

THE EFFECT OF WASTE MANAGEMENT EDUCATION ON FLY DENSITY IN THE SCHOOL ENVIRONMENT OF THE MEDAN SUNGGAL ISLAMIC COLLEGE FOUNDATION FOUNDATION

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Abstract

The problem of waste in the school environment can increase the density of flies as a vector of disease transmission. This study aims to analyze the influence of waste management education on students' knowledge and describe the density of flies in the Sunggal Islamic College Foundation. The research uses a quantitative method with a pre-experimental design through a one group pretest-posttest approach. The sample amounted to 40 grade IX students who were selected by purposive sampling. Data was collected using questionnaires to measure knowledge before and after education as well as observation of fly density at several points in the school environment. Data analysis was carried out univariate and bivariate using the Wilcoxon test with a significance level of $p < 0.05$. The results showed that the proportion of students with good category knowledge increased from 70.0% to 92.5% after education. The Wilcoxon test produced a p-value of 0.005 which shows a significant influence of education on improving student knowledge. Observations showed that the highest density of flies was in the canteen and garbage can areas after breaks, while the field area remained low. Waste management education has been proven to be effective in increasing student knowledge and supporting the creation of a cleaner and healthier school environment.

Keywords: Education, Waste Management, Fly Density, Knowledge, School Students

Introduction

One of the big problems experienced by big cities in Indonesia is waste. Globally, about 19% of the number of deaths from infectious diseases can be attributed to inadequate basic sanitation conditions, as well as environmental risk factors and unhygienic behavior. According to data from the 2021 National Waste Information System (SIPSN), the City of Medan produces 645,012.56 tons of waste per year. In 2022, the waste pile in Medan City decreased to 628,749.22 tons per year. According to Law No. 18 of 2018, waste is the remnant of human daily activities and/or natural processes in solid form. Waste management is all activities carried out to handle waste from incursion to final disposal ⁽¹⁾.

The problem of littering in Medan City has become a significant issue in recent years. The city generates about 2,000 tons of waste every day, but only 13% of the total is effectively managed, while 800 tons end up in landfills and the rest, which amounts to 1,200 tons or about 60%, is not properly managed. Organic waste dominates the composition of waste in Medan with a percentage of 61.35%, followed by plastic waste at 14.7%, paper at 8.2%, and the rest in the form of fabric, wood, glass, and other materials ⁽²⁾. The high volume of unmanaged waste worsens environmental conditions, especially schools with the habit of students who still throw garbage carelessly.

Waste with a high organic content can invite one of the vectors that carry diseases, namely flies. Prajaningtyastiti and Pawenang (2023) stated that flies are one of the vectors of disease transmission that can spread disease-causing germs from garbage to people or food ⁽³⁾. Several species of flies are the species that play the most role in public health problems, namely as vectors for disease transmission. Flies are a type of insect whose life cycle consists of four different phases, namely eggs, larvae, pupa, and adult flies. In a single egg, a fly is able to release 1,200–1,500 eggs. Most flies remain within a radius of 1.5 km from their breeding grounds. Flies sustain their lives by being attracted to foul odors that lead flies to seek out dirty places as food sources ⁽⁴⁾. Unclean environmental conditions and the accumulation of organic waste can increase the density of flies so that the risk of spreading diseases is also higher.

The accumulation of waste in the environment can be avoided by applying the 5R principle (reduce, reuse, recycle, replace, and replant). Within schools, the application of the 3R concept (reduce, reuse, and recycle) has been developed into the 5R concept. 5R (Reduce, Reuse, Recycle, Replace, and Replant), which emphasizes reduction, reuse, recycling, replacement with environmentally friendly goods, and replanting ⁽⁵⁾. The application of the 5R principle in the school environment is expected to reduce the amount of waste generated and increase the awareness of school residents on the importance of maintaining environmental cleanliness.

