

## Green Production Module Development Through Ecobricks As a Learning Source of Environmental Pollution

Nurhafizah<sup>✉</sup>, Nur Kusuma Dewi, Talitha Widiatningrum

Universitas Negeri Semarang, Indonesia

### Article Info

Article History :  
Received August 2019  
Accepted September 2019  
Published August 2020

Keywords:  
Ecobricks, modules,  
environmental pollution

### Abstract

This study aims to describe the results of the development of the green production module through ecobricks as a learning source of environmental pollution. Description of the results of the development in the form of validity and practicality. The data obtained from this study are the results of the validation of media experts and green production module experts through ecobricks. The results of the validity of the media experts from the green production module through ecobricks meet the very valid criteria that is 96,6%. The expert content assessment in this module also fulfills the very valid criteria, which is 95,6%. The results of the analysis based on research data indicate that the green production module through ecobricks is feasible to use with an average module validity result of 96,1% with a very valid category. The teacher's response to the practicality of 93,75% with the module criteria is very practical in learning activities. Student responses by 82,8% with very practical criteria used by students in the implementation of learning. Based on this it can be concluded that the green production module through ecobricks is very valid and very practical to be applied in learning environmental pollution material.

© 2020 Universitas Negeri Semarang

<sup>✉</sup> correspondence :  
Postgraduate Universitas Negeri Semarang  
Jalan Kelud Utara III No.37, Kota Semarang, Indonesia 50237  
E-mail: [nurhafizah@student.unnes.ac.id](mailto:nurhafizah@student.unnes.ac.id)

## INTRODUCTION

Plastic waste around the world is discharged into landfills around 22% - 43% and up to 95% of the rubbish that accumulates on the coastline, sea level and seabed, consisting of plastic goods, fishing equipment, PET food containers and drinks (Hoonwerg et al., 2012). Plastic waste is still a major problem in world countries, including Indonesia. All types of waste currently available come from plastics, which turned out to be quite large (Ermawati, 2011).

Human activities damage and pollute the environment due to lack of knowledge about the attitude of caring for the environment, thereby causing environmental pollution and damage. Pollution and environmental damage can be overcome by growing understanding of environmental literacy, so that in a person grows a sense of concern for the environment (Azizah et al., 2017).

The incident above is an example of pollution that can be a picture to broaden students' understanding of environmental pollution material. Environmental pollution material is the last material in the second semester of class X in High School (SMA). Basic Competence (KD) of this material which is 3.11 analyzing data on environmental changes and the impact of these changes on life and 4.11 proposing ideas for solving environmental problems in the area of environmental change.

The results of interviews with biology teachers in Jawai 1 High School showed that the curriculum used was the 2013 curriculum. However, the 2013 curriculum had not been implemented using the right implementation scheme because the support was incomplete. Teaching materials used are textbooks, student worksheets (LKS), and power point media. There is no teaching material supplement that can deepen understanding the correct concepts used at the school.

The results of interviews with students at the same school show that students like environmental pollution material because it is closely related to daily life, but for its application it has not been fully carried out like it still cannot sort waste because the school only provides one trash can and for outside the school environment

awareness students to dispose of solid waste are still lacking four because there is no waste treatment plant.

Contextual learning can be one alternative that can be applied for students to minimize waste problems is to recover plastics, and / or inorganic materials, from waste streams, for recycling or energy generation and to process waste into green production through ecobricks. Green production is the application of environmentally and socially sensitive practices to reduce the negative impacts of temporary manufacturing activities (Baines et al., 2012).

Ecobricks is one of the creative efforts to manage plastic waste into useful objects, reducing pollution and toxins caused by plastic waste (Suminto, 2017). The independence that is highlighted in the process of making ecobrix is individual. This is also supported by research (Nasichah & Harmanto, 2019) to make students aware that plastic waste is very dangerous for the environment and the right solution is to lock it into a bottle (ecobricks).

Modules can equip students to discover concepts, facts in depth, and are able to provide extensive knowledge. Parmin & Peniati (2012) states that the availability of modules can help students in obtaining information about learning material. The results of the study of Setyowati et al. (2013) which shows that the science module has the character of the pollution theme developed effectively used in student learning.

