


Mültrennung Method: The Application of Education for Separating Rubbish using Mini Comic in Kusuma Bangsa School

Ica Yolanda Ginting¹^a, Arta Uly Siahaan¹, Winanda Wahana Warga Dalam²
and Happy Yugo Prasetya¹

¹Department of Informatics, Politeknik Negeri Batam, Batam Centre, Batam City, Indonesia

²Department of Business Management, Politeknik Negeri Batam, Batam Centre, Batam City, Indonesia

Keywords: ADDIE Model, Education Media, Kusuma Bangsa School, Mini Comic, Pre-test, and Post-test.

Abstract: The importance of implanting is a sense of awareness and concern for environmental cleanliness must have been implanted in the community, especially implanted from an early age. One way is to carry out community activities with the aim of increasing awareness of the surrounding environment since children age with the implementation of waste sorting education and training in waste management to students at Kusuma Bangsa School use mini comic educational media entitled "Smart Waste Management". The purpose of carrying out this activity is to reduce existing problems by providing education, namely providing education in sorting and processing waste. The method of implementing will be made using the pre-test and post-test methods using the ADDIE Model in making these mini comics which consists of the stages of analysis, design, development, implementation, and evaluation. From the results that have been done as a whole obtained an average pre-test of 58% and post-test 88% with a value of N-Gain 0.71 which falls into the category of high increase. The results of the analysis showed that the mini comic "Smart Waste Management" can help students as a media of educational briefing on sorting and processing waste in the Kusuma Bangsa School environment.


1 INTRODUCTION

Every community has hopes to be able to live clean and comfortable in a residential environment in their daily life, but in reality, it is difficult to achieve because of the lack of empathy from the community for a clean environment. This problem needs special attention considering the various environmental problems it can cause. This can be seen from the high level of waste in Indonesia in 2020 which reached 67.8 million tons according to the submission by the Minister of Environment and Forestry, Siti Nurbaya in a press release number: SP.060/PR/PP/HMS.3/02/2020 (Kepala Biro Hubungan Masyarakat KLHK, 2020).

One form of empathy that can be done by the community in supporting the creation of a clean and comfortable environment is to process and sort waste. Waste sorting is an activity that is done to dispose of waste according to its type. If the waste is disposed of according to its type, then the processing of waste it will be easier and can improve environmental health

(Lestari, Purnama, Safitri, & Koto, 2020). Seeing this condition, the importance of planting a sense of awareness and concern for environmental hygiene should have been instilled in the community, especially instilled early. Instilling values on environmental hygiene to children from an early age is important to do, because as we know that children are the next generation of the nation where it should have been provided first by parents or teachers on things that can maintain the continuity of a nation where in this case one of them is by maintaining a clean environment. Children when they are in the stage of development, they are in the process of imitating something that is by looking at what the adults around them are doing and doing it (Amri & Widyantoro, 2017).

There are several factors that can influence a person's behaviour to dispose of waste in its place, such as habits that are done at home, in the community, and also in school. School is one of the media that is expected in an effort to provide education to children in applying waste disposal

^a <https://orcid.org/0000-0003-2263-1308>

behaviour in its place. However, not only the role of children is important in efforts to maintain cleanliness in the school environment, there are other roles that are also important such as teachers, security guards, janitors, sellers in the cafeteria, and others who also have to participate together in shaping awareness from as early as possible not to litter and as much as possible learn to know the types of waste to the way of management. In Batam, the volume of waste every day reaches 1000 to 1200 tons. In 2013-2014 waste increased by about 329,554 tons. Then in 2014-2015 there was a decrease of about 303.6 tons (Manalu & Purba, 2020).

Based on the exposure of the above problems by looking at the ever-increasing volume of waste in Batam, researchers are interested in doing something to hold activities aimed at increasing the sense of concern and responsibility for the environment at Kusuma Bangsa School, namely through the application of education on waste sorting assisted by smart waste can media, there is also waste processing training, as well as assistance in the process of rubbish to cash. Not only that, but researchers also want to create an educational media that can attract elementary school children by creating a mini comic that is also the focus of researchers in this report. This research aims to design and make mini comics as a media of educational briefing on sorting and processing waste in the Kusuma Bangsa School environment and analyzing the increase in knowledge from mini comics as a media of educational briefing on sorting and processing waste in the Kusuma Bangsa School.

