

The Development of Booklet about the Variety of Macroscopic Fungi Species in Arboretum Sylva Western Borneo as the Supplement of Learning Material at High School

Meltasari Sulaiman[✉], Sri Ngabekti, Talitha Widiatningrum

Graduate School Universitas Negeri Semarang, Indonesia

Article Info

Article History:
Received February 2019
Accepted March 2019
Published April 2019

Keywords:
Booklet, learning
achievement,
effectiveness.

Abstract

This R & D research's purposes are to calculate: a) the variety of microscopic fungi species used as booklet material development, b) the validity, readability, practice, and effectiveness of the booklet. The findings are: a) the 21 species of macroscopic fungi variety in Arboretum Sylva, consisting of two divisions namely Ascomycota and Basidiomycota, b) booklet validity based on material expert's judgment, 93.5% and media expert, 98.8%, with valid criteria, c) 89.6% readability of the booklet by students and 91.2% by teacher, categorized as understandable, d) the practice of the booklet by the students, 87.5% and teachers, 86.9%, categorized as very practice, e) the effectiveness of the booklet based on affective learning achievement, 73.3 for experimental group, and 66.2 for control group with well category. Psychomotor learning achievement averages are 72.6 for experimental group and 61.1 for control group, categorized as well. Based on cognitive learning achievement, the gain scores are 0.71 for experimental group and 0.56 for control group. U Mann-Whitney test result gains significant score $0.000 < 0.05$. Effective size calculation is 0.6 (categorized as medium) and has impacts as 38.2%. The conclusion is the use of booklet is effective toward students' learning achievement.

© 2019 Universitas Negeri Semarang

INTRODUCTION

Biology learning is a process of learning related to surrounding living creatures. The process is always correlated to real life, so the interaction appear are among students, students to teacher, and students to their environment. Therefore, the students will be able to solve biological problems in their environment. According to Atikah et al. (2013) in learning process, teachers have role to achieve success and learning objectives.

Based on the interview results with Biology teachers of Pontianak Public High School 8, there are still some problems in learning process to teach Biology. The problem is the students have not understood material about Fungi. It can be seen based on last 2 year score data in which the students have not reached the minimum grade (KKM) determined by school. One of the causes is because the learning material used relies on textbook, and the material scopes of the book are still limited. The students also have not understood about the variety of Fungi and how to classify them. Besides that, for this current material, it was also seldom to directly observe because of time limitation in learning process. If the observation is done around schools, the teacher will be difficult because the habitat of Fungi has their own characteristics to keep growing.

The school also has not had any specific learning material about Fungi. It causes to not optimal learning achievement in cognitive aspect. According to Khairani & Safitri (2017), learning achievement has important roles in learning process. Assessing process toward learning achievement will give information for teachers about the students' development in achieving learning objectives through learning activities. The indicators can be seen from the percentage of learning achievement if it is compared to other materials in X grade in even semester of the school for last two years in academic year 2016/2017 and 2017/2018. The percentage of unclear passing grade about fungi material for academic year 2016/2017 was

38.49%, compared to the percentage in the later year was about 45.28%.

The data is supported by interview of Biology teachers of the school, revealing the cause of the problem was the students had difficulties to understand how to group the types of fungi. Moreover, in delivering the materials was lack and was only limited in textbooks. Learning the variety of living creatures through local potencies also can give better understanding for the students about natural environment. It is also useful to teach them to protect their surrounding environments to be preserved. The utilization of surrounding environment will involve students directly to figure out the natural sources of fungi. To use local potencies as Biology learning sources is one of expected characteristics demanded by curriculum so learning will be more applicative and meaningful (Ridlo & Alimah, 2013).

Tourism forest is natural artificial forest. Arboretum Sylva has many variety, both fauna and flora. The variety inside of Arboretum Sylva is still unidentified, one of them is fungi. Based on the interview with the head of College Executive Organization of Tanjungpura University, Pontianak, states that UNTAN has not had archives about the variety of fungi species. Arboretum Sylva has higher fungi species variety which is caused by the natural condition of the forest, wet and cold environment so fungi can grow.