The development of green production modules through ecobricks as a source of student learning on environmental pollution material can be a good implementation to apply. Thus, this research is expected to produce a green production module through valid ecobricks and can be used as a source of student learning, especially on environmental pollution material.

## METHODS

The form of this research is development research. Design This research development was adopted from Gall et al. (2006) and have been modified. This study aims to produce a product that is the green production module through ecobricks as a source of student learning.

This development research procedure refers to the R&D steps of Sugiyono (2012). The steps of the research development of the green production module through ecobrick are as follows.

#### a. Potential and Problems

The initial activity before developing this module is a needs analysis. Need analysis in the form of interviews with biology teachers and students in schools. Interviews were conducted to find out curriculum and teaching materials, as well as those used in schools. Problems in the school environment based on interviews are that no supplement of teaching materials has been used, and there is still a lack of students' environmental care attitudes.

#### b. Data collection

Data collection can be obtained from the reference source used. Data is taken from relevant sources using books, research articles, and the internet.

#### c. Product Design

Products to be developed are learning modules. The preparation of the module through several stages, namely determining the subject matter, choosing the format of the module content, preparing the test which is then used to design or design the module product.

#### d. Design Validation

This design validation phase aims to produce a green production module through ecobricks as a learning resource for students on validated environmental pollution material based on advice from material experts and media experts. Modules are validated by media experts and material experts. The validation of media experts aims to determine the accuracy of the standards applied in compiling the learning modules and knowing the validity of the modules. Material expert validation aims to test the completeness of the material, the truth of the material, and the systematic matter.

#### e. Design Revision

Module revision based on the results of the assessment of 2 people validator of media and material. The revision is based on input and suggestions from the results of the expert assessment, but if the expert judgment is not revised, it means that it goes directly to the product trial phase.

#### f. Product Trial

Product trials were conducted on teachers and 12 students of grade X MIPA 2 in SMA Negeri 1 Jawai. This trial is to find out the level of readability of the contents, and the appearance of the modules developed.

#### g. Product Revision

Product revisions are made from the results of product trials. The response of teachers and students is low, the product will be revised again, but if the response is high, it will continue with a large scale implementation test. To measure the level of product development validity, the following analysis techniques are used (Sudijono, 2008). Module validity criteria by media experts and material experts can be seen in Table 1.

$$P = \frac{f}{n} \times 100 \%$$

Information:

P : percentage of students' performance assessment skills

f : number of scores obtained

n : the maximum number of scores in the assessment aspect

**Table 1.** Module Validity Criteria by Media Experts and Materials

Percentage (%)	Criteria
$81.25 < P \leq 100$	Very valid
$62.5 < P \leq 81.25$	Valid
$43.75 < P \leq 62.5$	Invalid
$25 < P \leq 43.75$	Very Invalid

## RESULTS AND DISCUSSION

### Module Validation by Media Expert and Material Expert

The validation of the green production module through ecobricks was carried out by media expert lecturers and material experts. The recapitulation results of the assessment by media experts and material experts are presented in Table 2.

**Table 2.** Recapitulation of Validation of Media Expert and Material Expert

Expert	Aspect	Scores	Criteria
Media	Feasibility of Graphic	96.6	Very valid
Material	Eligibility	95.8	Very valid
	Presentation	95	Very valid
	Language	94.4	Very valid
	Contextual	97.2	Very valid
	Average material validation	95.6	Very valid
Average		96.1	Very valid

The validation value obtained from media experts was 96,6% with very valid criteria, while the average value of the material validation value was 95,6% with very valid criteria. The average value obtained from the two expert validators is 96,1% with very valid criteria. The assessment data from media experts and material experts serve as the foundation for revising the green production module through developed ecobricks.

Based on the above table, it can be seen that the average percentage of the feasibility of the green production module through ecobricks is 96,6% and 95,615%, with a very valid category. This is because the module has met the requirements for the preparation of a good module in each component that has been validated. This shows that the module is in accordance with the BSNP (2006) reference, which has fulfilled the teaching material evaluation component that follows the linguistic, presentation, graphic, and environmental care components.

