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Abstract

The study makes an effort to experiment the effectiveness of green nudges in promoting water conservation and fostering a sustainability mindset in an educational setting. The objective of the study is to explore the potential for fostering a sustainability mindset at the school level by using green nudges to encourage environmentally conscious water conservation behaviors. The methodological application was a field experiment with a post-intervention quantitative analysis, strategically placed visual prompts (stickers) were used to encourage water-saving behavior among students, teachers, and staff. The results show a significant reduction in water wastage, highlighting the impact of green nudges. Regression analysis indicates that responsiveness to green nudges and knowledge of environmental issues are significant predictors of water conservation behavior. The study concludes that tailored, strategically placed nudges can effectively promote sustainable behaviors in schools. These findings offer valuable insights for educators, policymakers, and sustainability practitioners, emphasizing the importance of integrating sustainability education to maintain long-term behavioral changes.

Keywords: *Behavioral choices, Green-nudges, Sustainability mindset, Water conservation.*

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Introduction

The concept of "nudging" is a behavioral science approach guiding people to make better decision without restricting their choices (Thaler & Sunstein, 2008). The sustainable development goal of Clean Water and Sanitization can be achieved with the collaborative's effort, especially when it stressed at the school level. The UNESCO's study of learning and training tool highlights the application of nudges at the school level to foster the sustainable mindset in the school education (Srikanthan & Jeevasuthan, 2021).

Green nudges are behavioral interventions to prevent code red for humanity with the climate emergencies and encourage environmentally friendly actions (Hathy et al., 2023). Dr. Ravi Fernando, a Sri Lankan expert on sustainable development and strategic corporate sustainability refers "Cod Red for Humanity" as an urgent warning to address climate change and prevent irreversible damage to our planet's ecosystem. This term became prominent after the UN's Intergovernmental Panel on Climate Change released a major report in 2021, declaring that human activities were causing widespread and potentially irreversible damage to the environment. While they hold theoretical promise, there is a significant gap in empirical evidence regarding their effectiveness, particularly in the context of Sri Lanka (Miranda et al., 2019; Samaranayake & Thennakoon, 2021). The research objective is to investigate the effectiveness of green nudges in promoting water conservation mindset and behaviors in an educational setting.

Furthermore, a sustainable mindset is an attitude and approach that prioritizes the understanding, commitment, and actions necessary for sustainable development. Individuals with a sustainability mindset recognize the importance of balancing economic, social and environmental needs to ensure the long-term health of the planet and society. fostering a sustainability mindset-an awareness and commitment to sustainable practices is crucial at the school level, integrating sustainability into education can encourage environmentally conscious behaviors from a young age, preparing students to be responsible global citizens citizen (Bosevska & Kriewaldt, 2020). In this study, we assess the sustainability mindset by measuring participants' responsiveness to green nudges and their knowledge of environmental issues, which together indicate an orientation towards sustainable behaviors. The aim of the study is to explore the potential for fostering a sustainability mindset at the school level by using green nudges to encourage environmentally conscious water conservation behaviors. Rather than 'creating' a sustainable mindset outright, the study evaluates whether strategic visual prompts (green nudges) can effectively influence water-saving practices, thereby suggesting a pathway for cultivating a sustainability mindset among students and staff through repeated, targeted interventions.

Materials and Methods

The research methodology consists of a field experiment, especially a post intervention quantitative analysis, to investigate the effectiveness of green nudges in promoting water conservation behavior within educational setting. The water conservation behavior in the school is assessed in the post implementation of green nudges using a natural field experiment. The experimental design allows for real-time monitoring of behavioral changes. To assess water conservation behavior before and after the implementation of green nudges, a combination of quantitative and observational methods was employed. Water usage was recorded at specific intervals through monitoring water dispensers and other high-usage areas to capture any reductions in water consumption attributable to the intervention. Further, survey questionnaires were administered to students, teachers and staff during the post-intervention phase, measuring self-reported behaviors and attitudes towards water conservation. Key indicators included the frequency of water use, awareness of water conservation practices, and responsiveness to the visual prompts (stickers). These data provided a comprehensive view of the changes in behavior due to the green nudges. The stratified random sampling was used to collect data from 60 respondents in the school; Students, Administrative staffs and non-admin staffs. This study was conducted in a single school setting, chosen to provide an initial exploration of the effectiveness of green nudges on water conservation behavior in an educational context. While this setting allows for a focused and controlled evaluation of behavior changes due to the intervention. It also highlights a limitation of the study regarding generalizability which can be further explored in multiple schools in future researches.

