

The Development of BOLU BAPER as Adiwiyata Based Teaching Aids for Chemistry Learning

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Abstract

This research aims to examine the development of BOLU BAPER (Boneka Molekul Berbahan Kain Perca) (patchwork molecule doll) as Adiwiyata-based teaching aids for learning chemistry, the reviewer assessment on BOLU BAPER as Adiwiyata-based teaching aids for learning chemistry and the product eligibility based on the reviewers and the students' assessment toward BOLU BAPER as Adiwiyata-based teaching aids for learning chemistry in SMKN 2 Gedangsari. This research is a Research and Development (R&D) with five steps; analysis, design, development, implementation, and evaluation. The subject of this research is 26 grade X students of the Automotive Class in SMKN 2 Gedangsari. The result shows that the process of developing a BOLU BAPER as teaching aids consists of several steps; the process of creating, the process of preparing the reviewing instrument, and the process of product testing for the reviewer. The reviewer's assessment showed a good result with a slight revis. The detail of score from the material expert is 85%, the media expert is 96,25% and the students are 82,76%. The validity test proved that BOLU BAPER is valid to be used as teaching aids for chemistry learning.

Keywords: BOLU BAPER; teaching aids; chemistry learning; adiwiyata

Abstrak

Tujuan dari penelitian ini adalah untuk mengetahui proses pengembangan BOLU BAPER (Boneka Molekul Berbahan Kain Perca) sebagai alat peraga pembelajaran kimia berbasis adiwiyata, penilaian reviewer terhadap "BOLU BAPER" sebagai alat peraga pembelajaran kimia berbasis adiwiyata dan kelayakan produk berdasarkan penilaian reviewer dan siswa terhadap "BOLU BAPER" sebagai alat peraga pembelajaran kimia berbasis adiwiyata di SMKN 2 Gedangsari. Jenis penelitian ini ialah Research and Development (R&D) dengan lima tahap, yaitu analisis, desain, pengempangan, implementasi dan evaluasi. Subjek penelitian dalam R&D ini adalah 26 siswa kelas X program kompetensi keahlian Teknik Kendaraan Ringan Otomotif SMKN 2 Gedangsari. Hasil penelitian menunjukkan bahwa proses pengembangan alat peraga BOLU BAPER meliputi beberapa tahapan, yaitu proses pembuatan, penyusunan instrumen serta uji coba kepada reviewer. Penilaian reviewer memberikan hasil baik atau valid dengan sedikit revisi. Rincian persentase skor dari ahli materi yaitu 85%, ahli media 96,25% dan siswa 82,76%. Berdasarkan uji kelayakan (validitas) dinyatakan bahwa alat peraga BOLU BAPER valid untuk digunakan dengan sedikit revisi.

Kata kunci: BOLU BAPER; alat peraga; pembelajaran kimia; adiwiyata

Introduction

Fabric waste is one of the wastes which are difficult to reprocess because fabric waste is an inorganic waste that is difficult to decompose and cannot be composted, whereas if it is burned, it could produce toxic smoke and gas that are dangerous for the environment. For this reason, fabric waste become a problem because based on data in 2014, fabric waste ranked 4th in the highest number of waste, with 6,36% by weight and 5,1% by volume with an increase of 3% up to 5% every year (Karya & Susilo, 2012).

Fabric waste that is not managed properly could become a medium for the development of disease germs. Today, there are some creative industries that reprocess this waste into new products, such as; brooches, bags, doormats, and other products. However, patchwork has the potential to be developed into a more aesthetic product with higher sale values for various groups of people. On the other hand, creating works of art using various techniques and media is developing rapidly (A'isah, et al., 2016).