Waste management procedures based on the Indonesian National Standard Concept issued by the Ministry of Public Works include waste containerization, waste collection, waste removal, waste transportation, processing, and final disposal. Waste management begins with the collection of waste from school waste sources to prevent scattered waste and facilitate the collection process. The waste collection process is an activity of collecting waste from various sources and waste storage to then be loaded into transportation vehicles so that it can be transported to the Final Disposal Site (TPA) ⁽⁶⁾. Waste management that is not done properly can cause environmental pollution, cause unpleasant odors, and become a breeding ground for various disease vectors such as flies. Therefore, good and sustainable waste management is needed in the school environment to create a clean, healthy, and comfortable environment for all school residents.

Environmental health education is one of the important promotive efforts in increasing knowledge and forming good waste management behavior in the school environment. Secondary school, especially at the junior high school (SMP) level, is a crucial period in the formation of students' values, attitudes, and behaviors towards ⁽⁷⁾. There are many factors that cause the sanitation and cleanliness of the school environment to be not good, one of which is the low level of student knowledge about the impact of poor sanitation and environment, so that students do not feel concerned about the school environment ⁽⁸⁾. Students who have good knowledge of waste management tend to be better able to sort waste, dispose of waste in its place, and reduce the accumulation of organic waste that can be a breeding ground for flies. Therefore, education about waste management needs to be carried out on an ongoing basis as a strategy to create a clean, healthy school environment, and support the prevention of environmental-based diseases.

Based on the results of the initial observations that we have made at the Sunggal Islamic Education Foundation, there are still several problems in waste management, such as the presence of waste mixed between organic and inorganic waste, garbage cans that have not been used optimally, and the accumulation of waste at several points in the school environment. This condition has the potential to become a breeding ground for flies that can interfere with the comfort and health of school residents. In addition, the knowledge of school residents about good waste management still needs to be improved so that educational efforts are needed to support more effective waste management.

Method

This research is a quantitative research using a pre-experimental design approach, namely the one group pretest-posttest design method. In this study, respondents were given a pretest to find out the initial level of knowledge about waste management against fly density, then education or counseling, and then given a posttest to find out the increase in knowledge after being educated.

This research will be carried out at the Sunggal Islamic Education Foundation in 2026. The population in this study is all grade IX students in the school environment. The sampling technique uses purposive sampling, which is the selection of respondents based on certain criteria that are in accordance with the purpose of the research. The sample in this study amounted to 40 students who were willing to become respondents, participated in a series of educational activities, and filled out complete pretest and posttest questionnaires.

Variable measurements were carried out using a knowledge questionnaire about waste management and observation of fly density in the school environment. Questionnaires are used to measure students' knowledge levels before and after being educated. The knowledge assessment is categorized into good, adequate, and poor categories based on respondents' answer scores.

Observation of fly density was carried out at several points in the school environment using a simple tool, namely a paper glue trap on the surface of cardboard by placing it for 8 minutes at several points, namely canteens, public garbage cans, and fields, before and after break hours. The density of flies is categorized into low, medium, and high based on the results of field observations.

The data from the research results were analyzed univariate and bivariate and presented in the form of narratives and frequency distribution tables. Bivariate analysis was carried out using the Wilcoxon test to determine the effect of waste management education on improving student knowledge, with a significance level of $p < 0.05$.

Results

Table 1. Frequency Distribution of Respondents by Characteristics

Features	Frequency	Percentage %
Gender		
Male – Male	20	50
Women	20	50
Classes		
9	40	100

Based on the results of the study, it is known that the number of respondents is 40 people. The distribution of respondents by gender showed that male respondents amounted to 20 people (50%) and female respondents also amounted to 20 people (50%). This means that the number of male and female respondents in this study is balanced. Furthermore, based on class, all respondents came from grade 9, namely 40 people (100%), so it can be concluded that this research was completely carried out on grade 9 students.

Table 2. Distribution of Respondent Frequency Based on Knowledge Before and After Being Provided with Education on Waste Management in the Face of Fly Density at MTs Islamiyah Sunggal

Knowledge	Pre - test		Post test	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Good	28	70.0	37	92.5
Enough	9	22.5	3	7.5
Less	3	7.5	0	0.0

Based on the results of the pre-test, the knowledge level of the majority of respondents was in the good category, namely 28 people (70.0%). Furthermore, respondents with sufficient category knowledge amounted to 9 people (22.5%), while the underserved category amounted to 3 people (7.5%). After the intervention/counseling (post-test), there was an increase in the respondents' knowledge. In the post-test, respondents with knowledge of the good category increased to 37 people (92.5%). Meanwhile, the category is quite decreasing to 3 people (7.5%), and the less category to 0 people (0.0%). This shows that there is an increase in respondents' knowledge after being given the intervention, which can be seen from the increase in the percentage of good categories and the loss of poor categories in the post-test.