2 LITERATURE REVIEW

2.1 Waste

Waste is a solid waste material from households, markets, offices, inns, hotels, restaurants, industries, debris materials and scrap metal used motor vehicles and in other words waste is the result obtained from human activities or activities that have been used (Sucipto, 2012). There are two types of waste, namely organic waste, and inorganic waste. Organic waste means waste from living things such as humans, animals, and plants. Inorganic waste is something that is not derived from living things, but comes from materials that are not easily decomposed, hazardous materials or toxic materials and fall into the category of recyclable waste for example materials made of plastic and metal (Lestari, Purnama, Safitri, & Koto, 2020). The quantity and quality of waste can be

influenced from many types of activities as well as from the level of life of the community. Several important factors that affect waste production, such as the population, socioeconomic circumstances, and technological advances (Shobri, 2014).

2.2 Comic Media

A media when in the process of learning and teaching is often referred to as a graphic, photographic tool that serves to capture and process and reorder information both visually and verbally and one of the media that is now quite widely used is comics. In (Koswanto, Prestiliano, & Utami, 2017), Waluyanto said that comics used as a learning media is a tool that serves to convey the message of learning while being delivered. In this sense, the learning in question will be directed to a communication process that occurs between the student and the source (in this case the learning comic). Communication in learning will run appropriately if the message or learning objectives that want to be conveyed can be received clearly, systematically, and interestingly.

2.3 ADDIE Model

ADDIE Model is one of the designs of teaching materials development that is often used, while in ADDIE Model there are 5 stages: Analysis, Design, Development, Implementation and Evaluation (Cahyadi, 2019).

1. Analysis

This stage is the first stage that will be done where the analysis of the development of teaching materials in the learning objectives and there are several analyses that will be done.

2. Design

The design stage is divided from several planning of the development of teaching materials that will be carried out.

3. Development

Development in the ADDIE Model will contain the content of the activities of the application of product design which in this case is a teaching material. The development steps in this study include the activity of making and modifying teaching materials. When the design stage has been done, the framework has been prepared in concept from the development of teaching materials.

4. Implementation

This stage is the stage where the implementation will be carried out directly, namely the provision of finished comics to students. During the implementation process, the design of teaching materials that have been designed and then developed will also be applied to the actual stage.

5. Evaluation

Evaluation is the last stage of the ADDIE Model. Evaluation results will be used as feedback on the development of teaching materials and also measure whether the purpose of making teaching materials has been achieved or not.

2.4 Pre-test and Post-test

According to Costa in (Damayanti, Pusparini, Djannatun, & Ferlianti, 2017) pre-test and post-test methods are one of the widely used assessment tools and are highly recommended when measuring the success and progress of a learning process. Pre-test will be given before the activities and comic giving with the aim to know the extent of knowledge of students of Kusuma Bangsa School to waste and processing. While post-test is given when the activity has been implemented and the comic has been given with the aim of knowing if there is an increase in knowledge after the activity is carried out.

In this study will be used one group pre-test post-test design, namely the design of research that there is pre-test before being treated and post-test after treatment. Doing one group pre-test post-test design will get results that are known to be more accurate, because the results obtained will be compared to the holding before being treated (Citroesmi & Nurhayati, 2017). The form of one group pre-test post-test design as in Table 1.

Table 1: One Group Pre-test Post-test Design.

Pre-test	Treated	Post-test
T1	X	T2

Note:

T1: First Test (pre-test)

T2: Final Test (post-test)

X: Implementation of Learning Model

Next is to calculate the percentage of pre-test and post-test results will use the formula as below.

$$P = f/N \times 100 \%$$

Which is:

P = Question Percentage

f = Frequency of respondents' answers

N= Total Frequency

After the percentage of respondents' answers has been obtained, the next stage will be interpreted or assessed on the results of the study interpreted at the percentage criteria level in Table 2 (Prihanto, 2018).

