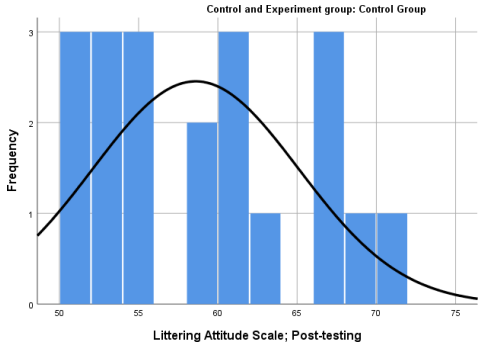


Figure 2. 11

Distribution of Littering Attitude scale on experimental group at pre testing through histogram

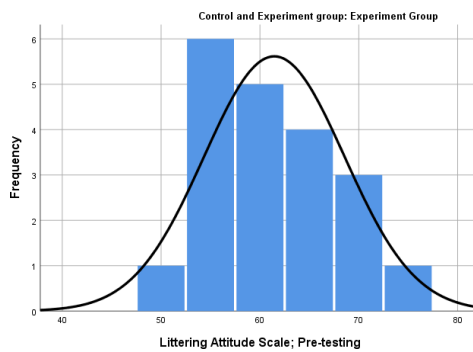
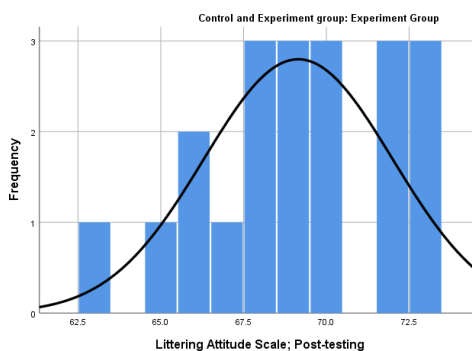


Figure 2. 12

Distribution of Littering Attitude scale on experimental group at post testing through histogram



According to above figures showing histograms with normality curve it is clear that littering attitude scale scores in control and experimental group at pre testing and post testing has non-normal data distribution.

Table 2. 4

Psychometric properties of Recycling Attitude Scale, Zero Waste Management Scale and Littering Attitude Scale at pre-testing and post-testing

Scale	M	SD	Range	α
Recycling Attitude Scale (Pre-testing)	24.78	5.43	15-34	0.83
Recycling Attitude Scale (Post-testing)	30	6.35	18-40	0.89
Zero Waste Management Behavior Scale (Pre-testing)	35.33	5.06	26-50	0.71
Zero Waste Management Behavior Scale (Post-testing)	42.65	4.92	33-52	0.82
Littering Attitude Scale (Pre-testing)	59.53	6.68	48-75	0.80
Littering Attitude Scale (Post-testing)	63.88	7.28	51-73	0.86

Note: M= Mean, SD= Standard Deviation, α = Cronbach's Alpha

By considering, cutoff scores of reliability, the above table shows that Recycling Attitude Scale (RAS) has higher mean of 30 at T2 comparing to T1 mean that is 24.78, Standard deviation is 5.43 at T1 and 6.35 at posttest, ranges from 15 to 34 at T1 and 18 to 40 at T2. At both testing (T1 and T2) RAS has good internal consistency reliability of 0.83 and 0.89.

For Zero Waste Management Behavior Scale (ZWMBS), the means scores 35.33 at T2 were higher than mean scores 42.65 at T1, data at both testing T1 (SD= 5.06) and T2 (SD= 4.92) is highly deviated. For T1, data ranges from 26 to 50 and for T2, data ranges

from 33 to 52. At both times Cronbach's α coefficient is in normal range $\alpha=0.71$ at T1 and good internal consistency reliability $\alpha=0.82$ indicated at T2.

For Littering Attitude Scale (LAS), mean scores 63.88 at T2 were higher than mean scores 59.53 at T1. Data is highly deviated at both testing (SD= 6.68, 7.28), the data ranges between 48 to 75 at T1 and 51 to 73 at T2. The Cronbach's alpha coefficient is 0.80 at pre testing and 0.86 at post testing indicating good internal consistency reliability.

Inferential statistics

In this section, results of hypotheses are presented.

Hypothesis 01: There will be a significant increase in recycling attitude score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

Considering the scores of recycling attitude, in both control and experimental group at pre and post testing were nonnormally distributed, so nonparametric test; Mann Whitney U test was applied to determine difference in means across groups and Wilcoxon signed rank test to determine difference across time (pre and post testing).