SMKN 2 Gedangsari is one vocational senior high school in the district of Gunungkidul that provides a fashion competency program. Learning in such a program focuses on creating clothes. SMKN 2 Gedangsari also has TEFA (Teaching factory) which presents a situation similar to the environment and activity of the real industry. The impact is that every day, there are many patchwork leftovers from the process of sewing that could pollute the environment. As one of the schools that promotes the Adiwiyata Program, SMKN 2 Gedangsari must be able to manage supporting facilities that are environmentally friendly. One of the efforts to that is coping with fabric waste by 4R (Reduce, Reuse, Recycle and Replace).

The Ministry of Environment and the Ministry of Education proclaim an environmental education program that is wrapped in Adiwiyata Program. Its implementation is regulated by the Minister of Environment Regulations no. 05 of 2013 on the guidelines of Adiwiyata

implementation. In achieving the aims of the Adiwiyata Program four components are appointed, these components become one whole unit to become an Adiwiyata school. The components are [1] policies with an environmental perspective, [2] the implementation of an environmental-based curriculum, [3] participatory-based environmental activities, and [4] managing supporting facilities that are environmentally friendly.

According to the Ministry of Environment and the Ministry of Education the aim of Adiwiyata Program is to create a responsible school society in protecting and managing the environment through good school governance to support sustainable development. This means that schools that are Adiwiyata-based are endeavored to become a school or a place for the school society to gain knowledge, norms, and ethics as the foundations towards the realization of a prosperous life and also towards the goal of sustainable development. Within this program, every school society is hoped to participate in school activities towards a healthy environment and also to avoid negative environmental impacts.

According to the Ministry of Environment regulations vision, mission, the education environment, the increase in human resources, the saving of natural resources, hygiene and health, and the allocation of funds, are needed in developing the school policy to create a school that is cultured and concerned to the environment. The stages to create a school that is Adiwiyata-based are through; recycling, reusing, reducing, and replacing. Recycling is reprocessing activities. The activities consist of making use of used goods and processing their materials for further use. For example, utilizing and processing organic waste to be composted. Reusing, activities in using materials that are still usable again. Reducing, activities in usage decreasing or behavior patterns that could decrease producing waste and prevent excessive consumption patterns. Replace, activities in changing the use of an item or using another item that is more reusable and environmentally friendly.

SMKN 2 Gedangsari also provides light vehicles automotive engineering competency program (TKRO). According to the Regulations of the General Director of the Elementary and Secondary Education no. 07/D.D5/KK/2018, one of the subjects in the TKRO competency program is chemistry. Chemistry is very closely related to everyday

life and has given many benefits to human beings. However, the fact is that students' understanding of chemistry is still lacking. This is shown by the SMKN 2 Gedangsari students' scores in chemistry are still low. The score can be seen from the final year assessment (PAT) average score which is shown below.

Table 1

The PAT of the Students' Average Score of Chemistry 2019/2020

No	Class	Chemistry Score
1	X TKRO A	62
2	X TKRO B	60
3	X TKRO C	62
4	X TKRO D	61
Average Score		61,25

(Source: Data processed by the Chemistry teacher)

The factors that influenced the low score in chemistry are varied, it could be either internal or external factors. One external factor is that the teaching methods the teacher is using are less varied and less creative. The teaching methods used by the teacher are still giving a speech, discussion, and question and answer which caused the students to feel bored and uninterested. Besides that, using the media as one teaching aid is rarely used. The characteristic of chemistry is learning something abstract which is why most students find it hard to understand chemistry.

For these reasons, the researcher is interested in developing learning aids to gain the students' attention and understanding. The learning aid itself aims to decrease the abstract of a concept so that students could understand the meaning of the concept. The learning aids could be used by chemistry teachers in either any senior high school or any vocational high school when studying molecular shapes. The molecular shape is one theory in chemistry that is abstract. In predicting the molecular shape, there are concepts that are interrelated and tiered from a simple concept to a concept with a higher level and more complex. These concepts include a concept to determine; the central atom, the number of electrons in the valence shell of the central atom, the number of electrons used, the number of free and

bond electrons, and the shape of the electrons. Since the characteristics are related and tiered, so when difficulties arise when learning simple concepts, such as; the concept of the central atom, it will also be hard for the students to understand the concept of valence electrons and the molecule shapes. These difficulties could lead to misconceptions if this occurs consistently. The molecule shapes are taught to both senior high school students and vocational high school students during the X grade in the first semester.