Table 2: Category Value Percentage.

No.	Percentage	Category Value Percentage
1.	> 84%	Very Good
2.	68% – 84 %	Good
3.	52% – 68%	Enough
4.	36% – 52%	Less
5.	< 36%	Very Less

Then to assess the increase in comic knowledge is determined from the post-test results. The post-test results obtained will be analyzed in increments from pre-test results calculated using the following N-Gain formula as seen in Figure 1 according to (Novianti, 2010) in (Prihanto, 2018).

$$N - Gain = \frac{\text{hasil posttest} - \text{hasil pretest}}{\text{hasil maksimum} - \text{hasil pretest}}$$

Figure 1: N-Gain Formula.

The results of the N-Gain then will be classified into categories in Table 3.

Table 3. Category of N-Gain.

No.	N-Gain Score	Category
1.	$G \geq 0,70$	Height Increase
2.	$0,30 \leq G < 0,70$	Medium Increase
3.	$G < 0,30$	Low Increase

Test results obtained from pre-test and post-test evaluation instruments, comics are said to be improved and useful for use in case of an increase in the average score of N-Gain $G \geq 0.7$ which is included in the classification of high increase Gain.

3 RESEARCH METHODOLOGY

In the creation of this comic the researcher uses ADDIE development model consisting of Analysis, Design, Development, Implementation and Evaluation (ADDIE) where each component that is interconnected and structured systematically cannot be sorted randomly as seen in Figure 2.

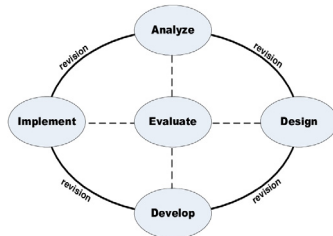


Figure 2: ADDIE Development Model Steps.

3.1 Analysis Stage

Comics are quite popular in Indonesia, where comics have been found in every Indonesian bookstore. The popularity of comics in Indonesia from year to year also experienced ups and downs. Such as the results of the popularity graph comics in Indonesia obtained from web searches through Google Trends. From the chart, in 2015-2020 the popularity of comics in Indonesia experienced ups and downs, but not as significant as seen in Figure 3. With this data, it can be concluded if the interest of Indonesian readers towards comics is quite large.

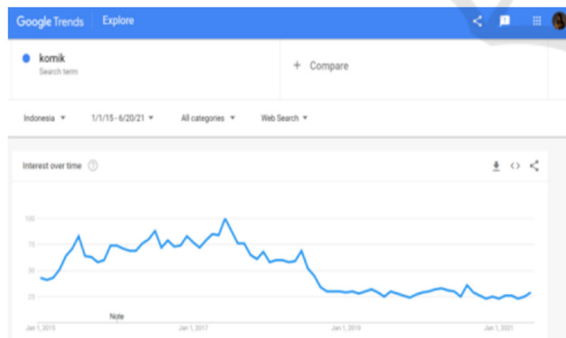


Figure 3: Graph of interest in comics in Indonesia.

3.1.1 Goal Analysis

With the results of previous analysis that has been done, the researcher wants to apply comics as a media of information about sorting waste with the title "Smart Waste Management" where the target is students of Kusuma Bangsa Elementary School located in Citra Pendawa Asri Housing Block A1

No.7-9, Kelurahan Buliang, Kecamatan Batu Aji, Batam City. The school has 68 students, with 13 kindergartens and 55 elementary schools.

3.1.2 General Needs Analysis

The needs used to create this comic consist of two things, namely hardware needs and software needs. Hardware needs include Laptops, Wacom, Hard drives. Software needs include Adobe Illustrator, Pain.

3.2 Design Stage

The design stage is the model design process that will underlie the next development process. The design stages that will be created include story ideas, synopsis, scripts, character sketches and storyboards.