Table 3. 1

Comparison of experimental group (N=20) scores with control group (N=20) scores on “Recycling attitude” at pre and post testing

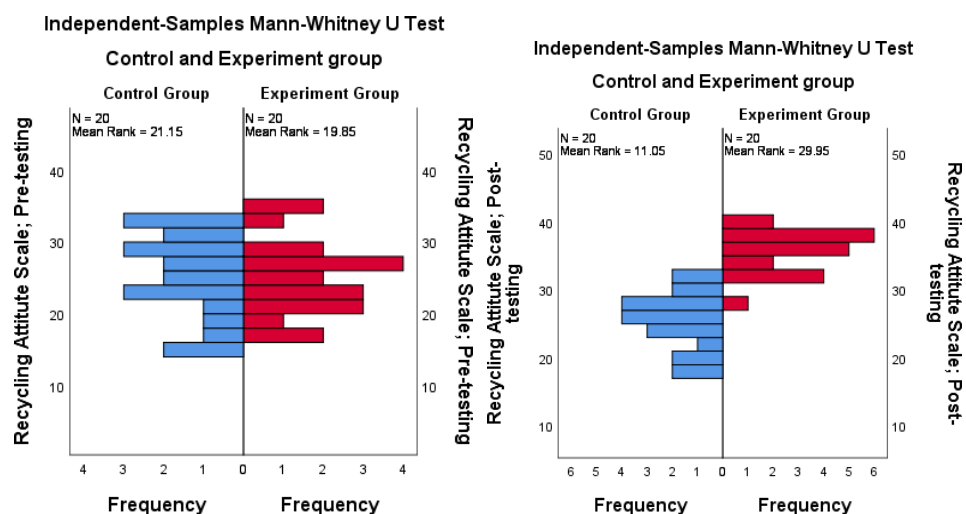
Pretest/ Post-test	Control Group		Experimental Group			
	N	M	N	M	U	p
Pre test	20	21.15	20	19.85	187	0.72
Post-test	20	11.05	20	29.95	389	0.00

Note: N= no. of participants, M= Mean Rank, U= Mann Whitney U test, p= Significance value

The above table showed that in recycling attitude there was no significant difference in mean score of control group compared with experimental group in pretest on recycling attitude ($p= 0.72$, $U= 187$) and there was a significant difference in mean score of control group compared with experimental group in posttest on recycling attitude ($p= 0.00$, $U= 389$). Findings showed that there was an increase in mean scores of experimental group on recycling attitude in posttest than in pretest.

Figure 3. 1

Comparison of mean scores in “Recycling attitude”, pre testing and post testing in control and experimental group

**Table 3. 2**

Comparison of pre-test scores with post-test scores of “Recycling Attitude” in control (N=20) and experimental group (N=20)

Group	Pre-test		Post test			
	M	Sum of ranks	M	Sum of ranks	Z	P
Control group	8.06	64.5	7.93	55.5	-0.26	0.79
Experimental group	1.75	3.5	11.47	206.5	-3.79	0.00

Note: M= Mean Rank, Z= Wilcoxon test value, p= significance value

From results of above table, we can interpret that on recycling attitude there was no significant difference in control group at pre and post testing ($p=0.79$, $Z= -0.26$) but there

was a significant difference between experimental group at pre and post testing ($p=0.00$, $Z= -3.79$). We can interpret that there was an increase in post testing score of recycling attitude in experimental group than in control group.

From all statistics done above, it is concluded that the hypothesis was retained as we got sufficient evidence to support that there was a significant increase in recycling attitude score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

Hypothesis 02: There will be a significant increase in waste management behavior score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

From the scores we found while performing descriptive statistics of ZWMBS and normality testing, our data on waste management behavior was nonnormal in control and experimental group, as well as for in pre testing and post testing and for that we have applied non parametric tests. For comparing scores of experimental group with scores of control group on waste management behavior, we applied Mann Whitney U test. pre and post testing comparison was also performed through Wilcoxon signed rank test.

Table 4. 1

Comparison of experimental group (N=20) scores with control group (N=20) scores on “Waste Management Behavior” at pre and post testing

Pretest/ Post-test	Control Group		Experimental Group		U	p
	N	M	N	M		
Pre test	20	21.63	20	19.38	177.5	0.54
Post-test	20	14.3	20	26.8	323.5	0.00

Note: N= no. of participants, M= Mean Rank, U= Mann Whitney U test, p= Significance value

Table 4.1 findings revealed that there is no significant difference in scores of control and experimental group at pre testing on waste management behavior ($p=0.54$, $U=$

177.5). There is a significant difference between scores of control and experimental group at post testing on waste management behavior ($p=0.00$, $U= 323.5$).

Figure 4. 1

Comparison of mean scores in “Waste Management Behavior”, pre testing and post testing in control and experimental group

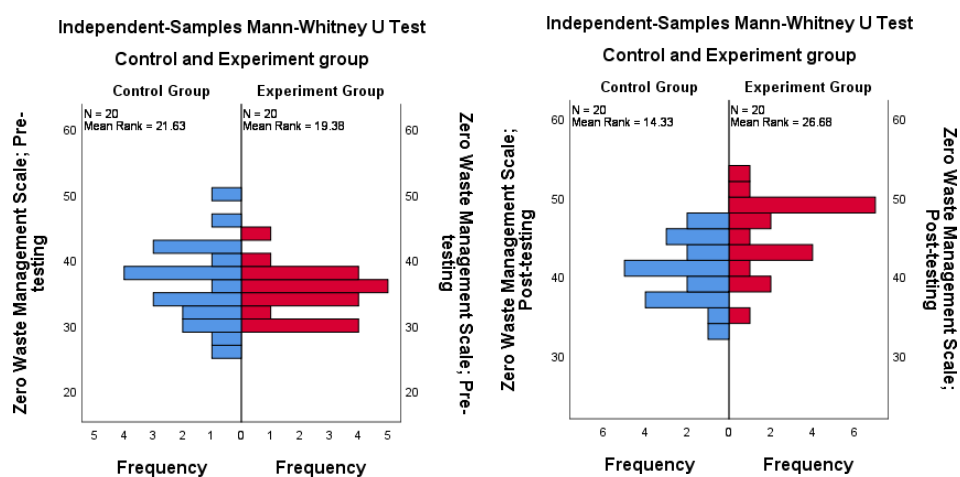


Table 4. 2

Comparison of pre and post testing in control and experimental group on “Waste Management Behavior”

