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Improving Existing Waste Management Practices: Comparing the Effectiveness of Recycling Systems Between a Private International School and a Public School

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Abstract

Despite Taiwan's title as one of the most efficient recycling systems, individual recycling habits contribute to these efficient recycling systems. Despite Taiwan's successful strategy of demolishing waste through incineration, improper recycling at a grassroots level, such as students' municipal solid waste recycling habits, result in recycling contamination, and improper waste recycling could lead to the release of toxic fumes into the atmosphere. This study compares the recycling practices and recycle bin setups of a public school and a private international school to determine important factors that could contribute to decreasing waste recycled improperly. The results show that immediate feedback if a student recycled improperly as well as clear recycling signs were essential factors to decrease recycling mistakes.

Furthermore, the study finds that the amount of time students give to recycling is not an essential factor in reducing recycling accuracy.

Keywords: Recycling; School; Recycling Behavior; Recycling Feedback

Introduction

Despite Taiwan's title as one of the most efficient recycling systems, individual recycling habits contribute to these efficient recycling systems. Proper disposal of plastic municipal waste, such as plastic, is necessary due to Taiwan's strict recycling programs [1]. Many times, if waste is thrown in the wrong bin and there is a lack of proper sorting, the waste in the wrong bin could damage machinery when recycling or lead to recycling contamination. Taiwan, formerly called the "garbage island" due to its large landfills, has resorted to incineration to get rid of waste quickly according to the Rapid Transition Alliance (2019), an international network of organizations. Despite Taiwan's successful system of demolishing waste through incineration, improper recycling at a grassroots level, such as students' municipal solid waste recycling habits, result in recycling contamination, and improper waste recycling could lead to the release of toxic fumes into the atmosphere. Additionally, personal lack of knowledge on how to properly recycle could also contribute to landfills filling up faster as more waste, such as plastic, is disposed of in the incorrect bins or is disposed of illegally which could lead to toxins leaking into the soil (Environmental Protection Agency, 1996). Moreover, recycling programs in both Taiwan's public schools and international schools are relatively similar in that both follow the 4 in 1 recycling system and Waste disposal act of the Taiwanese government [17]. Public schools in Taiwan typically include garbage classification activities during lunch for students while private international schools in Taiwan tend to build recycling skills through posters or in-class learning [1]. Therefore, I will investigate the recycling systems at a private international school and a public school to determine how their respective recycling programs could be improved, as it is essential to form well-developed recycling habits necessary for their future.

Building proper recycling skills in youth is essential for future generations, and schools are central hubs where students gain knowledge and pick up habits that can be applied.

Foundations developed during students' adolescence are vital to fostering practices like recycling for their future. a scientist from Aalto University who studied material sciences, describes that education at a young age and establishing a pro-environment behavior in recycling is essential for the future as stricter recycling targets are expected.

Therefore, helping students understand the importance of recycling and ensuring that students are building a habit of recycling properly is essential to improving the environment.

Multiple trends can be seen in the literature for recycling behavior and habits. Some frequently asked researched topics are determining the relation between recycling bin appearance and recycling practices and how hands-on school projects can influence recycling tendencies.

Additionally, standard methods to assess recycling trends are by directly observing recycling habits and calculating the percentage of times at which waste was actually recycled compared to not recycled [6]. Through this method, researchers can determine recycling trends at schools.

Other commonly researched topics include determining how easy it is to recycle at schools and how education has influenced recycling behavior [9]. These papers often focus solely on one location and, as a result, cannot compare the recycling trends in different areas.

Many broader themes include recycling education, recycle bin setup, and the perceived ease of recycling, and recycling education can induce proper recycling habits. For instance, whether or not students are told if they recycle incorrectly influences their recycling habits at school and home. The way recycle bins are set up has also been a well-researched topic.

Research papers discover how adding recycling bins to more populated areas could increase recycling behavior [6]. Therefore, how bins are set up is essential to how often a person will recycle. Also, the time a person is given to recycling their waste influences recycling behavior too. Recycling takes time in comparison to discarding all waste in the same bin; therefore, waste would frequently be recycled improperly. A study published by Berck finds that having more recycling bins and providing adequate time to recycle are both factors that are vital to increasing recycling. These particular aspects of recycling provide essential insights into how to approach improving recycling habits at schools. These research papers have explicitly discussed how various factors could impact recycling but only in one location.