The molecule shapes portray the position of atoms in one molecule, namely the position of atoms in three-dimensional space and the size of the bonded angles formed in one molecule, also the bond that occurs in the molecule formed by the electron pairs.

The molecule shapes according to hybridization theory are molecule shapes that are based on the shape of the outer shell of the orbital, where several orbitals merged and formed a new orbital with the same level of energy and this is called hybridization. Hybridization is also called the process of reconstructing orbitals in the atom to form a new equivalent orbital.

Based on the explanation above, the aim of this research is to develop economical Adiwiyata-based teaching aids for learning chemistry by making use of the patchwork

leftovers from the fashion competency program production.

According to the background stated above, this research could be formulated through several research questions; (1) how is the development process in creating BOLU BAPER (patchwork molecule doll) as the Adiwiyata-based teaching aids for learning chemistry in SMKN 2 Gedangsari? (2) What is the reviewer's assessment of BOLU BAPER (patchwork molecule doll) as Adiwiyata-based teaching aid for learning chemistry in SMKN 2 Gedangsari? (3) How is the suitability of the product according to the reviewer and the students of BOLU BAPER (patchwork molecule doll) as Adiwiyata-based teaching aids for learning chemistry in SMKN 2 Gedangsari?

The purposes and objectives of this research are to (1) understand the process of developing BOLU BAPER (patchwork molecule doll) as Adiwiyata-based teaching aids in learning chemistry in SMKN 2 Gedangsari, (2) investigate the reviewer's assessment towards BOLU BAPER (patchwork molecule doll) as Adiwiyata-based teaching aids in learning chemistry in SMKN 2 Gedangsari, (3) recognize the suitability based on the reviewer and the students of BOLU BAPER (patchwork molecule doll) as Adiwiyata-based teaching aids in learning chemistry in SMKN 2 Gedangsari.

This research is beneficial for; (1) other researchers, this research could be a reference for further research to support the creation of new innovations in both environment and education field, (2) decreasing the amount of fabric waste in the surrounding environment, (3) raising the teacher's creativity when teaching in the classroom, (4) raising both the senior high school students and vocational high school students' passion and interest for learning chemistry, (5) reducing the difficulties of the students in learning chemical bond and molecule shapes, (6) supporting schools in fulfilling the Adiwiyata Program, (7) the government, in considering when adopting a certain policy, especially in the education field as an effort to improve the learning achievement for both senior high school and

vocational high school students and the quality of education in Indonesia.

Research Method

This research is research and development (R&D) research. Research and development is one research method that is used to develop and validate a product in the education field. Besides developing and validating a product, this method of research is used to discover fundamental phenomena and also for educational practices. The product developed in this research is BOLU BAPER (patchwork molecule doll). BOLU BAPER (patchwork molecule doll) is a teaching aid for learning chemistry as one effort in implementing Adiwiyata Program in school.

This R&D research method adopted the ADDIE development method, which consists of; analysis, design, development, implementation, and evaluation (Piskurich, 2006). The explanation of each stage is as follows:

1. Analysis Phase

In this phase, the problems, the students' characteristics, and the school environment related to the Adiwiyata program are analyzed. Also in this phase, the aim of developing such teaching aid, and the Basic Competence and the materials of chemistry lesson for grade X based on the revised 2013 Curriculum are decided.

2. Design Phase

In this phase, designing all the utilities to develop a chemistry lesson teaching aid, collecting material references, designing a manual book, and writing the outline for the assessment instrument.

3. Development Phase

In this phase, the product which is the Adiwiyata-based teaching aid for learning chemistry is created. The product is a molecule doll made out of patchwork from fabric leftovers. Also in this phase, the instrument for assessment was made, the instrument for assessment was then validated by the expert, and the product was then reviewed by the material and media expert.