Group	Pre-test		Post test		Z	P
	M	Sum of ranks	M	Sum of ranks		
Control group	8.8	44	10.43	146	-2.05	0.40
Experimental group	0	0	19	10	-3.82	0.00

Note: M= Mean Rank, Z= Wilcoxon test value, p= significance value

Table 4.2 revealed the findings that there is no significant difference in control group at pre and post testing on waste management behavior ($p=0.40$, $Z= -2.05$). Findings also revealed that there is a significant difference between pre and posttest in experimental group on waste management behavior ($p=0.00$, $Z= -3.82$).

It is concluded that the hypothesis was retained as we got sufficient evidence from above findings to support that there was a significant increase in waste management behavior score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

Hypothesis 03: There will be a significant increase in negative attitudes towards littering score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

The scores of littering attitude on control and experimental group at both pre and post testing were not normally distributed. Considering this, we have applied non-parametric tests; Mann Whitney U test for comparison of mean scores on control and experimental group at pre and post testing and Wilcoxon signed rank test for comparison in pre and post testing on control and experimental group on littering attitude.

Table 5. 1

Comparison of experimental group (N=20) scores with control group (N=20) scores on “Littering attitude” at pre and post testing

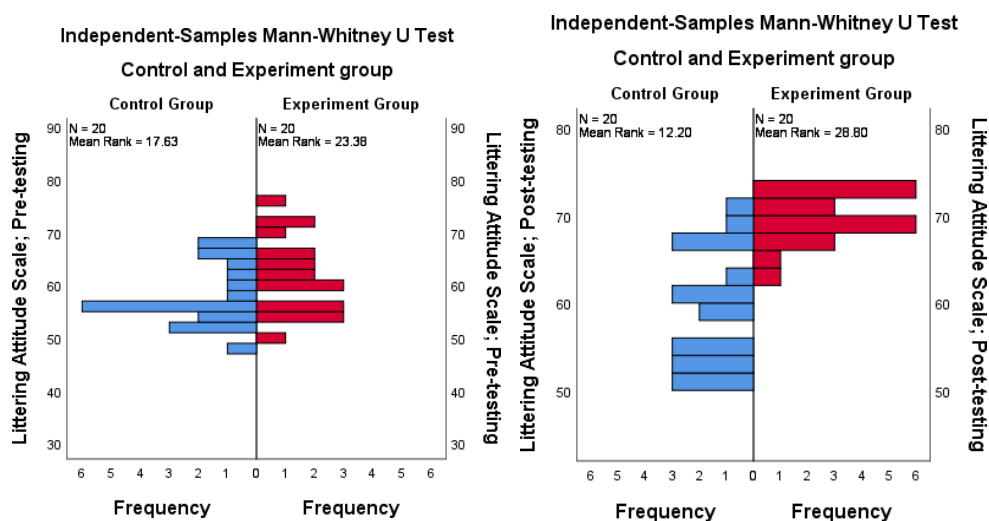
Pretest/ Post-test	Control Group		Experimental Group			
	N	M	N	M	U	p
Pre test	20	17.63	20	23.38	257.5	0.12
Post-test	20	12.2	20	28.8	366	0.00

Note: N= no. of participants, M= Mean Rank, U= Mann Whitney U test, p= Significance value

For littering attitude, the above table revealed that there was no significant difference between mean scores of control and experimental group at pre-testing ($p=0.12$, $U=257.5$). Findings also revealed that there was a significant relation between mean scores of control and experimental group at post-testing ($p=0.00$, $U=366$).

Figure 5. 1

Comparison of mean scores in “Littering attitude”, pre testing and post testing in control and experimental group

**Table 5. 2**

Comparison of pre and post testing in control (N=20) and experimental group (N=20) on “Littering Attitude”

Group	Pre-test		Post test			
	M	Sum of ranks	M	Sum of ranks	Z	p
Control group	9.22	83	10.7	107	-0.48	0.63
Experimental group	7.67	23	11	187	-3.06	0.00

Note: M= Mean Rank, Z= Wilcoxon test value, p = significance value

For littering attitude, the above table showed that there was no significant difference between pre and post testing in control group ($p = 0.63$, $Z = -0.48$) findings also revealed

that there was a significant difference between pre and post testing in experimental group ($p= 0.00$, $Z= -3.06$)

From all statistical findings we got above it is concluded that there will be a significant increase in attitudes towards littering score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group.