Figure 1: *Conceptual Framework*
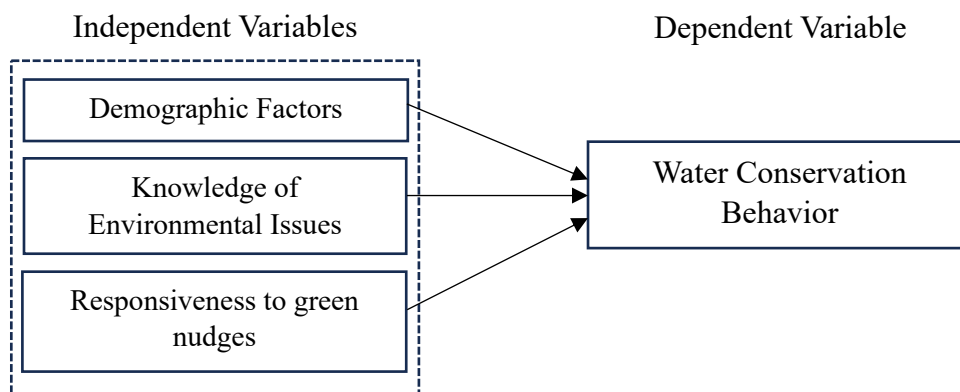
Source: Author's conception

The hypotheses were tested in the post intervention stages; after the visual prompts or a post green nudges application. The baseline where "water dispensers without stickers" and the at the treatment where "green nudge was applied". A survey was conducted at the post-implementation stages to measure behavioral changes in water conservation. This survey included questions on frequency of water usage, awareness of water-saving practices, and attitudes toward conservation. Participants were asked to rate their behaviors and perceptions, allowing for a comparative analysis of changes influences by the green nudges.

Results and Discussions

Table 1: *Descriptive Analysis*

Factors	N	Min	Max	Mean	Std.Dev
Knowledge of Environmental Issues	60	3.33	5.00	3.9944	.40474
Responsiveness to Green Nudges	60	3.33	5.00	4.0944	.42115
Water Conservation Behavior	60	3.00	5.00	4.0667	.45432

The table displays descriptive statistics for three variables: water conservation behavior, responsiveness to green nudges, and knowledge of environmental issues from the survey conducted after the application of the green nudge. It includes the count ($N = 60$), minimum and maximum values, mean, and standard deviation for each variable, offering an overview of their distribution and variability within the dataset.

Table 2: *Coefficient Table*

Dependent Variable: Water Conservation

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	Std. Error	**Beta Coefficient**	**t-statistic**	**Significance**
Knowledge of Environmental Issues	0.149	0.399	2.673	0.010***
Responsiveness to Green Nudge	0.143	0.452	3.150	0.003***
Constant	0.444	0.623	1.404	0.166

In order to forecast water conservation behavior, the regression model's coefficients are displayed in the Coefficients table. The standardized coefficients for both Environmental Issue Knowledge (Beta =0.399, p =.010) and Green Nudge Responsiveness (Beta =0.452, p =.003) are significant, suggesting that they have a major impact on the dependent variable. We didn't conduct a direct pre-intervention measurement of water conservation behavior, instead this study used a post intervention quantitative analysis to assess the effectiveness of green nudges by examining participants' responsiveness to the visual prompts and their impact on reported water conservation behaviors. This approach allowed us to infer behavioral changes attributed to the intervention without direct pre-intervention comparison.

Water Conservation Behavior = 0.623 + (0.399 * Knowledge of Environmental Issues) + (0.452 * Responsiveness to Green Nudge).

Table 3: *Analysis of Variance (ANOVA[a])*

Model		Sum of Squares	df	Mean squares	F	Sig.
1	Regression	6.290	2	3.145	30.446	<.001[b]
	Residual	5.888	57	.103		
	Total	12.178	59			

    a.   Dependent Variable: Water Conservation Behavior
    b.   Predictors: Responsiveness to green nudge, knowledge of environmental issues.

The table 3 shows that water conservation behavior is the dependent variable, and the model shows that the predictors, Responsiveness to Green Nudge and Knowledge of Environmental Issues, together explain a considerable amount of the variance (F = 30.446, p <.001).

Table 4: *Model Summary*

Model squares	R	R Square	Adjusted R	Std. Error of the Estimate
1	0.719[a]	.517	.500	.32140

    a.   Predictors: Responsiveness to green nudge, knowledge of environmental issues.

The results of the regression model are shown in the Model Summary table. Knowledge of Environmental Issues and Responsiveness to Green Nudge are predictors in the model. These predictors account for 51.7% of the variance in the dependent variable, according to the R-squared value of 0.517.