4. Implementation Phase

In this phase, the quality of the product was assessed by the reviewer, and the implementation to a limited number of students. The result of the implementation is assessment data of the quality of the product and several inputs and suggestions.

5. Evaluation Phase

In this phase, the product development goals were measured, or in other words, the quality of the product. The data of this research is the data on product development and the data on product quality.

The research subject in this R&D research is 26 grade X students of TKRO competency of SMKN 2 Gedangsari. The research took place in SMKN 2 Gedangsari on July 2019 until March 2020. The type of data of this research is qualitative data and quantitative data.

The research instrument used in collecting the data is an assessment sheet or an assessment questionnaire on BOLU BAPER as a teaching aid. There are three kinds of assessment questionnaires, one for the material expert, one for the media expert, and one for the students. The organized questioner was then validated by the expert before it was used for assessment. The questionnaires were validated by Eka

Arinovyanti, S.S as Bahasa Indonesia teacher in SMKN 2 Gedangsari.

Once the teaching aid has been produced, it will also be validated by the material and media experts. The validation process is done to determine whether or not BOLU BAPER is appropriate as a teaching aid in learning chemistry before it was being tried out to the students, the validation was done using a questionnaire.

The formula used to process the data from the media and the material experts as well as from the students as the direct users of the teaching aid, is based on Sa'dun Akbar formula, in which it is stated that such teaching aid can be used in teaching and learning process if it reaches the valid number of 62.51% - 81.25% and very valid number of 81.26% - 100%.

Analyzing the qualitative data was done descriptively towards the process of developing the Adiwiyata-based teaching aid for learning chemistry that was obtained from suggestions, responses, critics, and improvements from the reviewers. Whereas the analysis of the teaching aid quality was done through the steps below:

Converting qualitative assessment results to quantitative using Likert scale, below are the evaluation guides:

Table 2

Scoring Level

No	Numbers	Qualitative Meaning
1	4	Sub-topic discussion is very good/ very proper/ very interesting/ very easy/ very appropriate/ very precise/ very clear
2	3	Sub-topic discussion is good/ clear/ proper/ interesting/ easy/ appropriate/ precise
3	2	Sub-topic discussion is not good/ not proper/ not interesting/ not easy/ not appropriate/ not precise
4	1	Sub-topic discussion is very bad/ very improper/ very not interesting/ very hard/ very inappropriate/ very not precise

The quantitative data is the result of the material expert, the media expert, and the students' assessments of the BOLU BAPER teaching aid.

- 1) Calculating the average score of the whole assessment aspects
- 2) Converting the data into qualitative data based on the ideal assessment criteria

The formula used to process the reviewer assessment is as follows:

$$Vr = \frac{TSe}{TSh} \times 100\%$$

Description:

Vr = the reviewer validation

TSh = the maximum expected total score

TSe = total empirical score (trials)

The guideline used in making decisions from the data analysis is by using a qualification scale to determine the conclusion of what has been achieved. The criteria for validation were done through several steps. The total validation items for the material expert are 15 items, so the highest score, if the validator gave 4 as the score for all validator items is $15 \times 4 = 60$ and the lowest score is $15 \times 1 = 15$. The score is then substituted into the equation (formula), so that $(15/60) \times 100\% = 25\%$ for the lowest percentage and 100% for the highest percentage. The highest and the lowest score has a 75% difference.

The total items validation for the media expert and the students are 20 items, so the highest score, if the validator gave 4 as the score for all validator items is $20 \times 4 = 80$

and the lowest score is $20 \times 1 = 20$. The score is then substituted into the equation (formula) so that $(20/80) \times 100\% = 25\%$ for the lowest percentage and 100% for the highest percentage. The highest and the lowest percentage has a 75% difference. Using the Likert scale with 4 levels of scoring, accordingly, the validity criteria were made into 4 interval classes. The big interval between classes is calculated through dividing the highest score and the lowest difference by four, and its 18,75%. The model development could determine its own validity criteria in accordance to the number of item in the validation instrument and how to assess the score. Based on the calculation it is decided that the percentage criteria with interpreted guide are shown in the table below (Fuada, 2015).