Chapter 4**Discussion**

This study demonstrates the utilization of development and feasibility testing of sustainable educational intervention on recycling, littering attitude and waste management behavior among college students based on quasi-experimental design.

This study's main focus was on female college students within age range 17-19 years. The targeted age range was selected through the studies mainly focusing this age as more effective for sustainable development (Beck, 2007). The grade of college students for this age was confirmed through different colleges. The participants were recruited from only one girl's college. The targeted variables were measured at pretest for both control and experimental group to get the baseline to compare the scores after delivering the intervention. Control group didn't receive any intervention and experimental group was given intervention within 2 weeks; total 5 days with gap of two days in between for 15-20 minutes per session. Each session was targeted on providing basic knowledge about recycling, littering and waste management, in printed form we paste some facts for 2 days gap between each session; related to targeted variables including figures and fact and providing information related to items to place in which bin on noticeboard of class. Recycling bins were placed on the same day as of day one of delivering intervention. After completion of intervention delivery, post testing was done for both control and experimental group. This study was mix-method design inclusive of with-in group and between group design.

The sample consists of 40 number of participants (N= 40). Considering quasi-experimental design with convenient sampling, 20 participants were in control group (N=20) and 20 participants were in experimental group (N=20). Most of the participants reported 19 years of age in both control and experimental group. In living area, most participants reported living in cities in both experimental and control group.

To measure targeted variables three different scales; recycling attitude scale, zero waste management behavior scale and littering attitude scale were used in English version based on education level of students. All scales score good $>.80$ Cronbach alpha reliability. Descriptive statistics were performed to check the normality of data and the values of skewness, kurtosis, Shapiro-wilk test and histograms show non-normal distribution of data. So, non-parametric tests were applied to find results of hypotheses.

Firstly, it was hypothesized that there will be a significant increase in recycling attitude score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group. From statistics done in result section, analyses suggest from table 3.1 and 3.2 that there was a significant increase in recycling attitude in experimental group as compared to control group in post testing and there was a significant difference in pre and post testing. These findings are aligned with what has been quoted in past researches that education and awareness about recycling will help increase recycling attitudes in individuals (Shipley, 2021). In another study research indicates that recycling education initiatives possess the capacity to considerably enhance students' understanding, foster positive attitudes, and enhance their recycling practices (Williams, 2011). Hence, the information related to recycling, the importance of it

mentioned in intervention has significant impact in post testing compared to pre testing and the change experimental group get was also significant compared to control group.

Second hypothesis of our study states that there will be a significant increase in waste management behavior score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group. Additionally, the availability of recycling bins is the major factor as participants lack motivation to recycle and manage waste, when students got bins to recycle and manage their material, management of waste behavior increases. Findings are related with previous literature that posed that interventions posing on proper waste sorting and availability of waste sorting facilities will affect waste management behaviors (Yidan, 2023). The findings from table 4.1 and 4.2 suggest that there was a significant increase in waste management behavior in experimental as compared to control group in post testing and significant difference in post as compared to pre-testing.

Thirdly, it was hypothesized is that there will be a significant increase in negative attitudes towards littering score in experimental group as compared to control group as well as at post testing as compared to pre testing of experimental group. To make participants aware about the issue was one of the major targets. Our main target was to make students intention to engage in reducing a certain attitude. Findings from study by Bettencourt et al., (2023) revealed that engaging to reduce such behavior alone is not effective until educational aspect is added to it, evidence found supported both together. From table 5.1 and 5.2 we can conclude that there was a significant difference between littering attitudes of participants in experimental group as compared to control group and in post testing compared with pre testing. Notably, there were difference between mean scores of pre

testing and post testing and differences in mean rank score of control and experimental group.

The recycling bin placed in class had a great impact on students. As, they reason why are there two bins in class? They got their answers from facts posted on notice board. The homeroom of that class was asked to observe whether students recycle their papers, pens in certain bins or not. Students started using the bins according to their roles and this is linked with what previous literature findings we have that placing the bins in close proximity where people can easily reach bins is effective for them to use it (Omburo, 2020).

The above findings concluded that all hypotheses were accepted that recycling attitude, waste management behavior and littering attitude has significant difference at experimental group and at post testing compared to pre testing. This study has also certain limitations that are discussed below.

Limitations

With the acknowledgement of insights, we get from this study it is considerably important to report the limitations for future researchers to focus on, to increase the generalizability and scope of the research.

1. Firstly, the focus of this study was on college students however results may vary in other education level.
2. The present study's sample size was so small due to feasibility testing, including large sample may produce different results.
3. The study does not include a follow-up due to certain restrictions imposed for certain activities in college.

4. The study relied on self-report measures to assess littering attitude, waste management behavior and recycling attitude which may include biasness and element of social desirability when participants report such measures.

Future recommendations

To enhance the generalizability and future researchers to get more innovative ideas it is recommended that:

1. The focus of study should be on both genders to find if there is any role of gender in recycling attitude, waste management behavior and littering attitude.
2. Future studies should include a comparison of private and public colleges to see role of education system.
3. Future studies should include mix method approach; quantitative plus qualitative to get vast knowledge with reason of particular attitudes and behavior of students.
4. Future studies should focus on large sample size to get generalizable results.
5. Future studies should include other education level of students rather than only focusing on college.