Table 3. Analysis of Knowledge Changes Before and After Being Provided with Education on Waste Management in the Face of Fly Density

Data Type		Mean Rank	Sum of Ranks	P-Value
Post test Knowledge	Negative Ranks	5.50	5.50	0.005
Pre test Knowledge	Positive Ranks	6.59	72.50	

Based on the results of the Wilcoxon test, a p-value = 0.005 was obtained. Because the p-value is less than 0.05 ($0.005 < 0.05$), it can be concluded that there is a significant difference between the knowledge before (pre-test) and after (post-test) intervention/counseling is carried out. In the table, it can also be seen that the Positive Ranks score has a Sum of Ranks of 72.50 with a Mean Rank of 6.59, while Negative Ranks has a Sum of Ranks of 5.50 with a Mean Rank of 5.50. This shows that most respondents experience increased knowledge in the post-test compared to the pre-test, because the value of positive ranks is greater than negative ranks.

Table 4. Changes in the Number of Flies Density at Multiple Observation Points Before and After Rest Hours

Dot	Before Istiraharat Hours	After Break
Canteen	15 Flies	25 Flies
Public Trash Can	18 Flies	28 Flies
Field	5 Flies	6 Flies

Description of Flies. Low : 5 – 10 Flies, Medium : 10-20 Flies, High : > 20 Flies

Based on the table, the conditions in the canteen changed from moderate before the break to high after the break time. In public garbage cans, conditions also increased from medium to high. Meanwhile, in the field, conditions remain low both before and after the break.

Discussion

Knowledge Level Before and After Waste Management Education

Based on table 2, it is known that the level of knowledge of respondents before being given education about waste management against fly density is mostly in the good category, namely as many as 28 respondents (70.0%). However, there are still 9 respondents with a sufficient level of knowledge (22.5%) and 3 respondents (7.5%) with a lack of knowledge. These results show that before the counseling was carried out, some respondents already had an understanding of waste management and its relationship with fly density, although it was not entirely optimal. The lack of knowledge in some respondents can be influenced by the lack of information, lack of environmental health education, and low awareness of the impact of waste on the development of flies as a vector of disease.

After being given education or counseling, there was an increase in the level of knowledge of the respondents. This can be seen from the increase in the number of respondents with the good knowledge category to 37 respondents (92.5%). In addition, the number of respondents with the category was quite low to 3 respondents (7.5%), while the less category was no longer found (0.0%). This increase shows that the education provided is able to increase respondents' understanding of the importance of waste management in controlling fly density in the school environment. The approach applied in counseling includes lectures, questions and answers, and pre-post test evaluations. The results of this study are in line with the research of Faizah et al. (2025) which shows that health counseling on waste management is able to significantly increase students' knowledge ⁽⁹⁾. The increase occurred because the direct delivery of material made it easier for students to understand the information provided, especially related to the importance of maintaining the cleanliness of the school environment.

In addition, the research of Auliana et al. (2025) also explains that increasing students' knowledge about waste management is related to increased awareness in maintaining the cleanliness of the school environment and better waste sorting behavior ⁽¹⁰⁾. This shows that health education has an important role in shaping clean and healthy living behaviors in the school environment. This increase in knowledge is also supported by theories in Health Education & Promotion which states that the level of education can affect a person's ability to receive and understand new information. The better a person's level of education, the easier it is for health information to be received and understood.

Based on these results, health counseling has been proven to be effective in increasing students' knowledge about waste management, which is ultimately expected to reduce fly density and create a cleaner and healthier school environment.

