RESEARCH ARTICLE

Improvement on Waste Segregation Behavior by Verbal and Visual Prompt in Indonesia International Institute for Life Sciences (i3L)

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A B S T R A C T

Sorting waste is seen to be an efficient way to promote recycling and lessen environmental damage. To reinforce the waste sorting behavior, this study observed the impact of verbal and visual prompts intervention in a trained community of a higher education institution, Indonesia International Institute for Life Sciences (i3L). The treatment incorporated volunteers to stand guard beside the canteen waste bins (visual prompt) to instruct every wrong waste separator to remove their waste from the wrong bin to the correct bin (verbal prompt). The intervention was done for four weeks, one hour every weekday from twelve to one p.m. The data collection was done in two ways: via waste observation log during the four weeks of intervention and one precursor week of no intervention; and through questionnaires distributed on the last week of the intervention. The prompt generated a statistically significant improvement in the community's waste sorting behavior, owing to the threat of consequences the verbal prompt posed.

K E Y W O R D S

Pro-environmental behavior; verbal prompt; visual prompt; waste sorting behavior; subjective norm

H I G H L I G H T S

- ❖ Waste sorting behavior can be reinforced in society by verbal and visual prompts.
- ❖ The verbal prompt deters people from inappropriate waste sorting behavior by posing a penalty to remove the trash.
- ❖ The visual prompt serves as an additional reminder of the fear of punishment that is created by the verbal cue.

INTRODUCTION

Sorting waste is seen to be an efficient way to promote recycling and lessen environmental damage (Luo et al., 2020). Waste-sorting, -segregation, or -separation is the classification of waste into separate categories at the point of generation (such as homes, workplaces, or building sites or at the point of collection or dumping (Christensen & Mastufuji, 2011). Public participation in the process is critical, thus awareness and other factors that encourage them to do so are necessary (Wadehra & Mishra, 2018). People who conserve the environment through their actions are said to engage in pro-environmental behavior (PEB) (Krajhanzl, 2010). Informational interventions are one of several intervention approaches to alter human behavior and promote sustainability. Informational interventions are designed to change people's attitudes, awareness, knowledge, perceptions, and social norms that affect people's reasons for engaging in certain

behaviors (Steg & Vlek, 2009). The most popular informational intervention is disseminating information, which is typically accomplished by conducting educational and promotional campaigns. Prompting is another tactic used in the distribution of information (Wan et al., 2019). A spoken (verbal) or printed (visual) message is typically used to remind people to act in a certain manner, such as a poster of types of waste appropriate for each separate bin (organics, recyclables and landfill) which draws individuals' attention to participate in waste sorting practices.

Sustainable waste management techniques are extremely desirable in order to meet realistic economic, environmental, and social goals (Hutner et al., 2017). Since the tertiary education sector is frequently regarded as a significant catalyst for societal shift, higher education institutions (HEIs) are essential in accomplishing the goal of waste management for sustainable development (Zhang et al., 2017). In numerous case studies, Indonesia HEIs' PEB is generally sufficient or low (Mandra et al., n.d.; Utami & Faradiba, n.d.). Consequently, this poses a need for approaches to improve PEB, specifically waste sorting behavior in Indonesian universities. This study will evaluate the effectiveness of the strategy for improving waste sorting behavior in an Indonesian HEI by means of verbal and visual prompts intervention done by volunteers guarding the bins and reminding wrong waste separator.

METHODS

The educational body itself has established mandatory waste sorting at source policy and has briefed the students, staff and tenants on the waste sorting policies and knowledge. In other words, the study is done in a small knowledgeable community. For improvement, the visual and verbal prompt intervention was executed in the cafeteria of the i3L campus for four weeks. There are two methods of data collection used: one by observation log and one by questionnaire.