Implications

This study can be implied in following domains:

1. This study addressed the issue of sustainability by special focus on developing an intervention to help students change their attitudes towards recycling, littering and waste management behaviors, now the intervention can be used in different activities by education system to aware them about this issue.

2. This study is pivotal for introducing different bins to students for reduce, reuse and recycle consequently have a long-term impact on community level.
3. This study contributed in Sustainable Developmental Goal number 12 that is responsible production and consumption.

Conclusion

With the growing population and advancement of technology, the world is giving us a lot but what we are giving back to our society is just ample amount of waste that the earth is now struggling to get over it or manage it somehow. The global focus for this issue is sustainable management to the problem considering Sustainable Developmental Goals. One of the main factors to raise voice for it, is creating awareness; through people who are influencers of upcoming generations, our youth are the change makers who will create long-lasting impacts from time to time.

This study aimed to create solution by developing intervention on college students by focusing on the factors lead them not to litter, the facilities available to them for managing waste and the awareness they have related to recycling and manage waste, so we can minimize reduction and maximize the reuse and recycle. Most importantly, the opportunity to recycle is found effective. Students started to use recycling bins when they got the opportunity to recycle. The results were found significant of developed intervention for reducing littering attitude and enhancing waste management behavior and recycling attitude.

There is a lack of awareness regarding particular issue in Pakistan and most of the people are unaware about such facilities available for reducing waste. If such facilities like

recycling bins will be introduced by governmental level and placed in schools and colleges along with awareness about the issue and guidelines about the usage of bins, the change will not only minimize the waste but will also help build a sustainable community.

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Appendix A

Support letter



Capital University of Science and Technology
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Ref. CUST/IBD/PSY/Thesis-583
August 7, 2023

TO WHOM IT MAY CONCERN

Capital University of Science and Technology (CUST) is a federally chartered university. The university is authorized by the Federal Government to award degrees at Bachelor's, Master's and Doctorate level for a wide variety of programs.

Ms. Farwa Aman, registration number **BSP201028** is a bona fide student in BS Psychology program at this University from Spring 2020 till date. In partial fulfillment of the degree, she is conducting research on "Development and feasibility testing of a sustainable educational intervention for attitude towards recycling, littering and waste management behavior among college students.". In this continuation, the student is required to collect data from your institute.

Considering the forgoing, kindly allow the student to collect the requisite data from your institute. Your cooperation in this regard will be highly appreciated.

Please feel free to contact undersigned, if you have any query in this regard.

Best Wishes,

Dr. Sabahat Haqqani
Head, Department of Psychology
Ph No. 111-555-666 Ext: 178
sabahat.haqqani@cust.edu.pk

Appendix B

Principal's Informed Consent

I **Farwa Aman**, student of BS Psychology in Capital University of Science and Technology, Islamabad. I am conducting research on **“Development and feasibility testing of Sustainable Educational Intervention for Attitude towards Recycling, Littering and Waste Management Behavior among College Students”**

The purpose of this study is to develop sustainable educational intervention for college students. This research requires 17-19 years old students of 11th grade and is of total 5 weeks; one session per week; the session will be delivered within class time. There will be a follow-up session after 2 weeks of completion of intervention. The participation of students in this study is voluntary. To conduct this study, I require permission from principal of this college to deliver the sessions.

There will be no harm to the college and students in this research. All the collected information will be kept confidential and results will be reported collectively. This research will help and serves as a first step for students to develop sustainable attitudes and behavior. Your cooperation is highly appreciated. In case of any query, you can ask the researcher. Kindly sign below if you agree to let this study happen in your college.

I _____, principal of college _____ confirm that I have read and understand all the above-mentioned information. I agree that I had right to ask any query, the permission granted for this research was voluntary and all data of students will be kept confidential. I permit the participation of students in this research.

Signature: _____

Date: _____

Appendix C

Information sheet

Name of Student Researcher: Ms. Farwa Aman

Institution: Capital University of Science and Technology, Islamabad

Contact details: bsp201028@cust.pk

Title of Study: Development and feasibility testing of sustainable educational intervention

Objective: This is an intervention study which will help students develop sustainable attitudes and behavior.

Procedures: In this study, students will be given educational sessions for 15-20 minutes for 2 consecutive weeks; one session per week. Before starting 1st session students have to fill demographic information and questionnaires. After completing all the sessions students again have to fill post questionnaires.

Right to Refuse or Withdraw: Your participation in this study is voluntary. In addition, you may withdraw from the study at any time without penalty.

Anonymous and Confidential Data Collection: Your participation in this study is anonymous, because we do not collect information that would allow someone easily identify you. In other words, your identity cannot be determined, not even by the researchers, from the information we collect in this study.

Confidentiality of records: The collected data will be kept by the researcher herself and discarded after completion of this research.