Based on the scores obtained there are a number of suggestions from media experts as an improvement to make the module better. It is suggested from material experts to pay more attention to statements with questions so that there are links to several questions. Material validation is in line with the statement of Khalil et al. (2010) ie the contents of modules must be arranged logically and appropriately for use in facilitating students' independent learning.

Aspects of the appropriateness of the contents of the assessment indicators include the suitability of the material with KI and KD, the accuracy of the material, the updating of the material, and encouraging student curiosity. The assessment obtained is 95,8% with very valid criteria. The aspects of presenting the assessment indicators in the form of presentation techniques, supporting presentation, presentation of learning, coherence and mindset of the developed modules. The assessment obtained in the aspect of the presentation of 95%. Presentation aspects of the book are shown in the conceptual wrangling, examples of questions and practice questions, student involvement, and the integrity of meaning in learning activities. BSNP (2006) states that good textbooks are found in the presentation techniques in the form of conceptual wrangling, supporting the presentation in the form of simple language and concise, and the presentation of student-centered learning.

Aspects of the appropriateness of the language of assessment indicators are straightforward, communicative, dialogic and interactive, conformity with student development, as well as conformity with language rules. The assessment obtained was 94,4% with very valid criteria. Majid (2011) teaching materials are good, easy to understand, and interesting. The use of language that is simple, easy to understand, and uses commonly used terms is one form of language worthiness of teaching materials.

Advice from media experts is to improve the source of photos on the cover by avoiding plagiarism and giving color or markings to subtitles to make it more interesting. Suggestions from material experts are to pay more attention to statements with questions so that there are links to several questions. Improvements to the green production module through ecobricks were made so that the modules could be better when used by students in learning. Some display modules in the initial conditions and after the revision are in the following Figure 1.



Figure 1. Display cover (a) before revision, (b) after revision

The initial preparation of the module cover before revision (a) uses images sourced from the internet, and does not include the downloaded address. Validators suggest replacing images using personal documentation in order to avoid

plagiarism. Based on the validator's suggestion, the module is revised, a display that after revision (b) already uses a photo of the results from personal documentation.