3.3 Development Stage

This stage is a stage that contains the results of the realization of the design stage. At this stage, it will be done making smart comics sorting waste which will then be continued by giving colour to the comic. This stage will result in a smart comic sorting out the waste that will be used as a media of information about waste.

3.4 Implementation Stage

This stage is the stage where the implementation will be carried out directly, namely the provision of finished comics to students of Kusuma Bangsa School. This stage is also the stage where the pre-test will be conducted before the comic is given with the aim to measure the level of knowledge of students to sort waste and post-test to see the renewal of student knowledge to sort waste.

3.5 Evaluation Stage

Evaluation is the last step of the ADDIE Model. This stage is a process that is done to provide value to smart comics sorting waste, which will be assessed the level of knowledge of students after reading comics through post-test.

4 RESULTS AND DISCUSSION

4.1 Comic Implementation and Colouring

Colouring is done so that comics can be seen and distinguished from other objects. This stage is the realization of the design stage as shown below. The first is the comic cover that can be seen in Figure 4.



Figure 4: Comic Front and Back Cover.

Figure 5 is the content of the first and second pages containing the opening story of the comic.



Figure 5: The Opening Story of Comic.

Figure 6 is the content of the third and fourth pages that contain the types of waste, the colors of the trash can, and the impact of littering.



Figure 6: Material Types of Waste and the Impact.

Figure 7 is the content of the fifth and sixth pages that contain about how to process waste.



Figure 7: Waste Processing Materials.

Figure 8 is the content of the last page that is the ending of the comic.



Figure 8: The Ending.

4.2 Comic Giving

This stage is the stage where the implementation will be done directly, namely the granting of comics that have been completed. This stage is where the comics that have been designed are applied to the actual conditions. Comics were given during the activity on Saturday, May 11, 2019, to 68 students of Kusuma Bangsa School as shown in Figure 9 and Figure 10.



Figure 9: Mini Comic "Smart Waste Management".



Figure 10: Comics Received by Students.

4.3 Results Achieved

The test results of pre-test and post-test that have been conducted to 68 students of Kusuma Bangsa School can be seen as in Table 4.

Table 4: Pre-Test and Post-Test Results.

No	Question	Pre-test		Post-test	
		True	False	True	False
1.	What is waste?	45	23	65	3
2.	How many types of waste?	28	40	60	8
3.	Why should we throw away the waste?	50	18	60	8
4.	What would happen if we littered the waste?	50	18	59	9
5.	Who is responsible for waste management ?	33	35	58	10
6.	How to recycle the waste?	25	43	53	15
7.	What are the benefits of sorting out the waste?	40	28	55	13
8.	Why should we sort out the waste?	38	30	57	11
9.	How many colors of trash can?	30	38	66	2
10.	Are you going to start sorting out the waste?	55	13	68	0

Then the data that has been obtained from the results of pre-test and post-test tests will be processed into a percentage form. The first is the percentage result of the pre-test that can be seen in Table 5.

Table 5: Pre-Test Percentage Results.

No.	Target Outcome	Percentage Calculation	%
1.	Students are able to know the meaning of waste	56/68*100%	66%
2.	Students are able to understand the types of waste	40/68*100%	41%

3.	Students are able to understand the importance of disposing of waste in its place	55/68*100%	74%
4.	Students are able to know the impact of littering	50/68*100%	74%
5.	Students are able to know who is responsible for waste management	47/68*100%	49%
6.	Students are able to understand how to recycle waste based on the type of waste	45/68*100%	37%
7.	Students are able to know the benefits that can be from sorting waste	52/68*100%	59%
8.	Students are able to understand the importance of sorting waste	50/68*100%	56%
9.	Students are able to know the types of trash cans based on the types of waste	40/68*100%	44%
10.	Students have the motivation to do waste sorting	55/68*100%	81%
Average			58%

From Table 5, it can be known that the pre-test results on each external aspect targeted have an average of only 58% of students who know about waste and its processing. Then after the granting of comics to students of Kusuma Bangsa School, post-test is conducted that are seen from after the reading of comics by students get percentage results as in Table 6.