METHODS

This research is an R & D (Research and development) (Sugiyono, 2014). This study calculates the numbers of fungi species variety in the forest. This mini research will be used as booklet learning material. The analysis is done to analyze the needs of the school. The populations of the research are 148 X graders coming from 4 classes of Public High School 8 Pontianak in academic year 2018/2019. The sample of the research is 74 graders from two classes, experimental group with booklet learning material and control group with textbooks. The technique to determine the

sample uses purposive random sampling. The development of booklet needs time to assess the reliability of the booklet used as learning materials. Booklet is validated by two expert lecturers, expert media and material. After the booklet is validated to be reliable, then small sized test to measure the readability and practice, responses from students and teachers of the school are needed. It is then continued by having larger scaled test to measure the

effectiveness of the booklet through learning student achievement. Cognitive assessment is analyzed using N-Gain to improve students' learning, comparing the learning achievement analyzed by U Mann Whitney statistic test and Effect of Size to see the backwash of the booklet. The learning uses JAS approach in Arboretum Sylva. The technique and instrument of collecting data are presented in this table;

Table 1. Instruments and Techniques of Collecting Data

No.	Data	Instruments	Techniques of Collecting
1.	The variety of Fungi Species	Fungi wealth analysis sheet	JAS method, documentation and identificatio
2.	The validity of booklet	Questionnaire for material experts and media experts	Questionnaire
3.	Responses readability of booklet	Questionnaire for teacher and student responses	Questionnaire
4.	Responses practice of booklet	Questionnaire for teacher and student responses	Questionnaire
5.	The effectiveness of booklet	Learning outcomes (cognitive, affective, and psychomotor)	Tests, observation sheets, and LKS

RESULTS AND DISCUSSION

There are two types of data in this research, qualitative and quantitative data. The qualitative data are suggestion and commentary, the qualitative data are scores gained based on responses, validity and effectiveness.

The Variety of Fungi Species in Arboretum Sylva to Develop Booklet Learning Material

The review and local potency becoming the base of this research development are the researches' findings about variety of fungi species done in Arboretum Sylva in Western Borneo. There are two fungi divisions gained, they are Ascomycota and Basidiomycota. The special characteristic of Basidiomycota is: having basidium. Meanwhile, the special characteristics of Ascomycota is shaped like bowl called ascokarp, meanwhile in the body of Basidiomycota is called basidiokarp.

The found fungi have similar sexual and asexual reproductions. Asexual reproduction is by forming konodia spore. The sexual reproduction is by fertilizing between 2 different hifa according to Tjokrokusumo (2015) fungi has two reproduction ways covering sexual and asexual. The habitat of fungi in this research, all of them are found in dead wood. However, some of them also grew on dirt. According to Hiola (2011) fungi has grown on fallen and deteriorate trees, by optimum temperature of the condition, about 10 until 15oC and humidity about 90.

The Validity of Booklet Learning Material

The indicators of booklet reliability can be seen from the validity of media and material experts. The validating step is done after the

booklet is completely designed. The validity of material and media experts are seen in Table 2.

Table 2. The Validity of Material and Expert Media

Component	Score	Percentage	Criteria	
Material	Content Feasibility	50	89,2	
	Feasibility of Presentation	27	96,4	
	Contextual	19	95	
	Total score	96	93,5	greatly valid
Teaching Material Size	8	100		
Media	Cover Design	24	100	
Teaching Material Design	27	96,4		
	Total score	59	98,8	

The validity aspect covers from content, presentation and contextual aspects. Each aspect has percentages in order 89,2%, 96,4%, and 95%. The score of all validities is 93.5%, it is categorized as greatly valid. The presentation of the booklet is also complemented by figures to elicit students' curiosity. It also aligns with research done by Agustanti (2012), learning must provide novelty, differences and something interesting to attract students. Learning by using well figures takes appropriate figures with the purpose of the learning, so the learning achievement will be maximum.

The aspect of media validity covers from 3 assessment: learning material size, cover design, and learning material design. The aspect of learning size and cover design get highest percentage, 100%. Meanwhile, for aspect of learning design is gained 96.4%. The score of all validities is 98,8 %, it is categorized as greatly valid. However, there are some suggestions given by validators covering from the description of booklet which is considered to have lengthy paragraph, so it seems not readable and makes the students difficult to understand.

Based on the suggestion given by the experts about the booklet, it is then revised, printed, and tested to small scale learning. The booklet has been designed appropriately accordingly to instructional principles so it gives information according to findings based on field around students to be repackaged and arranged so it can be a supplement for learning material. Booklet is presented by full color pictures to more attract students' visual ability. According

to Rizky & Wildaniati (2015), learning using pictures can give description about a specific and more concrete explanation and become a meant and physical material existing in students' surroundings to present message of learning activities so it can trigger their visual ability to study.

Readability and Practice of Booklet Learning Material

Readability and practice of the booklet is done by small scaled test with 33 students of MIPA 2 and 2 Biology teachers of the school as the respondents. The selection of the respondents are based on Bartlett test. The responses of teachers and students in small scaled test are presented in Figure 1.