Fly Density in the School Environment

Based on the results of the analysis with the Wilcoxon test in table 3, a p-value of 0.005 (<0.05) was obtained, so it can be concluded that there is an influence of waste management education on increasing students' knowledge about waste management. So it can be concluded that waste management education has an effect on increasing students' knowledge about waste management. The findings of the study also indicate that the value of positive ranks is higher than the value of negative ranks, which means that the majority of respondents experience an increase in knowledge scores after receiving education. The increase in knowledge indicates that the counseling carried out can increase students' awareness of the importance of waste management to maintain the cleanliness of the school environment and prevent the emergence of flies as vectors for spreading diseases.

The results of this study are also supported by the research of Pradani, et al. (2025). It shows that education about waste management can improve community knowledge, attitudes, and behaviors after being given an educational intervention with a significance value of 0.000. Education delivered directly

can increase people's awareness of the importance of maintaining environmental cleanliness and preventing the risk of diseases related to the environment.

In addition, research by Angraini, et al. (2024) also indicates that educational media about waste management is effective in increasing students' understanding of waste management in school areas. A good understanding of waste management can form an attitude to maintain environmental cleanliness so that it can reduce the fly population in the school area ⁽¹¹⁾.

Therefore, waste management education has an important role in increasing student knowledge and supporting the creation of a cleaner and healthier school environment. A clean environment and minimal accumulation of organic waste can help reduce the risk of fly breeding as a disease vector in the school environment.

The Effect of Waste Management Education on Fly Density

Based on table 4 of the observations, there was an increase in the level of fly density in the canteen area and public garbage cans after the break time. Before the break time, the level of fly density in both locations was in the medium category, while after the rest hour increased to the high category. Meanwhile, in the field area, the level of fly density remains in the low category both before and after the rest time. This condition shows that student activities during break hours affect the increase in the number of flies, especially in locations where there are food scraps and organic waste. The increase in fly density in the canteen area occurs because after rest there is a buildup of food scraps, drinks, and organic waste that are a source of food and a breeding ground for flies. Public garbage cans also experience an increase in fly density due to the large amount of garbage that accumulates and produces an unpleasant odor that can attract flies. Waste management in schools requires special attention, because there are still many students who throw garbage carelessly. Inadequate bin facilities, as well as a lack of sorted bins, make the situation worse. Daily lunch activities in the canteen have the potential to cause the accumulation and mixing of waste ⁽¹²⁾.

The results of this study are in line with the research of Wowor et al. (2024) which states that the accumulation of organic waste can be a breeding ground for flies, thus affecting the level of fly density in the surrounding environment. In addition, Hutasuht's (2022) research also showed that locations with poor sanitation conditions and a lot of wet garbage have higher levels of fly density ⁽¹³⁾.

In the field area, the level of fly density remains low because the area is an open space where there is no accumulation of garbage or food waste. Cleaner and less humid environmental conditions cause flies not interested in landing or breeding in the location. This shows that the existence of organic waste and environmental cleanliness have a close relationship with fly density.

Conclusion

This study shows that waste management education has an effect on increasing student knowledge at the Sunggal Islamic Education Foundation. This is shown by the increase in the percentage of respondents with the good knowledge category from 70.0% in the pre-test to 92.5% in the post-test, with the results of the Wilcoxon test obtaining a p-value of 0.005 ($p < 0.05$).

In addition, the observation results showed that the density of flies increased after rest hours in the canteen area and public garbage cans, while the field area remained in the low category. Based on these results, waste management education is effective in increasing student knowledge and supporting the creation of a cleaner and healthier school environment.