Therefore, my research question is: How can the recycling programs of a private international school and a public school in the same district in Taiwan be improved? While many studies have targeted factors that will impact recycling behavior, there is a gap in research on how different types of schools, such as private and public schools, can influence the students' consistency in recycling.

Literature Review Recycling Education

Environmental education is a significant factor that influences a student's recycling behavior. Education can take form through multiple media, including schools, television, or social media. A study by Wu and Otsuka (2021) [16], from the Graduate School of Environmental and Information Studies at Tokyo City University determines how pro-climate behavior could be derived from learning sources students absorb at school and on the internet. These researchers used questionnaires to determine through which sources students absorb the most information about the importance of recycling. They realized that action-based activities are the most efficient in encouraging students to take action [16]. While this study was able to use a suitable method to gather information on how students take in and apply knowledge, they could not take into account that the sociocultural aspects of some students who fill out their questionnaires will most likely have contributed to or skewed the responses from the students. They did find that by having students actively participate in recycling, they would be more prone to recycling themselves. In a research paper by [4] from the Department of Psychology at the University of British Columbia, they evaluated whether immediately notifying a student if they made a recycling mistake and helping them learn from their mistakes were influential in developing more vital habits [4]. They had two groups of participants, one that was given immediate feedback if they made a mistake, and one that was not. After determining if there was a correlation between immediate feedback and proper recycling behavior, they found that immediate feedback would enable students that did not have a strong knowledge of recycling to become better at recycling [4]. Another research paper by [1], from the National Taiwan Normal University, and Lee, from the Education University of Hong Kong, reports Taiwan's pre-existing environmental education and how it could be improved. To achieve this objective, they reviewed various published research papers regarding Taiwan's waste management system and education [1]. This study finds that encouraging learning through activities, creating networks to share and advance recycling education, integrating waste management and recycling into the curriculum, giving out rewards for systemic performance, and implementing a whole school recycling education strategy are essential in inducing behavioral change [1]. Although this paper provides critical insight into the best ways in which education can influence recycling, it is an accumulation of other research papers and a summary, not necessarily a new finding.

While all these studies are similar in that they focus on some education, there may also be some slight disagreements in how environmental education should be carried out. Chang and Lee would agree with Luo that environmental education at schools is vital to good recycling behavior [1, 4]. However, while Wu and Otsuka concur with the importance of education, they will emphasize that more interactive and hands-on activities are more efficient in inducing behavioral change than solely teaching students about the importance of recycling [16]. Also, Luo would believe that providing more immediate feedback to students if they make a mistake in hands-on recycling activities would be vital to developing solid skills [4].

The studies reveal the importance of how education could play a role in personal recycling behavior, which is vital to take into account for my research. Since the setting of my study is a private and public school, factors such as education in and out of the classroom could influence student behavior. The studies by Luo and Chang and Lee help bolster the proposition that education plays a vital role in recycling behavior [1, 4]. Wu and Otsuka's findings reveal that hands-on learning is integral to altering recycling behavior [16]. This finding is essential, as each type of school's quality and type of education are different. Activities or lecture-based learning can impact the students' willingness to take action to recycle correctly. Although each study emphasizes how education plays a significant role in encouraging recycling, there remains a gap in how recycling education at different types of schools. These studies have focused on education at one school or the influence of school on adults' ability to recycle. However, it is unclear that this conclusion applies to different types of schools. There was no mention of how different types of schools could potentially lack or have ineffective recycling programs.

Education, such as hands-on recycling activities that provide immediate feedback on students' recycling accuracy influences student recycling habits.

Recycling Bin Setup

While education plays an essential role in influencing recycling behavior, the ways bins are set up and labeled also contribute to how willing people are to recycle-whether that be the clarity of recycle bin signs or the appearance of recycle bins. A study by [6], from the University of Houston-Clear Lake, focuses on how the number and location of the bins affect people's willingness to recycle plastic waste. They implemented 31 observation sessions and used frequency data to determine the percentage of waste recycled in the correct bin [6]. Frequency data enabled them to calculate how often students recycled properly following the changes to where the bins were located. They found out that how the bins are set up and how many there are in shared spaces induce recycling behavior [6]. While the researchers utilized a method that enabled them to gather essential data on how students recycle, they did not consider other factors that could influence how many students were at the locations where they placed the recycle bins. A study conducted by [9], a research associate at the University of Bath, dives deeper into the question of barriers and facilitators of recycling.