Observation of the waste separation behavior

The prompts were done by a group of twenty-eight trained student volunteers named 'waste rangers'. The volunteers selected are those with high awareness of waste problems and initiatives in bettering the environment - reflected from their answers to the interview. A representative sample was conveniently assessed from the sole cafeteria of the campus building at the peak hour of 12 to 1 PM on weekdays for four consecutive weeks plus one week of zero intervention before it. For every shift, a pair of rangers took turns staying on guard beside the canteen waste bins (visual prompt). Their task was to direct the wrong waste generators to move their incorrectly thrown waste into the correct bin (verbal prompt). Additionally, rangers need to input data on every waste disposal and the bin it's thrown into before the verbal correction daily. Rangers had to note down every waste type one might bring in hand (e.g., tissue, food waste, plastic bottle, food wrapper, etc), and even constantly noted down repeated disposals. The data recorded were the ones before the waste generators are corrected. The data was collected at the baseline week without intervention (week 0) and weeks of intervention (weeks 1-4). The assessed participants and the waste rangers were uninformed of the ongoing study.

Questionnaire

The observed participants in the final week of the experiment were also given a questionnaire form to assess their waste sorting knowledge change. The questionnaire was distributed by snowball sampling method via the volunteers' social media. Apart from the basic personal information (name, cohort and major for students or N/A for others), the content of the questionnaire was constructed as follows:

Table 1. Questionnaire list of "Waste Ranger Performance Survey"

Questions	Options
Q1. Are you aware of the existence of waste rangers in the canteen?	Yes
	No
Q2. Have you ever been notified by a waste ranger for wrong disposal?	Yes
	No
Q3. Do waste ranger notifications improve your behavior and knowledge in correct waste disposal?	Yes
	No
Q4. Do you think that your waste sorting skill improved this semester?	Yes
	No
Q5. If yes, what causes your improvement?	Waste Ranger
	Others (Please specify)
Q6. Which aspects of the program help you to improve your skill?	(Short answer text)

Data analysis

Data collected from the observation log were processed into percentages of correct disposal (Eq. 1) per day.

$$\% \text{ Correct disposal} = \frac{Number\ of\ correct\ waste\ disposal}{Total\ disposal}$$

Eq 1. The formula of the percentages of correct waste disposal

The daily correct waste disposal percentages were averaged per week and mapped on a chart to show the progressive change over the week. To test whether the prompt intervention has significantly affected the number of correct disposals, a student's t-test was performed using the week 0 and week 4 data, with a significance level of 0.05.

RESULTS

Observation of the waste separation behavior

The study observed a lot of students, a small number of staff and canteen tenants that repeatedly dispose of waste. The daily logged data (see Appendix B) was averaged per week and mapped altogether

(Figure 1). The trend of %correct waste disposal shows an improvement of a total of 15.22% and an average of 3.48% improvement per week. However, a double rise (6.29%) is noted on week four.
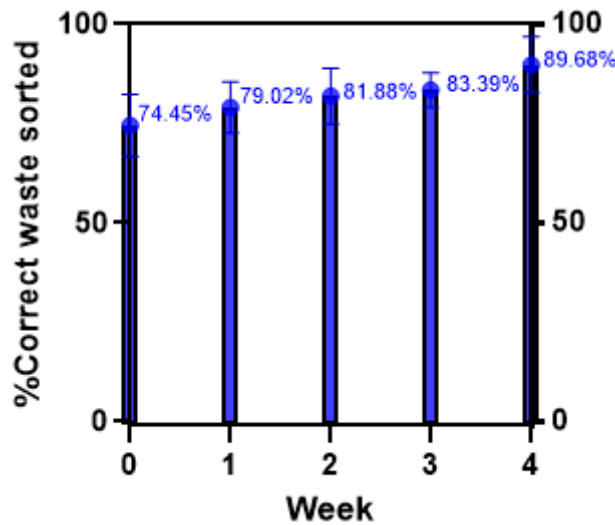

Figure 1. The %correct waste sorting (blue bar) averaged per week recorded on the week without intervention (week 0) and weeks with intervention (weeks 1-4).

Questionnaire

A total of 47 respondents filled out the survey with 97.87% of its respondents being students, while the remaining 2.13% is an academic staff; and no administrative staff and tenants filled the questionnaire (see Appendix C). It revealed that the community is mostly aware of the waste rangers' existence (87.2%), but only three people (6.3%) admitted that they were verbally prompted by the rangers. Following the assertion, these three people claimed an improvement in their waste sorting knowledge. Meanwhile, 78.7% of participants who claimed not to receive verbal prompts, stated that the reason for their knowledge improvement was prompted visually by the presence of the waste rangers next to the disposal bins. The remainder (14.73%) learned by themselves, by the poster, or by socializing with waste rangers outside the observation time.