Table 6: Post-Test Percentage Results.

No.	Target Outcome	Percentage Calculation	%
1.	Students are able to know the meaning of waste	65/68*100%	96%
2.	Students are able to understand the types of waste	60/68*100%	88%
3.	Students are able to understand the importance of disposing of waste in its place	60/68*100%	88%

4.	Students are able to know the impact of littering	59/68*100%	87%
5.	Students are able to know who is responsible for waste management	58/68*100%	85%
6.	Students are able to understand how to recycle waste based on the type of waste	53/68*100%	78%
7.	Students are able to know the benefits that can be from sorting waste	55/68*100%	81%
8.	Students are able to understand the importance of sorting waste	57/68*100%	84%
9.	Students are able to know the types of trash cans based on the types of waste	66/68*100%	97%
10.	Students have the motivation to do waste sorting	68/68*100%	100%
Average			88%

From Table 16 can be known on each external aspect targeted to have an average of 88% of students who know about waste and processing. So from the percentage of pretest 58% and posttest 88%, there is an increase in knowledge in students by 30%. Some aspects that have below average value are related to the impact of littering, who is responsible for waste processing, how to recycle waste based on the type of waste, the benefits of sorting waste and the importance of sorting waste. This is because there are still some students, especially in kindergarten, grade 1 and grade 2 who do not understand.

While the aspect that has a high score is the motivation of students to do waste sorting where previously there were still some students who did not have motivation and after reading the comics all students have the motivation to do waste sorting such as Figure 11.

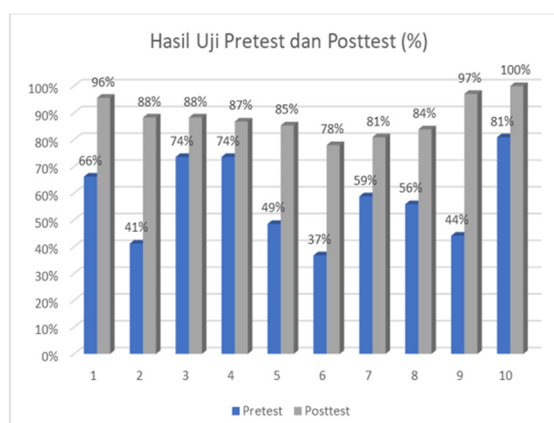


Figure 11: Pre-Test and Post-Test Results.

4.4 Improved Understanding of Comics

The improved understanding of the comic "Smart Waste Management" will be determined from the post-test results of Students of Kusuma Bangsa School. The post-test results obtained will be analyzed in increments from pre-test results calculated using the N-Gain formula with the results as in Table 7.

Table 7: Recapitulation of Pre-Test and Post-Test Results.

Average		N-Gain	Category
Pre-Test	Post-Test		
58	88	0,71	Height Increase

The results of previous research conducted (Prihanto, 2018) explaining the test results obtained from pre-test and post-test evaluation instruments, shows that comics can help students in learning in case of an increase in the average N-Gain G score ≥ 0.7 which is included in the high increase Gain classification.

From the calculation using the formula N-Gain in Table 17, the results were obtained where there was an increase in knowledge in students of Kusuma Bangsa School related to waste and its processing of 0.71 which falls into the category of high increase. The results of the analysis showed that the mini comic "Smart Waste Management" can help students of Kusuma Bangsa School as a media of educational briefing on sorting and processing waste in the Kusuma Bangsa School environment.

5 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The conclusion of this study is:

1. The creation of this mini comic using ADDIE Model with several stages, namely Analysis, Design, Development, Implementation and Evaluation. Mini comic "Smart Waste Management" contains knowledge of waste ranging from the types of waste, the colour of the trash can, the impact of littering, to sorting and managing waste with a total of 7 pages.
2. Based on the results of the pre-test and post-test mini comic "Smart Waste Management" that has been obtained from 68 students of Kusuma Bangsa School, there has been an increase in knowledge related to waste and its processing. The average pre-test is 58% and post-test is 88% with an N-Gain score of 0.71 which falls into the high increase category. The results of the analysis showed that the mini comic "Smart Waste Management" can help students of Kusuma Bangsa School as a media of educational briefing on sorting and processing waste in the Kusuma Bangsa School environment.