Table 3

Validity Criteria

No	Validity Criteria	Validity Level
1	81,26 % - 100,00%	Very Valid, or, could be used without revision
2	62,51 % - 81,25 %	Valid, or, could be used with slight revision
3	43,76 - 62,50 %	Not Valid, or, it is suggested to not be used because there are much revision
4	25,00 % - 43,75 %	Very Invalid, or, cannot be used

Research Result and Discussion

This research produced a teaching aid called BOLU BAPER (patchwork molecule

doll) made from the sewing process leftover fabrics in the fashion competency program. The leftover fabrics are used as the fillings of the molecule doll.

Figure 1

Patchwork



There are many fabric wastes as the leftovers of the sewing process that have not been properly managed, just being piled up

in the bin and at the TEFA storage of fashion competency program of SMKN 2 Gedangsari.

Figure 2
The Process of Cutting and Sewing



Pattern-making is done using the computer. This teaching aid could be disassembled and quite flexible. Basically, this teaching aid consists of three kinds of orbitals, they are; orbital 1s, orbital 2s, and orbital p. Orbital 1s and 2s are shaped like a ball whereas orbital p is shaped like a twisted balloon. The difference between orbital 1s and 2s is in its size. The size of orbital 2s is bigger than orbital 1s. The three orbitals are made of three different colors of flannel.

Apart from being differentiated by size, orbital 1s and 2s are also made with different colors. Orbital 1s is colored blue and purple, and orbital 2s is colored red and yellow. Orbital 1s and 2s are shaped like the head of the doll because of their round shape. The finished orbital 1s and 2s are not interesting if the accessories are not yet added, the accessories are such; eyes, nose, mouth, ears, and head covers. That is why the two orbitals needed more creative decorations.

The decorated s orbitals are then added with snap buttons at the bottom part (chin). The function is to connect or to pair with orbital p. The snap buttons could be replaced with Velcro (fabric adhesive) to make the installation easier.

Orbital p is showing the body of the doll which is why it must be creatively decorated to make it look interesting. Orbital p could be decorated to shape like a bee, a panda, a butterfly, a dragonfly, and other animals. Orbital p could also be decorated by

adding some funny clothing. Orbital p has two ends of different sizes. The end with a bigger size is added with a snap button or Velcro to connect it with the s orbitals which is the head of the doll. The smaller end is also added with a hook or another snap button to connect it with the other orbitals and become a molecular geometry.

Four of the orbital 1s symbolize 4 H (hydrogen) atoms that will be related to the sp^3 hybrid orbital. The attached orbital is tetrahedral. This kind of Hybridization occurs in CH_4 . s and p orbitals could be arranged according to the desired hybridization and the molecular shapes.

This teaching aid could easily be assembled according to the desired type of hybridization. For example, shaping the sp^3 hybridization of the CH_4 (methane) molecule, the sp^2 for C_2H_4 (ethylene), sp for C_2H_2 (acetylene), or hybridization with a non-carbon atom. The finished teaching aid of BOLU BAPER is then packed in a gift box or used box which has been decorated with patchwork.

This teaching aid is also equipped with student-centered student worksheets (LKS), making it easier for students to find the concept. The system of learning does not focus on memorization. The student worksheets contain learning objectives, theories, material tools, work procedures, and questions. Students are asked to answer the questions provided by the worksheets. The questions direct the students to discover the concept of molecular shapes. In addition,

the BOLU BAPER teaching aid is also equipped with a manual book which makes it easier to use.