This paper uses a qualitative methodology in the school environment by analyzing interviews conducted with students regarding their recycling plastic processes, experiences, and possible ways to improve packaging [9]. They find that the availability of bins and the reduced ambiguity of recycling bin labels could be facilitators of recycling. They also find that food packaging could be improved by clarifying what types of containers could be thrown in which bins [9].

While this study was able to determine how students at that particular school felt about what could be improved about the recycle bins, researchers struggled to find students who understood local recycling policies and had the motivation to recycle. Additionally, a study by [7], from the Department of Developmental and Social Psychology of the Sapienza University of Rome, explores how dispositional factors of recycling bins could influence recycling skills. They used measuring instruments, participants, and statistical analyses to determine how ambiguity could reduce recycling skills. Specifically, they found out that due to closure, defined as a desire for a firm answer, many do not recycle as they do not prefer throwing waste in ambiguously labeled bins. In the end, they discovered that reducing the ambiguity of the recycling bins could increase proper recycling [7]. However, since they were evaluating individual traits, they realized that other factors, such as social norms, also influenced their results and became relevant when considering perceived and actual skills.

All of the studies' authors would agree that current recycling programs could be improved by decreasing the ambiguity of bin labeling. However, O'Connor and Roy would agree that, in addition to reducing ambiguity, the increased number of recycling bins should also be used because this would increase the convenience of recycling [6, 9]. Each study presents a unique perspective as each focuses on various groups.

For example, Passafaro and Livi focused on Italian cities with household recycling systems, while [6], studied recycling habits at a particular school [6, 7]. The studies reveal the importance of bin setup and labeling in inducing personal recycling behavior, which is vital to take into account for my research. Each school would have a different number of recycling bins in its cafeteria, so determining how each school labels its recycling bins, how many bins are set up, and where the bins are located are essential factors influencing recycling behavior. Some strengths of the studies are that each focused on multiple factors and how they could connect (such as social norms). However, some weaknesses are that the methodologies that are used, such as questionnaires for participants, are not necessarily the most reflective of recycling action, as many of the responses would only reflect perceptions of recycling and planned activity, not necessarily accurate action participants would take. Therefore, bin setup is essential to better understand factors that could influence students' recycling behavior, as ambiguous bins could lead to students throwing trash in the wrong bins and a lack of recycling bins would cause students to decrease their recycling due to lack of convenience.

Policies on Recycling Time

Another important theme to keep in mind is policies on recycling time offered to students. A study by [10], a researcher from Gebze Technical University, dives deeper into how research and social norms could increase recycling. This study observed Eco-schools, a program for environmental management and certification, and utilized questionnaires and asked students questions such as whether they thought that there are enough recycling bins at school and then compared the results to the school's policies regarding recycling [10]. They find that while schools from all different development levels could participate in the Eco School program, not all could achieve the policies. Additionally, a study by [5], a researcher from the Department of Science & Technology Education, University of South Africa, studied the policies at school that exist and how socioeconomic factors could influence the ability of elementary schools to carry out such policies [5]. Mkhonto used quantitative data by having students participate in hands-on activities that supported government policies on the necessity of environmental education [5]. This paper finds that through interactive activities, government policies on recycling could be followed; ultimately surpassing the challenges that socio-economic factors may bring. Moreover, a research paper written by [8], a researcher under the government of the Philippines, utilizes quantitative data to determine the effectiveness of schools practicing solid waste management to determine how well schools follow governmental policies. They used a paired t-test to compare the means between a public and private school to see whether they followed the RA 9003 SWM, a policy on solid waste management in the Philippines [8]. Romualdo finds that while both schools follow the government policies by having environmental education in their curricula, there was a lack of proper recycling habits and schools should put more effort into changing that [8].

These researchers are all interested in how factors such as recycling policies, could encourage more people to recycle. All of these authors would agree that both policies on the national and educational levels are essential in inducing improvements in recycling behavior.