5.2 Recommendations

The recommendations that can be given to the next researcher:

1. Mini comics as a media of educational briefing on sorting and processing waste can be developed into a form of comic series with the next series that can be continued.
2. Developing the distribution of mini comic "Smart Waste Management" more widely to several other schools to better educate children from an early age sees the positive influence gained from this study.

ACKNOWLEDGEMENTS

This research was partially supported by Directorate General of Education and Student Affairs, Ministry of Research, Technology and Higher Education of Indonesia through Program Kreativitas Mahasiswa (PKM).

REFERENCES

- Amri, C., & Widyantoro, W. (2017). Pendampingan Pembelajaran Memilah dan Menempatkan Sampah Pada Tempatnya Sejak Usia Dini di TK Imbas 1. *International Journal of Community Service Learning*, 121-126.
- Cahyadi, R. A. (2019). Pengembangan Bahan Ajar Berbasis ADDIE Model. *Halaqa: Islamic Education Journal*, 35-43.
- Citrosesmi, N., & Nurhayati. (2017). Penerapan Model Pembelajaran Means-Ends Analysis Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. *Jurnal Pendidikan Matematika Indonesia*, 13-18.
- Damayanti, N. A., Pusparini, M., Djannatun, T., & Ferlianti, R. (2017). Metode Pre-Test dan Post-Test Sebagai Salah Satu Alat Ukur Keberhasilan Kegiatan Penyuluhan Kesehatan Tentang Tuberkulosis di Kelurahan Utan Panjang, Jakarta Pusat . *Prosiding SNApP2017 Kesehatan*, 144-150.
- Kepala Biro Hubungan Masyarakat KLHK. (2020, February 21). Siaran Pers. Retrieved April 24, 2021, from http://ppid.menlhk.go.id/siaran_pers/browse/2329
- Koswanto, G. Y., Prestiliano, J., & Utami, B. S. (2017). Perancangan Komik Mengenai Sampah Plastik Untuk Perancangan Komik Mengenai Sampah Plastik Untuk. Salatiga.
- Lestari, N. E., Purnama, A., Safitri, A., & Koto, Y. (2020). Peningkatan Pengetahuan dan Sikap Pemilahan Sampah Pada Anak Usia Sekolah Melalui Metode Simulasi. *Jurnal Pengabdian Masyarakat Indonesia Maju*, 45-49.
- Manalu, F., & Purba, T. (2020). Analisis Kebijakan Pengelolaan Sampah Melalui Program Bank Sampah Kota Batam. *Jurnal AKRAB JUARA*, 12-24.
- Novianti, R. D. (2010). Pengembangan Media Komik Pembelajaran Matematika untuk Meningkatkan Pemahaman Bentuk Soal Cerita Bab Pecahan Pada Siswa Kelas V SDN Ngembung. *Teknologi Pendidikan*, 1-17.
- Prihanto, D. A. (2018). Pengembangan Media Komik Matematika Pada Materi Pecahan Untuk Siswa Kelas V Sekolah Dasar. *MAJU*, 79-90.
- Prihanto, D. A. (2018). Pengembangan Media Komik Matematika Pada Materi Pecahan Untuk Siswa Kelas V Sekolah Dasar. *MAJU*, 79-90.
- Shobri, A. (2014). Program pilah sampah plastik, kardus, kertas dalam meningkatkan nilai kebersihan siswa dan pendapatan sekolah di SDN Tambakaji 04, SDN Ngaliyan 01 dan SDN Ngaliyan 03. IAIN Walisongo.
- Sucipto, C. D. (2012). *Teknologi Pengolahan Daur Ulang Sampah*. Yogyakarta: Gosyen Publishing.