References

- [1] Anggraena V, Alwiah SS, Purnamawati N, Mildawati R, Harmiyati. Penyuluhan Tentang Pengelolaan Sampah Menjadi Produk Yang Bernilai GunA. *Abdimas Galuh*. 2024;6(2):2225–31.
- [2] Banjarnahor J, Gultom SM, Lahera LB, Belinda M, Nainggolan R, Fisika P, et al. Efektivitas Penerapan Hukum dalam Penanggulangan Sampah Sembarangan di Kota Medan: Sebuah Studi Literatur. *Jinu* [Internet]. 2025;2(1):28–44. Available from: <https://doi.org/10.61722/jinu.v2i1.3129>
- [3] Rochma Prajaningtyastiti A, Tunggul Pawenang E. Pengelolaan Sampah dengan Tingkat Kepadatan Lalat pada Tempat Penampungan Sementara (TPS). *Higeia J Public Heal Res Dev* [Internet]. 2023;7(1):55–66. Available from: <http://journal.unnes.ac.id/sju/index.php/higeiahttps://doi.org/10.15294/higeia.v7i1.56198>
- [4] Bialangi S, Irwan, Mokodompis Y. Gambaran Kondisi Sanitasi Lingkungan, Kualitas Fisik Dapur, Dan Kepadatan Lalat Di Kantin Universitas Negeri Gorontalo. *Miracle*. 2025;2(1):1–15.
- [5] Sudiyanto IW, HS SM. Strategi Penguatan Bank Sampah dalam Implementasi Zero Waste di Indonesia: Pendekatan Berbasis Studi Literatur. *J Multidisiplin West Sci*. 2025;4(02):178–92.
- [6] Soro SH, Dermawan H, Nurwulan TR, Ariani BS. Peran Sekolah Untuk Mendorong Partisipasi Siswa dalam Pengelolaan Sampah Melalui Program GAMES (Studi Kasus di SLB Muhammadiyah Kota Bandung). *EDUKASIA J Pendidik dan Pembelajaran* [Internet]. 2024;5(1):2209–18. Available from: <https://www.jurnaledukasia.org/index.php/edukasia/article/view/1234>
- [7] Prasetyo E. Membangun Kesadaran Lingkungan Melalui Edukasi Pengelolaan Sampah Plastik: Studi Di Smp Muhammadiyah Satu Depok, Kecamatan Depok, Kabupaten Sleman, Daerah Istimewa Yogyakarta Eko. 2024;2:306–12.
- [8] Febria D, Irfan A, Syafriani S, Angraini DN, Hardianti S. Upaya Peningkatan Sanitasi dan Kebersihan Lingkungan di Pondok Pesantren Darun Nahda Bangkinang. *J Med Med*. 2024;3(2):57–61.
- [9] Faizah AHN, Najiyah HS, Marfansyah R, Werdani KE. Efektivitas Penyuluhan Kesehatan Tentang Sampah Terhadap Tingkat Pengetahuan Siswa Sekolah Dasar. *JMM (Jurnal Masy Mandiri)*. 2025;9(2):2356.
- [10] Anbarsari M, Asiah N, Hidayat Ramli Inaku A. Hubungan Pengetahuan Dan Sikap Siswa Dengan Perilaku Pemilahan Sampah Di Smpn Kecamatan Bekasi Timur. *J Kesehat Lingkung J dan Apl Tek Kesehat Lingkung*. 2022;19(1):143–50.
- [11] Angraini W, Febriawati H, Yanuarti R, Fatmawati T, Rizal AF. Efektivitas Media Edukasi Video Dan Leaflet Terhadap Pengetahuan Dan Sikap Tentang Pengelolaan Sampah Di Sma Negeri 11 Kota Bengkulu. *JNPH*. 2024;2(1):306–12.
- [12] Kinasih A, Mariana E, Qomariyah S, Rosyidah U, Ayuwanti I, Wardany K. Edukasi Pengelolaan Sampah Organik dan Non Organik pada Siswa Siswi. *Mestaka J Pengabdian Kpd Masy*. 2025;4(2):185–9.
- [13] Hutasuhut VA. Analisis Kepadatan Lalat Pada Pedagang Ikan di Pasar Tradisional Kampung Lalang. *J Kesehat Ilm Indones Indones Heal Sci J*. 2019;7(2):105–12.
- [14] Wowor, J. S., Kanan, M., & Dwicahya, B. (2024). Gambaran penanganan sampah dan kepadatan lalat di Kelurahan Hanga-Hanga di Kota Luwuk tahun 2022 (The description of garbage handling and density of flies in Hanga-Hanga Village in Luwuk City in 2022). *Public Health and Medical Education Journal (JPMEO)*, 3(1), 1–8.