Kayihan and Mkhonto agree that having students better understand how to recycle appropriately through hands-on recycling activities helps schools achieve both governmental policies [10, 12]. While Romualdo would agree with these researchers, Romualdo finds that many other factors, such as the amount of time given to students for recycling during their lunchtimes, also play a role in proper recycling habits [8]. Understanding how policies could be changed to influence social norms in recycling is essential to encourage recycling. While multiple studies focused on households and government policies, some of the successful strategies that schools could implement the governments utilized to establish proper recycling practices at a young age.

Materials and Methods

Participants and Setting

I provided no information to students or employees about the existence of a recycling research study, except for the few administrative employees who initially approved the project. While each school provides a unique experience for its students, there is no doubt that the two schools' settings and cultures are different. To better understand each school's academic system and culture and gain greater insight into the school. I looked through the curriculum of each (international and public school) to see if any factors near the recycling bins could influence the students' behaviors and found that both schools had classes tailored towards the environment. I also took note that the population of the high school section of each school, with the private international school having a greater population than the public school and with the private international school having more posters around school about the importance of recycling. I also observed the quantity of environmental clubs at each school that could have an influence on recycling. The private international school had more environmental clubs and posters up on schools while the public school did not have any posters up. While I was doing the study, I considered how these factors could influence the students' recycling behaviors.

Design and Conditions

After reading about the importance of recycling bins set up in recycling behavior in O'Connor's study, I decided to follow O'Connor's study on evaluating bin setup with recycling behavior [6]. O'Connor also sorted their methods by factor and utilized time slots and line graphs to assess their results [6]. Since recycling could also be influenced by factors such as the setup of recycling bins, I analyzed the waste bins' configuration and appearance by looking at the color of each school's bins and the clarity of the bins' signs to indicate which type of trash is put where. I will be analyzing recycling behavior at recycle bins that students use during their lunch times.

With these common aspects of recycle bin setup, I can easily see which factors are beneficial to effectively recycle bin setup and which characteristics may not be as successful. Each data collection session was completed in one hour and 15 minutes. I did four observation sessions for each school and I also held two days of data collection per school. The two sessions I collected data from are 11:20 am - 12:35 pm and 12:35 pm - 1:50 pm for the private international school. For the public school, I collected data from 12:35 pm - 12:47 pm and 12:47 pm - 1:00 pm because students were allocated that period to recycle their trash. I determined the proportion of waste recycled improperly by dividing the amount of trash thrown away incorrectly by the total amount.

Response Measurement and Interobserver Agreement

First, I took a picture of the cafeteria and used a camera to record a video of each data collection session for each school. Then I observed how often students appropriately recycled and not properly (separated into two categories). I created a spreadsheet to analyze the data and split it into multiple sections (plastic in the wrong container, plastic in the correct container).

Then, I calculated how much plastic was recycled correctly among all the trash thrown in that particular period. With the determined percentage, I would directly check each school's bin setup (whether it has a colorful bin or descriptive sign) to see what type of bin setup was more efficient. Then, I found the proportion of waste recycled improperly at each school and the waste recycled improperly during each session. To analyze my data in the end, I made percentage graphs as seen in Figure 1 to determine whether each school's policy on time plays a role in students' recycling behavior. Besides the percentage graphs, I utilized two sample z-tests for the proportions of my two groups to determine if there was a significant difference according to the test. Then I will use common aspects of recycle bin setup to easily determine which factors were beneficial to effectively recycle bin setup and which characteristics may not be as successful (see Chart 1).

Data Analysis Methods

I analyzed my data by utilizing a significance test and charts (see Chart 1) to determine aspects of each school that contributed to proper recycling habits. I chose this methodology after reading Romualdo's study that compares the recycling statistics between public and private schools through a statistical significance test [8]. While Romualdo used a statistical T-test to compare means, I used a z-test for proportions to compare proportions to see if statistical significance existed [8]. I organized my data by qualitative and quantitative and portrayed them through charts and a line graph. Charts like Chart 1 are methods I used to analyze possible factors influencing students' recycling behavior.

	Private International School	Public School
Condition 1: colorful bin		
Condition 2: descriptive sign		
Condition 3: Recycling Feedback		

Chart 1: Example of Chart used for Qualitative Data

Note. An example chart compares the bin setups of the private international school and the public school to determine which factor impacts a higher percentage of recycled waste. In this case, we can see that the lack of a descriptive sign may be the most significant reason for less recycling.