Student's t-test significance test

The changes that occurred were assessed by measuring the mean difference between week 0 and the last week of the intervention period (Table 2). The one tailed Student's t-test generated a p-value of 0.0069 and confirmed that the waste sorting behavior improved significantly after four weeks.

Table 2. Data Collection Result of %correct waste disposal on the week without intervention (week 0) and last week of intervention (week 4).

Day	Correct Waste Sorting%	
	Pre-intervention (Week 0)	Last week of intervention (Week 4)
1	84.75%	100.00%
2	66.67%	92.16%
3	75.61%	81.25%
4	78.57%	85.51%

5	66.67%	89.47%
Average	74.45%	89.68%

DISCUSSION

Without assistance, the community begins with a sufficient number of 74.45% correct trash disposal. This ample amount may be due to the taught sustainability-related courses, pre-existing waste sorting infographics posters on the bins, or waste sorting socialization given during the freshmen week. The number is constantly increasing, reflecting the community's increasing behavior on correct waste disposal. The verbal prompt approach incorporates a consequence of re-picking up the thrown trash into the appropriate bin. Therefore, increment owes to the act of deterrence posed by the verbal prompt, which aims to prevent a behavior (inappropriate waste sorting) by evoking uncertainty or fear of the consequences of the threat of punishment (Mazarr, 2021), which is to re-pick the trash. This is because individuals have always felt pressure to behave in accordance with how others see them and treat them (Ličen et al., 2016), which in turn deter the community from throwing the waste carelessly while waste rangers are still guarding. This subjective norm emerged due to the evolutionary principle that people who were motivated to maintain group dynamics had a higher chance of surviving (Zeki et al., 2004). Therefore, the best response is to avoid the consequence of social rejection (Eisenberger et al., 2003). The graph shows an average of 3.48% of improvement per week, however, a double increment of 6.29% occurs on week fourth, which may be due to the distribution of the questionnaire that added the waste sorting conscience to the community.

Through informant reports collected via the survey, only 6.3% admitted to being prompted verbally and 78.7% visually, while the rest 14.73% claimed that the intervention did not improve their waste sorting behavior. Following the claim, all of the prompted respondents, either visually or verbally, declare an improvement in waste sorting behavior. However, one issue with questionnaires is that respondents could falsify in order to appear truthful to others. Most people seek to project a good picture of themselves; thus, they may lie or distort the facts to protect themselves from psychological damages like embarrassment (Fraley et al., 2000). And this might be the cause of the low number of verbally reminded responses. This also indicates that people have more tendency to be just visually prompted rather than verbally. Nonetheless, the intervention encourages the community to have more awareness of the duty to perform sorting waste.

At last, the student t-test has been used to show mathematical support for the data by comparing the means of two groups to identify how significant the difference is. In this case, the student t-test was used to compare the changes in waste sorting behavior in week 0 and week 4. The result shows high significance of the intervention (verbal and visual prompt) to the improvement of waste sorting behavior. Thus, it confirms that the intervention is effective to enforce the waste sorting behavior on a small trained community and so it needs to be continued to achieve maximum change - as habits need an average of 66 days to form (Lally et al., 2009). Additionally, knowledge sharing emphasizing the importance of waste sorting is crucial to be carried out, since habits, which are the depictions of stimulus-response linkages, are triggered by context, external factors, or stimuli (Robbins & Costa, 2017). That way, when the individuals have an understanding on the need of waste sorting, the behavior may persist in the future without the surveillance of waste rangers anymore.

CONCLUSION

The visual and verbal prompt intervention successfully improves the waste sorting behavior significantly for an already knowledgeable community. The verbal prompt deters people from inappropriate

waste sorting behavior by posing a penalty to remove the trash. The visual prompt serves as an additional reminder of the fear of punishment that is created by the verbal cue.

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