Figure 3
Packing BOLU BAPER



BOLU BAPER teaching aid is tested on the reviewers, they are the media expert, the material expert, and the students. The questionnaire used in assessing this teaching aid has been validated. According to the questionnaire validity, it proved that for the material expert, 15 items are valid. The questionnaire for the media expert also has

20 items that are valid and the questionnaire for the students also has 20 items that are valid. Based on these validations, it could be concluded that these questionnaires are, though they needed slight revision, but appropriate for assessing the teaching aid.

The result of the reviewers' assessment is as follows Table 4.

Table 4
The Reviewers' Assessment Result

No	Reviewer	Score Percentages
1	Material Expert	85%
2	Media Expert	96,25%
3	Students	82,76%

Based on the table above, it could be concluded that this teaching aid is valid for use and needed a slight revision.

The teaching aid has been tried out to one media expert, named Jayaul Khoiriyah

S.Pd, on 10 February 2020. From the tryout, quantitative data were collected, and based on the assessment the score percentages are shown below Table 5.

Table 5
The Score Percentages of the Media Expert

No	Indicators	Score Percentages
1	Clarity	100%
2	Simplicity	100%
3	Compatibility	95%
4	Communicative	100%
5	Cleanliness, tidiness, and attractiveness	90%

There are three questions that weren't given the highest score, they are: (4)

The BOLU BAPER teaching aid is not following the current development; (7) The

cleanliness of the BOLU BAPER, and (12) The shape and the quality of the BOLU BAPER.

The aspects of cleanliness, tidiness, and attractiveness received the lowest score. This is acceptable because this teaching aid is made out of patchwork which has been piled up for some time in the TEFA garage and was not washed before being used. The attractiveness and the neatness of the stitching are still lacking because this teaching aid was made by grade X students

of the fashion competency program, which is why it is understandable if the stitching was not neat enough.

The teaching aid has also been tried out to a material expert named Sri Watini, S.Pd, who is a chemistry teacher, on 10 February 2020. From the tryout, quantitative data were collected, and based on the assessment the score percentages are shown below Table 6.

Table 6
The Score Percentages of the Material Expert

No	Indicators	Score Percentages
1	Clarity	75%
2	Simplicity	91,7%
3	Compatibility	84,4%
4	Completeness	87,5%

The aspect of clarity scored the lowest. This is acceptable because the material on molecular shapes is very abstract and quite hard for the students to understand.

The teaching aid has also been tried out to 26 students of grade X D of the light

vehicles automotive engineering competency program on 13 March 2020. Other competency programs in SMKN 2 Gedangsari are the fashion competency program and financial accounting and institutions competency program which these two programs were not taught chemistry lessons.

Picture 4
Trying Out the Teaching Aid during Chemistry Lesson



From the tryout, quantitative data were collected and based on the assessment,

the score percentages are shown below Table 7.

Table 7
The Score Percentages of the Students

No	Indicators	Score Percentages
1	Clarity	94,4%
2	Simplicity	85,7%
3	Compatibility	77%
4	Communicative	66,7%
5	Cleanliness, tidiness and attractiveness	90%

The communicative aspect received the lowest score because in one group there were several students who dominated other students and there were passive students causing no cooperation within the group.

Conclusion

Based on the research analysis and discussion, it could be concluded that the process of developing BOLU BAPER (patchwork molecule doll) as a teaching aid consisted of several steps; the process of creating, the process of preparing the reviewing instrument, and the process of product testing for the reviewer. The reviewer's assessment showed a good result or valid with slight revision. The detailed percentages of the score from; the material experts 85%, media experts 96,25% and the students 82,76%. According the validity test, it can be concluded that BOLU BAPER (patchwork molecule doll) is valid to be used as teaching aid though with a slight revision.