Results

Raw Data

The charts below display the quantitative data I collected at each respective school. I utilized these data to determine the proportion of students who recycled incorrectly at each school.

Public School			
Session 1 (12:35pm-12:47)			
Day 1		Day 2	
Right bin	Wrong bin	Right bin	Wrong bin
58	5	60	4
Session 2 (12:47-1:00 pm)			
Right bin	Wrong bin	Right bin	Wrong bin
70	7	80	10

Chart 2: Count Data of waste recycled properly and improperly for the Public School

Note. Displays the count data of the amount of waste appropriately recycled and improperly for the public school in day one session one, day one session two, day two session one, and day two session two.

Private International School			
Session 1 (11:20 am-12:45 pm)			
Day 1 (2/9)		Day 2 (2/11)	
Right bin	Wrong bin	Right bin	Wrong bin
67	17	51	10
Session 2 (12:50 - 1:50)			
Right bin	Wrong bin	Right bin	Wrong bin
65	20	62	15

Chart 3: Count Data of Waste Recycled Properly and Improperly for the Private International School

Note. Displays the count data of the amount of waste appropriately recycled and improperly for the private international school in day one session one, day one session two, day two session one, and day two session two.

Quantitative Analysis

Before comparing the facets of recycling for each school, I conducted a two-sample z-test from proportions to test for significance between the private international school and the public school. The following calculations were utilized to determine a p-value necessary to determine if there is a statistical significance between the two schools. After the calculations, I concluded that there was a significant difference because the p-value of p-value = 4.16E-5 was less than the α value of 0.05.

Calculations for the 2-sample z-test for Proportions

I used data from Chart 1 and Chart 2 to determine the proportion of students who recycled improperly at the private international school and the public school.

Null hypothesis: $p_1 - p_2$

Alternative hypothesis: $p_1 - p_2 > 0$

Where p_1 = the proportion of students who recycled inaccurately in the private international school

p_2 = the proportion of students who recycled inaccurately in the public-school Conditions of randomness, independence, and normality are satisfied.

$$z = \frac{(\hat{p_1} - \hat{p_2}) - (p_1 - p_2)}{\sqrt{\hat{p_c}\left(1 - \hat{p_c}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}(0.202 - 0.0884) - 0}$$

$$= \frac{(0.202 - 0.0884) - 0}{\sqrt{0.146(1 - 0.146)\left(\frac{1}{307} + \frac{1}{294}\right)}}$$

$$= 3.935$$

P-value= 4.16E-5

Since the p-value of 4.16E-5 is less than the α value of 0.05, I rejected the null hypothesis. There is convincing evidence that the proportion of students who recycled incorrectly is less in the public school than in the private international school.

The calculation above is a sample calculation utilizing a two-sample z-test to determine that there is a significant difference between the private international school and public school. This calculation was also utilized to determine if the first session was significantly less than the second session for each school to see if time policies at school are a factor in influencing student recycling behavior.

Time Policy Influence

Then to determine how time played a role in the recycling accuracy of students, I created a recycling accuracy percentage graph that reflects recycling accuracy throughout the times to determine how time policies at each school play a role by observing the increasing trends as seen in Figure 1. I calculated the percentage of waste that was recycled in the wrong bin by calculating the number of trashes placed in the wrong bin and dividing that by the number of total trashes thrown away (see Chart 1). I then created a graph that compares the percentage of waste recycled improperly at each school along with the percentage recycled improperly for session one and session two. To determine the specific percentages, I found the average of the proportions of day one and day two for session one and session two.