Whom to Contact with Questions: If you have any questions about this study and have questions or concerns about your rights as a participant, you may contact

sadaf.zeb@cust.edu.pk or bsp201028@cust.pk

Parental Consent Form

I have read, discussed and understand the information and procedures in the study information sheet attached to this consent form. I acknowledge that I voluntarily give my child the permission to participate in the research and they have full right to withdraw from it anytime. I agree that all the data will be kept confidential and will use only for research purpose. I give my child the permission to be a part of this research.

Sign: _____

Date: _____

Student Consent Form

I have read, discussed and understand the information and procedures in the study information sheet attached to this consent form. I acknowledge that I voluntarily participate in the research and I've full right to withdraw from it anytime. I agree that all the data will be kept confidential and will use only for research purpose. I agree to be a part of this research.

Sign: _____

Date: _____

Appendix D**Demographics**

Please mark a tick (✓) in front of the option related to you.

1.	Age	17	<input type="checkbox"/>
		18	<input type="checkbox"/>
		19	<input type="checkbox"/>
2.	Living area	City	<input type="checkbox"/>
		Town	<input type="checkbox"/>

Appendix E

Scale 01; Recycling Attitude Scale

This scale has been prepared to determine the attitudes of students towards reducing, reusing and recycling the packaging wastes. You are expected to read each item in the scale and mark the appropriate option regarding the degree to which you agree with the statement. The answers that you will offer for the items will be used in research and kept confidential. Thank you for cooperating.

On the scale of 1-5 how much do you agree with the statements below; 1=Strongly disagree, 2=Disagree, 3= Neutral, 4= Agree, 5=Strongly agree

Mark only one option for each item below.		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
1.	I use the recycle boxes to recycle the wastes of plastic, glass, metal, paper. I use the recycle boxes to recycle the wastes of plastic, glass, metal, paper.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

2.	I feel happy when there are recycle boxes where I am.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3.	I know that the plastic, glass, metal, paper wastes are not garbage.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4.	I feel happy when the plastic, glass, metal, paper wastes become reusable through recycling.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
5.	I know that the plastic, glass, metal, paper wastes should not be thrown into the garbage can.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
6.	I feel happy when people seeing the plastic, glass, metal, paper wastes at	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

	the street throw them into the recycle box.					
7.	I reuse the plastic bottles, glass jars, tin cans etc. for other purposes.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
8.	I get angry when people throw the plastic, glass, metal, paper wastes in the street.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
9.	When I am outside, I use the bottle of water that I have been carrying with me instead of buying one.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
10.	I feel happy when my family and friends use recycle.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Appendix F

Scale 02; Zero Waste Management Behavior Scale

On the scale of 1-5 how much do you agree with the statements below; 1=Strongly disagree, 2=Disagree, 3= Neither agree or disagree, 4= Agree, 5=Strongly agree

Mark only one option for each item below.		Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
		1	2	3	4	5
1.	I have sufficient knowledge about zero waste management practices.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
2.	I have enough knowledge about recycling.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
3.	I have sufficient knowledge about the harmful effects	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree

	of waste oils on the environment.					
4.	I have sufficient knowledge about the harmful effects of waste batteries on the environment.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
5.	I have sufficient knowledge about environmental protection signs (recycling, green dot, etc.).	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
6.	I can reach recycling bins where I can throw paper, metal, plastic, glass waste.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree

7.	I can reach the recycling bin where I can throw the waste batteries.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
8.	I can reach the waste collection point where I can leave vegetable waste oils (frying oil etc.).	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
9.	I have access to the recycling bin where I can leave organic waste (fruit/vegetable peels, leftovers, tea pulp, etc.).	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
10	I think that zero waste management practice increases public awareness	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree

	to prevent environmental pollution.					
11	I think that the information about the zero-waste management application on TV and social media is sufficient.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
12	If I reach the recycling bins in my immediate surroundings, I separate my paper, glass, plastic, and glass waste.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
13	If I reach the waste oil collection point in my vicinity, I deliver the waste	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree

	oil I have accumulated.					
14	I deliver it to the collection point of electronic waste, such as batteries, old cables, other electronic parts, if I reach it in my close vicinity.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
15	The survey study contributed to my zero-waste awareness.	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree

Appendix G

Scale 03; Littering Attitude Scale

On the scale of 1-5 how much do you agree with the statements below; 1=Strongly disagree, 2=Disagree, 3= Neutral, 4= Agree, 5=Strongly agree

Mark only one option for each item please.		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
		1	2	3	4	5
1.	I believe littering is a negative habit.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2.	I think one should not bother about litter once it is not affecting ones' life.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
3.	Even though my surrounding is littered, I don't worry much about it.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
4.	When a bin is full, I will carry my litter to the nearest empty litter bin.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

5.	I believe litter does not hurt anyone.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
6.	Litter is unsightly.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
7.	Seeing litter in drainages upsets me personally.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
8.	Seeing someone littering upsets me	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
9.	I am not comfortable in a littered surrounding.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
10.	I can participate in removing litter in my community.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
11.	In the absence of an empty litter bin nearby, it is ok to throw litter beside a full litter bin.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
12.	I feel uncomfortable whenever I am in a littered environment.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree


13.	When I see people littering, I feel angry about it.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
14.	Litter is only considered a problem when it hurts one's personal well-being.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
15.	Any members of the public caught in the act of littering must be punished.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
16.	I think time spent in removing litter from public places is wasted	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
17.	Litter ruins the environment.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
18.	Litter is only considered a problem when it hurts the well-being of others.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree


19.	Throwing small items on the ground is not littering.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
20.	If I have enough time or money, I would certainly devote some of it to the removal of litter in my community	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
21.	It is my responsibility to report to the appropriate government agency any person seen littering.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
22.	When I see people littering the public places, I will tell them that public places are extension of personal homes that should not be littered.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
23.	When a litter bin is full, it is ok to throw waste on	Strongly disagree	Disagree	Neutral	Agree	Strongly agree


	the ground near the litter bin.					
24.	If anything, I must admit to a slight dislike of litterers.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Appendix H

Permission from scales authors

 Taşkın Taştepe <Taskin.Tastepe@ankara.edu.tr>
To: BSP201028 - FARWA AMAN


 Fri 3/24/2023 1:20 AM







Dear Farwa Aman Khan,
Thanks for your interest in the scale. You can use the scale in your study. I marked the required information about the scale on the PDF.
Best regards

Assoc. Prof. Dr. Taşkın TAŞTEPE
Department of Child Development
Faculty of Health Sciences
Ankara University

23-03-2023 08:07, BSP201028 - FARWA AMAN yazmış:

 DR OLUYINKA OJEDOKUN <yinkaoje2004@yahoo.com>
to me


Mar 21, 2023, 12:16 AM    


Dear Farwa Aman,
Thank you for your and interest in using my scale- Littering Attitude Scale. If you already have a copy of the scale, then you can get all information regarding scoring format and interpretation of scores when you read the method section of the paper. I don't have any separate manual for the scale. I hope you find this information useful. If you have further questions, kindly let me know. I wish you luck in your research.

Oluyinka Ojedokun

[Sent from Yahoo Mail on Android](#)

...

 Sezen Coşkun <sezencoskun@isparta.edu.tr>
To: BSP201028 - FARWA AMAN

 Thu 5/11/2023 2:04 PM

Dear Khan,

You can also apply the scale to the 14-year-old group, if you cite the article from which you took the scale, it is okay to use it.

I have 2 articles about zero waste, both of them can be cited in the discussion,

- COSKUN S. (2022), Zero Waste Management Behavior: Conceptualization, Scale Development and Validation—A Case Study in Turkey. Sustainability, 14, 1-11. <https://doi.org/10.3390/su141912654>

- Coskun S. (2021). Effect of the Covid-19 pandemic period on Zero Waste Awareness: a scale development survey in Turkey. Global NEST Journal, 23, 581-589. <https://doi.org/10.30955/gnj.004152>

the questionnaire can be used in general questions, however, since you will be applying the scale in a different country, you need to do the reliability and validity tests of the scale. It must have credibility for your country as well.

Good luck,

SC

----- Orijinal Mesaj -----
Kimden: "BSP201028 - FARWA AMAN" <bsp201028@cust.pk>
Kime: "Sezen Coşkun" <sezencoskun@isparta.edu.tr>
Gönderilenler: 10 Mayıs Çarşamba 2023 15:24:42
Konu: Request for permission to use the "Zero Waste Management Scale"

Appendix I

Sustainable educational intervention



SUSTAINABLE EDUCATIONAL INTERVENTION



Per session	Content
01	Pre-Questionnaires
02	Littering Attitudes
03	Waste Management Behavior
04	Recycling Attitude
05	Post-Questionnaires

Pre-questionnaires

Pre-questionnaires will be filled by students including informed consent, information sheet. Recycling bin will be placed in both classrooms; experimental and control group.

Littering Attitudes

Did you know? Interesting facts (to paste on noticeboard; for two days)



Have you ever heard of the term sustainability?

Sustainability is the ability to exist and develop without reducing natural resources for the future. It is about environmental growth and development along with considering environmental concerns and economic development. We can target our environment differently in relation with sustainability like littering, waste management and recycling.

What is litter?

Litter is stuff that ends up on the ground or in lakes and seas, and that shouldn't be there, such as glass bottles, plastic bags, tins, cigarette butts or sweet wrappers.

Why do we do litter?

According to research on littering behavior it was found three elements for litter: Personal choice, Litter begets litter, It's not my responsibility.

- If a person has the belief that littering is wrong, they felt obligation to not litter and less likely do it.
- If there is already litter present, it will attract more litter like people throw trash over there but if proper bins are available to trash, people will more likely to use them.
- If a person does not have sense of responsibility in them, they will throw trash and think someone else will pick it for them and it's not their duty.

Does litter impact us?

Yes, litter impact us in our daily lives. How? When rain happens all the litter waste flow down into main stream and end up in oceans creating water pollution. This will then affect quality of water and life under water. This is a continuous process that can't end until we do not take step forward to change our actions.

Does my one piece of litter make a difference?

If we pick up just one piece of litter every day, it will help reduce litter up to 300 million pieces of litter.



What is waste management?