The survey data reveals significant insights into the demographic factors influencing participants' receptivity to green nudges. The findings indicate a diverse range of attitudes towards water conservation, with younger students demonstrating a higher level of environmental consciousness compared to all the students and staff members. This demographic variability underscores the importance of tailoring nudges to specific groups to maximize their effectiveness.

The treatment resulted that green nudge through visual prompts led to noticeable changes in behaviors compared to baseline. There was a significant reduction in water usage in the areas where the green nudges were placed, indicating that these subtle interventions can effectively encourage conservation behaviours. While the study explored the influence of demographic factors such as age, gender, and prior environmental knowledge, results primarily focused on overall responsiveness to green nudges and knowledge of environmental issues as predictors of water conservation behavior. The study focused on visual prompts, specifically strategically placed stickers in high-traffic areas such as restrooms and water dispenser, to encourage water-saving behaviors. Among these, stickers with direct conservation messages in restrooms were observed to be particularly effective, as they led to the most noticeable reduction in water usage compared to other areas. This suggests that context-specific placements of green nudges have a significant impact on promoting sustainable behavior.

Conclusions and Recommendations

This study demonstrates that green nudges can be an effective tool for promoting water conservation behaviours in an educational setting. The finding highlights the importance of demographic considerations and strategic placements of nudges to maximize their impact. Based on the results, several recommendations can be made. The schools should implement green nudges as part of a broader sustainability strategy which cannot directly be drawn from this study's results. The study specifically assessed the impact of green nudges on water conservation through strategically placed visual prompts in a school setting. Therefore, while it demonstrated the effectiveness of green nudges in reducing water usage in this context, any recommendation for a broader strategy would need to be supported by further research across various schools and sustainability domains beyond water conservation alone. Visual prompts, particularly in high-traffic areas can serve as an effective reminder of the importance of conservation. Additionally, tailored interventions that account for demographic variability can enhance the effectiveness of nudges.

In conclusion, this study provides valuable insights into the effectiveness of green nudges in promoting water conservation. By bridging the gap between theory and practice, the research contributes to the growing body of literature on behavioural economics and sustainability. The findings have practical implications for policymakers, educators, and sustainability practitioners, offering a promising strategy for promoting resource conservation in schools and beyond. The study also suggests the need for ongoing efforts to sustain behaviour change. While green edges can initiate changes in behaviour, long-term sustainability requires continuous reinforcement through education and engagement. Schools should incorporate environmental education into their curricula to foster a culture of sustainability among students. Future research should explore the applicability of green nudges in different contexts and among different populations. Expanding the scope of research to include other schools and community settings can provide a broader understanding of the potential of green nudges to promote sustainable behaviors.

References & Annexures

Barker, H., Shaw, P. J., Richards, B., et al.. What Nudge Techniques Work for Food Waste Behaviour Change at the Consumer Level? A Systematic Review. *Frontiers in Psychology*, *9*. (

Bernedo, M., Ferraro, P. J., & Price, M.. The Persistent Impacts of Norm-Based Messaging and Their Implications for Water Conservation. *Journal of Consumer Policy*, *37*, 437–452.

Bosevska, J., & Kriewaldt, J. (2020). Fostering a whole-school approach to sustainability: Learning from one school's journey towards sustainable education. *International Research in Geographical and Environmental Education*, 29(1), 55-73.

Hathy, A., Mithursan, A., & Samaranayake, D. I. J. (2023). Efficacy of Green Nudges on Resource and Energy Conservation: A Systematic Review. *International Conference on Eco Health Nexus (ICEN)*. Rajarata University. http://repository.rjt.ac.lk/handle/123456789/6690

Miranda, J.J., Datta, S. and Zoratto, L. (2019). Saving Water with a Nudge (or two): Evidence from Costa Rica on the Effectiveness and Limits of Low-Cost Behavioral Interventions on Water Use. *The World Bank Economic Review*. doi:https://doi.org/10.1093/wber/lhy025.

Samaranayake, D.I.J and Thennakoon R.S. (2021). Could Behavioural Nudges Improve the Accuracy of Waste Sorting? An Experimental Survey. *Environment and Pollution*. 10(1), 1-14.

Schubert, C.. Green nudges: Do they work? Are they ethical? *Ecological Economics*, *140*, 52–62.

Srikanthan, S., & Jeevasuthan, S. (2021). Stakeholders' Perspective on Water Education Among School Students: A Case Study of Nallur Divisional Secretariat.

Thaler, R. H., & Sunstein, C. R. (2008). Nudge: Improving decisions about health, wealth, and happiness.

Appendix