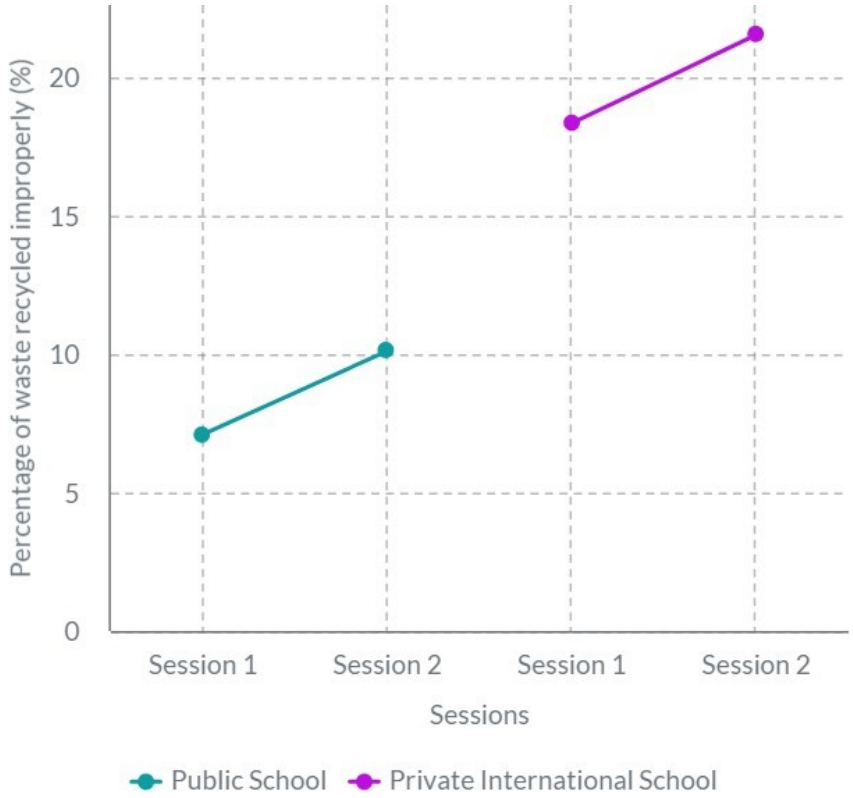

Figure 1: Proportion of Improper Waste for Two Sessions at Each School

Note. A percentage line graph that portrays the waste recycled improperly in the two sessions for each school.

As seen in Figure 1, there is an increase in the percentage of waste recycled improperly for session two in comparison to session one. While this graph shows that the proportion of students who recycled incorrectly at the private international school was greater, this graph also reveals that as the lunch period ended, more students were recycling incorrectly for both the private international school and the public school. To determine if there was actually a significant difference between the two sessions of each school, I performed a z-test for proportions between the two groups and found that there was no significant difference between the two lunch periods. Therefore, the time given to recycling did not really impact students' recycling habits in these two schools.

Qualitative Observations

To determine factors that could influence recycling behavior, I created a chart (see Chart 4) like the sample chart (see Chart 1) to compare the observed similarities and differences between the private international school and public school.

	Private International School	Public School
Condition 1: colorful bin		
Condition 2: descriptive sign		
Condition 3: Recycling Feedback		

Chart 4: Comparing Bin Color, Sign Descriptiveness, and Recycling Feedback

Note. Green shows that the condition was satisfactory and red indicates that it was not satisfactory.

Bin Setup and Recycling Feedback at each school

To record what the recycle bins at each school looked like, I took pictures of the recycle bins at each school (see Figure 2 and Figure 3).

Figure 2: Image of Recycling bins at the Public School

Note. Signs on each bin from left to right are in the following order: empty containers, tetra pak, meal box, plastic bottles, cans.

Figure 3: Image of Recycling bins at the Private International School

Note. Signs on each bin from left to right are in the following order: food only, ordinary trash, metal cans and tetra pak, and plastic.

After determining that there was a significant difference between the two schools, I observed how the recycling bin is set up (color and description of the bins) at each school and whether feedback was given to students if they accidentally recycled incorrectly. Specifically, recycling instruction refers to whether someone would indicate to a student to let them know if they recycled incorrectly.

The public school's recycle bins were not colorful, but quite clear in their description (see Figure 2). They also had specific students appointed to be a manager for recycling to give recycling instructions and to ensure that everything recycled was going into the right bin. During their recycling sessions, students will bring their waste from the classroom outside to throw their classroom's waste during their allocated time. Students who threw their trash in the wrong bin would be told that they threw their bin in the wrong bin and the recycling managers would take the trash placed incorrectly and place it in the right bin. The private international school's recycle bins were colorful and quite clear except for the ordinary trash bin (see Figure 3). I observed that many students often recycled the plastic into the ordinary waste bin because they did not understand what ordinary trash means. There were no recycling instructions, but staff would come to the bins every few minutes to look through the trash bins and organize the waste into the correct bin if the student put their trash in the wrong bin.