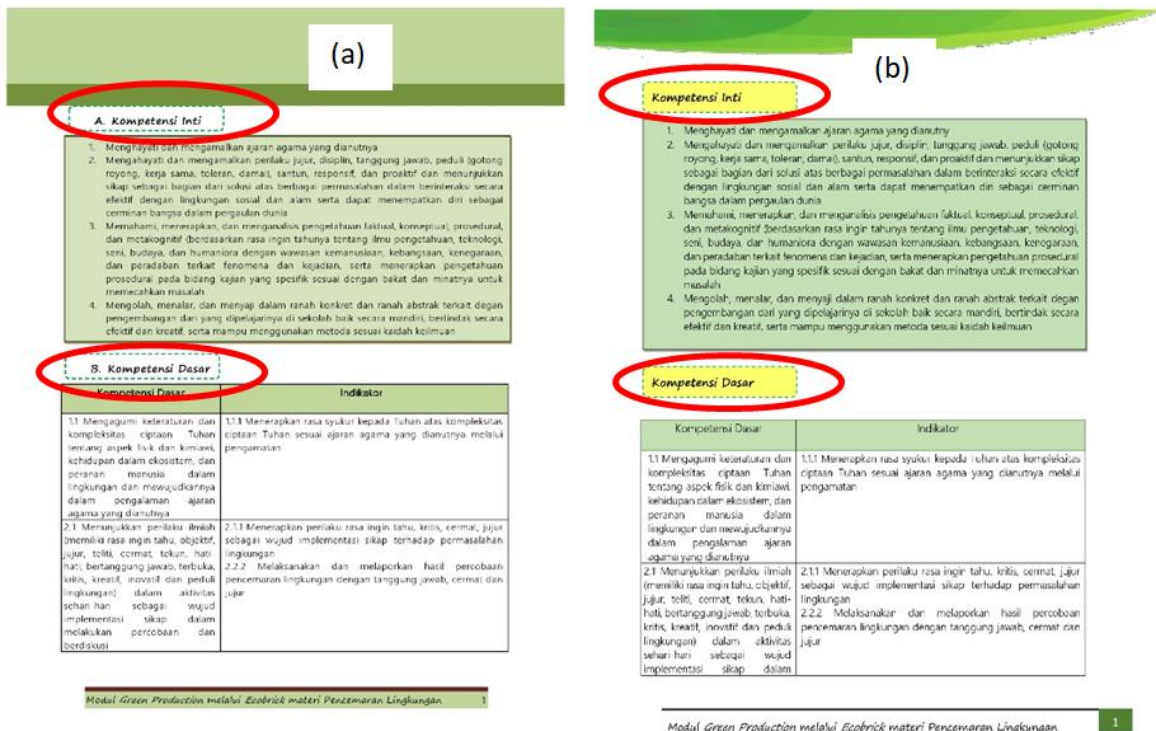


Figure 2. Display KI and KD before being revised and after being revised

The initial compilation of modules in the Core Competency (KI) and Basic Competency (KD) displays prior to revision Figure 2(a) shows that the subtitles are colorless and the contents of the KI section are more prominent than the subtitles of KI so that they are not attractive. The validator suggests that the subtitles be colored. Based on the validator's suggestion, the module is revised. The display shows subtitles that have been given color and the color theme is also replaced to better adjust the blend of colors that have been given. The results display after the revision can be seen in Figure 2(b).

The presentation of this module uses a lot of pictures and colors, so it gives an attractive appearance. Students are more likely to like interesting reading and lots of pictures and colors. Color can be a form of non-verbal communication that can convey instantly and more meaningfully (Ami et al., 2012).

The picture as an illustration in the module must be interesting to read compared to the explanation with the sentence (Ayriza, 2014). An effective module if it is easily understood to achieve certain competencies. Modules are feasible to use from systematic writing modules, easy to understand, relevant material with measured competencies and current references (Wening & Sudarmiatin, 2010).

### Practical Modules based on Teacher and Student Responses

Teacher and student responses to determine the usefulness of the green production module through ecobricks for students and teachers to use the module. The results of assessing teacher responses to the use of the green production module through ecobricks can be seen in Table 3.

**Table 3.** Assessment of Teacher and Student Responses to Modules

Data	Result (%)	Category
Teacher Response	93.75	Very Practical
Student Response	82.8	Very Practical

Teacher and student responses aim to find out the readability and implementation of learning activities using the green production module through environmental pollution material ecobricks. The results of the teacher's response that is equal to 93,75% with a very practical

category. The teacher's response questionnaire contained 20 statements, with the highest score of 4 and the lowest score of 1. The results of the teacher's response assessment aimed to facilitate the teacher's task in assessing student learning outcomes and could facilitate teachers in guiding students to improve their learning outcomes. Student responses are students' responses to the modules developed. To find out the students' responses were carried out in the form of a linkert scale and consisted of several aspects including interests, material, and language used in the green production module through ecobricks. Practicality is obtained from the response of the teacher and students after learning. The results of the assessment show that the module is very practical. Practical because the trial class has a percentage of positive responses of 83,3%.

Yuliana et al. (2012) states that the level of readability is needed to identify difficult words and identify the reaction of people who read to understand words contained in the text. In the use of modules, teachers can develop their own assessment sheets according to the needs of each teacher. Novera et al. (2019) developed modules can simplify the task of the teacher in carrying out learning activities and and can make students more easily understand learning material, analyze problems in the surrounding environment

The practicality of the module developed shows the ease with which students learn environmental pollution material. The material contained in the module uses easy to understand language, clear images and sources. The results of the teacher's response gave a very good response to the module, and the response of students also gave good results for the use of the module.

### CONCLUSION

Based on the results of the study it can be concluded that the results of the development of the green production module through ecobricks are as follows.

1. Validity of media experts by 96,6% and validity of material experts by 95,615%
2. Practicality of the module on the teacher's response of 93,75% with the module criteria very practical in learning activities, while the student response of 82,8% with the criteria of

very practical use of students in the implementation of learning.