Waste management starts from generation of waste to collection, transport, treatment and disposal of waste. It is also to minimize the generation of our waste, for this; we have reduced waste generation hierarchy.

Reduced waste generation

Reduction of the amount of solid waste generated following the three-tiered approach (the 3 R's) to managing solid waste:

1. Reduce
2. Reuse
3. Recycle.

Is it possible to manage waste?

Yes, this is possible to manage waste here's how we can manage our waste:

1. Reduce:

Minimize Consumption: Avoid single-use items.

Use Reusable Items: Replace disposable items with reusable alternatives (e.g., water bottles, bags, containers).

Avoid Food Waste: Plan meals, store food properly, and compost food scraps to reduce food waste.

2. Reuse:

Repurpose: Give items a second life by finding new uses for them.

Donate or Sell: Pass on items you no longer need to others through donation or resale.

3. Recycle:

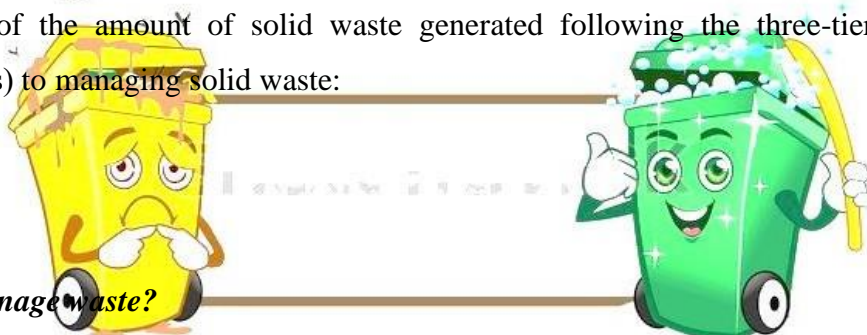
Separate Recyclables: Follow your local recycling guidelines for separating paper, cardboard, glass, plastic, and metal.

4. Compost:

Compost Organic Waste: Composting organic materials like food scraps and yard waste reduces landfill waste.

5. Proper Disposal:

Hazardous Waste: Safely dispose of hazardous waste materials (e.g., batteries, electronics) at designated facilities.



Types of waste:

Biodegradable waste; easily degradable (Breakdown)

Non-biodegradable waste; known as dry waste and can be reused. Can't degrade by themselves.

Different types of bins and their usage:***Recycling bin***

Recycling bins are used to throw items from that we can make new things from already used things.

Dustbin/ Trash bin

Dustbins are trash bins that contain things that are not recyclable not reuse able. We have to minimize using things that cause more trash.

Activity; Quick quiz (oral) (ask from random participant)

Which item to place in which bin?

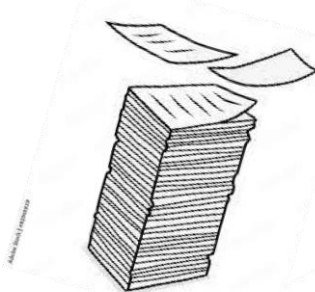
- | | |
|---------------------------|---------------------------|
| 1. Glass (Recycle bin) | 6. Paper (Recycle bin) |
| 2. Broken glass (Dustbin) | 7. Plastic (Recycle bin) |
| 3. Metal (Recycle bin) | 8. Batteries (Dustbin) |
| 4. Tin (Recycle bin) | 9. Plastic Bags (Dustbin) |
| 5. Aluminum (Recycle bin) | |



Recycling Attitude

Did you know? Interesting facts (to paste on noticeboard; for two days)

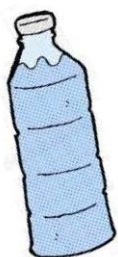
Recyclable items:



Paper



Glass



Bottle



Metal



Tin/ Aluminum

Non-Recyclable items:



Broken glass



Batteries



Plastic bags

What is Recycling?

Recycling is the process of collecting and processing materials (that would otherwise be thrown away as trash) and make new products out of it.

Why it is important to put recyclable items into recycle bins and not in trash bin/dustbins?



Importance of recycling

Recycling is a key component of sustainable living. It not only helps conserve resources and energy but also reduces pollution, greenhouse gas emissions, and waste.

By recycling, we contribute to a healthier planet and a more sustainable future for generations to come.

Importance of putting recyclable items into recycle bins

Putting recyclable items into recycling bins instead of trash bins or dustbins is essential for conserving resources, reducing energy consumption, minimizing pollution, and promoting a more sustainable and environmentally responsible way of life.

It has numerous benefits for the environment, the economy, and society as a whole. If they are not properly recycled then it is not possible then to recycle them and they'll become trash.

Activity; Quick quiz (oral) (ask from random participant)

Which item is recyclable? Say 'yes' if it is recyclable and 'no' if it is not.

- | | |
|----------------------|----------------------|
| 1. Glass (Yes) | 6. Paper (Yes) |
| 2. Broken glass (No) | 7. Plastic (Yes) |
| 3. Metal (Yes) | 8. Batteries (No) |
| 4. Tin (Yes) | 9. Plastic Bags (No) |
| 5. Aluminum (Yes) | |

Post-Questionnaires

Post questionnaire will be filled by students.