Discussion

Bin Setup

Regarding bin setup, color was not an impacting factor, but how clear the descriptions of the bins were quite substantial. For instance, the description of the public school's bins specifically indicated the type of material, such as plastic, or tetra pak (see Figure 2 and Figure 3). However, for the private international school, while most of the bins were clear, there was some confusion about whether plastic should be thrown away in the ordinary trash bin or the black plastic box bin. This lack of clarity in recycle bin signs could be improved upon whether that is through providing some pictures to clarify what is recycled in the ordinary trash bin. This finding can also be supported by Roy's conclusions on how the ambiguity of recycling bin signs could immensely reduce the rate of proper recycling [6]. Adding pictures to recycle bins or being more descriptive of the signs could reduce ambiguity. By reducing ambiguity, the amount of waste that is appropriately placed would be able to increase significantly.

Recycling Education

The public school had students who were responsible for ensuring that students were recycling correctly. While some students made some mistakes with recycling, the recycling managers standing there served as peer pressure for students to recycle properly. In contrast, private international school had staff helping them sort trash and were frequently not told if they were recycling incorrectly. The distinction between students being aware of their recycling habits and the lack thereof could result from the difference between public and private schools. This result is supported by Luo's research paper on determining if immediate feedback if a student made a mistake in recycling could improve their recycling habits [4]. This is also seen in my research because the public-school students were immediately told if they made a mistake in recycling, while the students at the private international school were not immediately informed. This result is also supported by [13], from the Federal University of Rio de Janeiro, as he emphasizes in his research that public schools may instill essential habits like proper recycling as students recycle trash by themselves at home. This finding is also supported by [4]. because they found that providing students feedback about their recycling habits actually helped them learn quickly and improve their recycling accuracy [4]. The public school has a statistically significantly lower proportion of students who recycled incorrectly and had students who immediately gave them feedback if they recycled improperly there is a possibility that this is one of the main contributing factors to the higher recycling accuracy of the public school.

Policies and Convenience

As seen in Figure 1, the graph shows that there was an increase in waste recycled incorrectly towards the end of both of the school's lunch periods. While this graph reveals that

students are prone to make mistakes in recycling perhaps due to time constraints and the need to return to class, there is no significant difference after I performed the z-test for proportions.

Domina and Koch from Central Michigan University finds that time influences recycling behavior. My finding does not align with Domina and Koch's study about how convenience and time influence recycling accuracy [2]. While there is no alignment with that study and my results do not indicate that time is a crucial factor in recycling, it is still possible that recycling accuracy could increase if students were given more time to recycle. Perhaps a reminder to recycle a few minutes before the end of the lunch period could help students become more aware of their recycling habits, preventing time and convenience from being a factor in reducing recycling accuracy.

Conclusion

This study contributes to the field as there have yet to be any studies that focus on the different factors in recycling at different schools. This study is imperative in opening a window that reveals the difference in recycling habits between a local school and a private school. By understanding this difference, new methods of recycling at schools could be implemented to improve recycling at other schools. Additionally, factors that I observed support findings by other researchers and therefore also emphasize that individual characteristics, such as clarity in recycling signs, should be taken into account for improving school recycling programs.

Despite being able to contribute to the field, the study incorporates a variety of limitations. For instance, the sample size could be much larger to increase the statistical significance and decrease the standard error. Another limitation is that I did not directly manipulate the environment around me to test variables and instead conducted an observational study due to policies prohibiting me from altering the bin set up at the public high school. Moreover, this study took place in Taiwan, meaning the recycling trends I observed can only be applied to some locations. However, the observations on how each school recycles can provide insight into new ways schools could improve their recycling methods.

Many studies can be done to build off of this research. Another study that could be conducted is observing the environmental education classes at each school and determining how the quantity of these classes influences the students' recycling habits at school. While culture plays a significant role in the atmosphere around schools, I did not get a chance to dive deeper into how a school's culture and ethnic makeup of a school could influence recycling behavior. Therefore, a study on how the ethnic makeup of the school and the culture of the school could affect students' recycling behavior. This study only serves as the beginning as the field of improving student recycling habits could be researched much more.

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Conflict of Interest

The author declares no conflict of interest.

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