## REFERENCES

- Ami, M. S., Susantini, E., & Raharjo. (2012). Pengembangan Buku Saku Materi Sistem Eksresi Manusia di SMA/MA Kelas XI. *BioEdu*, 1(2), 10-13.
- Ayriza, Y. (2014). Developing and Validating the Social Life Skill Module for Preschool Educators. *Jurnal Pendidikan dan Evaluasi Pendidikan*, 2(1).
- Azizah, R., Dewi, N. K., & Bintari, S., H. (2017). Pengembangan Modul Pembelajaran Pencemaran Lingkungan Bervisi SETS Berorientasi *Bioentrepreneurship*. Tesis. Program Studi Pendidikan Ilmu Pengetahuan Alam. Pascasarjana. Universitas Negeri Semarang.
- Baines, T., Brown, S., Benedettini, O., Ball, P. (2012). Examining Green Production and Its Role Within The Competitive Strategy of Manufacturers. *Journal of Industrial Engineering and Management*, 5(1), 53-87.
- BSNP. (2006). *Naskah Akademik Instrumen Penilaian: Buku Teks Pelajaran Pendidikan Dasar dan Menengah*. Jakarta: Badan Standar Nasional Pendidikan.
- Ermawati, R. (2011). Konversi Limbah Plastik Sebagai Sumber Energi Alternatif. *Jurnal Riset Industri*, V(3), 257-263.
- Gall, D. M., Gall, J. P., & Borg, W. R. (2006). *Educational Research: an Introduction (8<sup>th</sup> edition)*. United States: Pearson.
- Hoonwerg, Daniel, & Perinaz, B. T. (2012). *What a waste: a global review of solid waste management*, World Bank.
- Khalil, M. K., Nelson, L. D., & Kibble, J. D. (2010). The use of self-learning modules to facilitate learning of basic science concepts in an integrated medical curriculum. *Anatomical Science Education*, 3 (5), 219-226.
- Majid, A. (2011). *Perencanaan Pembelajaran Mengembangkan Kompetensi Guru*. Bandung: PT Remaja Rosda Karya.
- Nasichah, N. & Harmanto. (2019). Peran Sanggar Hijau Indonesia dalam Mengembangkan Sikap Peduli Lingkungan Peserta Didik melalui Program *Ecobrick* di SMA Negeri Mojoagung Jombang. *Kajian Moral dan Kewarganegaraan*, 7(2), 571-585.
- Novera, D., Indriyanti D. R., & Marianti, A. (2019). The Development of Ecosystem Module Based on Science Literacy in Senior High School. *Journal of Innovative Science Education*, 8(1), 525-532.
- Parmin, E. & Peniati. (2012). Pengembangan Modul Mata Kuliah Strategi Belajar Mengajar IPA Berbasis Hasil Penelitian Pembelajaran. *Jurnal Pendidikan IPA Indonesia*, 1(1), 8-15.
- Setyowati, R. (2013). Pengembangan Modul IPA Berkarakter Peduli Lingkungan Tema Polusi Sebagai Bahan Ajar Siswa SMK N 11 Semarang. *Jurnal Pendidikan IPA*, 2(2).
- Sudijono, A. (2008). *Pengantar Statistik Pendidikan*. Jakarta: PT Rajo Grafindo Persada.
- Sugiyono. (2012). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)*. Bandung: Alfabeta.
- Suminto, S. (2017). *Ecobricks: Solusi Cerdas dan Kreatif untuk Mengatasi Sampah Plastik*. *Jurnal Desain Produk*, (3)1, 26-34.
- Taufiq, M., Dewi, N. R., & Widiatmoko, A. (2014). Pengembangan Media Pembelajaran IPA Terpadu Berkarakter Peduli Lingkungan Tema "Konservasi" Berpendekatan *Science-Edutainment*. *Jurnal Pendidikan IPA Indonesia*, 3(2), 140-145.
- Wening, P. R. & Sudarmiati. (2010). Pengembangan Modul Kewirausahaan. *Jurnal Ilmu Pendidikan*, 17(2), 153-157.
- Yuliana, E., Sadjati M. I., & Fadila, I. (2012). Penilaian Tingkat Keterbacaan Materi Modul Melalui Evaluasi Formatif. *Jurnal Pendidikan Terbuka dan Jarak Jauh*, 13(2), 113-124.