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References

- A'isah, Aisyah, T. N. & Novitasari, D. (2016). KENCANA: Kerajinan Kain Perca menjadi Line Art sebagai Industri Kreatif Berpeluang Ekonomi. *Jurnal PENA*, 3(1), 463-470.
- Akbar, S. (2013). *Instrumen Perangkat Pembelajaran*. Bandung: PT Remaja Rosdakarya.
- Anderson, R. (1994). *Pemilihan dan Pengembangan Media untuk Pembelajaran*. Jakarta: PT Raja Grafindo Persada.
- Arsyad, A. (2011). *Media Pembelajaran*. Jakarta: Rajawali Pers.
- Asyhar, R. (2012). *Kreatif Mengembangkan Media Pembelajaran*. Jakarta: Referensi Jakarta.
- Depdikbud. (2011). *Pedoman Pembuatan Alat Peraga Kimia Sederhana untuk SMA*. Jakarta: Depdikbud.
- Fuada, S. (2015). Pengujian Validitas Alat Peraga Pembangkit Sinyal (Oscillator) untuk Pembelajaran Workshop Instrumentasi Industri. *Prosiding Seminar Nasional Pendidikan, FKIP Universitas Muhammadiyah Ponorogo*, 854-861.
- Indiatiningsih. (2017). Penggunaan Media Plastisin untuk Meningkatkan Hasil Belajar Kognitif Siswa Materi Bentuk Molekul Kelas X Lintas Minat di SMAN 8 Malang. *Jurnal Zarah*, 5(1), 5-13.
- Juwairiah. (2013). Alat Peraga dan Media Pembelajaran Kimia. *Visipena*, 4(1), 1-13.
- Kusuma, P. I. (2018). Implementasi Program Sekolah Adiwiyata dalam Peningkatan Mutu Pendidikan di SDN Tanah Tinggi 3 Kota Tangerang. *Jurnal Green Growth dan Manajemen Lingkungan*, 7(2), 122-132.
- Mayangsari, D. (2018). *Pembuatan Alat Peraga Pelapisan Logam Berorientasi Representasi Kimia*. Skripsi. Bandung: UIN Sunan Gunung Djati.
- Mulyani, S. A. (2013). Penggunaan Boneka sebagai Media Simulasi Kreatif di Sekolah Dasar. *Jurnal Pemikiran dan Pengembangan SD*, 1(2), 20-25.
- Pasaribu, B. Y. (2013). Upaya Meningkatkan Aktifitas dan Hasil Belajar Kimia Pokok Bahasan "Tata Nama Senyawa Kimia" Melalui Model Pembelajaran Demonstrasi dengan Alat Peraga Kartu Tata Nama Senyawa. *Jurnal Ilmiah Pendidikan MIPA*, 3(2), 136-144.
- Priyambodo, E. & Wulaningrum, S. (2017). Using Chemistry Teaching Aids Based Local Wisdom as an Alternative Media for Chemistry Teaching and Learning. *International Journal of Evaluation and Research in Education (IJERE)*, 6 (4), 295-298.
- Purba, M. (2013). *Kimia SMK*. Jakarta: Erlangga.
- Septiawati, R., Murhad, A., Dinata, D., Anggainy, R., Sari, W., & Febrianty, F.

- (2019). Pemanfaatan Limbah Kain Perca Sebagai Alternatif Peluang Usaha. *COMVICE: Journal Of Community Service*, 3(1), 1-8.
- Shafwa, F. (2008). *Pengaruh Penggunaan Alat Peraga Kimia Sederhana Model Alat Uji Elektrolit terhadap Hasil Belajar Kimia Siswa: Studi Kasus di SMA Negeri 1 Pamulang*. Skripsi. Jakarta: UIN Syarif Hidayatullah Jakarta.
- Susilo, R. & Karya, A. (2012). Pemanfaatan Limbah Kain Perca untuk Pembuatan Furnitur. *Jurnal Tingkat Sarjana Seni Rupa dan Desain*, 1, 1-6.
- Wahono. (2006, Juni 21). Aspek dan Kriteria Penilaian Media Pembelajaran. Diakses pada 1 Agustus 2020, dari Romi Satria Wahono.net:
<http://romisatriawahono.net/2006/06/21/aspek-dan-kriteria-penilaian-media-pembelajaran/>