Based on the responses of the students and teachers toward readability and practice of the booklet, readability gains 89,6% from students and 91,2% from teachers, they are categorized is easy to understand. The practice responses of the booklet gains 86,9% from teachers and 87,5% from students with criterion to be very practical. However, there are still some suggestions about the booklet in which is still difficult to understand. Based on the suggestion, the booklet is revised by using easy and simple language to be understood. Yulini & Herlina (2015) state a good learning materials should have communicative language to be understood by readers.

Based on the responses of readability and practice, the booklet meets the reliability criteria because it gains practice response percentage

87,2 % and readability 90,4 %. Overall, the booklet is seen reliable as the supplement of the material. Booklet is said to be suitable learning

material to deliver detailed and clear information, covering from pages into a small, practical book to use (Pambayun & Dewi, 2015).

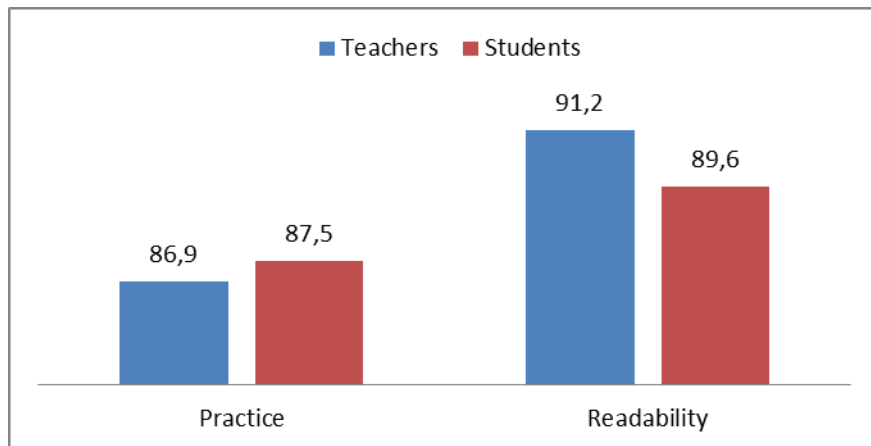


Figure 1. Small Scale Teachers and Students Responses

The Effectiveness of Booklet Learning Material

The effectiveness is done on larger scale test with 74 graders from two classes, experimental and control group containing 37 students for each group. Experimental group is a group of students with the intervention, MIPA 4 class. Meanwhile, the control group is a group of students with no intervention, MIPA 1. The decision making to determine whether the class is experimental or control is based on Bartlett test.

The effectiveness of the booklet can be measured from students' learning achievement. The learning achievement meant has three aspects: affective, psychomotor, and cognitive learnings. The affective learning is measured through students' attitude while discussion and

their attitudes of caring about their environment. Psychomotor learning achievement is average score of the students in presenting skills, reporting their worksheet gained from group discussion.

Students' affective judgment consists of students' attitudes while discussion and observation to Arboretum Sylva in which what is seen from caring students' environment. The average of affective score from students' attitude questionnaire spread to experimental group gains 74.05 for caring students' environment attitudes and average of discussion attitudes is 72.56. Meanwhile, the score of control group for average of caring students' environment attitudes is 66.7, and percentage of discussion attitudes is 65.7. The average of affective score is seen on Figure 2.

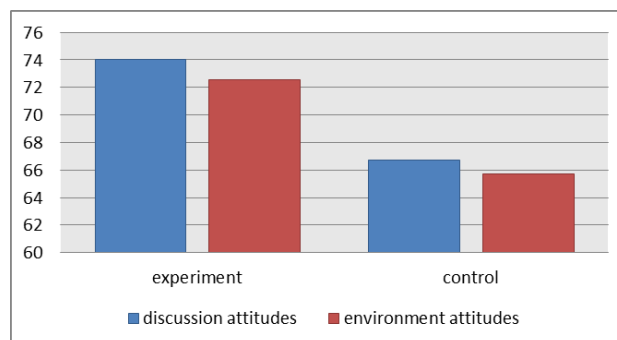


Figure 2. The Average of Students' Affective Score

All aspects of affective assessment gain score above 61% both control and experimental groups. It can be concluded the affective score are categorized well. It aligns with Imithana et al. (2014) stating that learning using booklet demands students to learn independently, so they do not only read and listen the teachers but it gives chance to them to observe by themselves.

Psychomotor score is gained from students' skills in reporting the discussion done in Arboretum Sylva. The average of experimental and control groups' scores are 72.62 and 61.18. Both classes are categorized well. Findings of psychomotor is presented in Figure3.

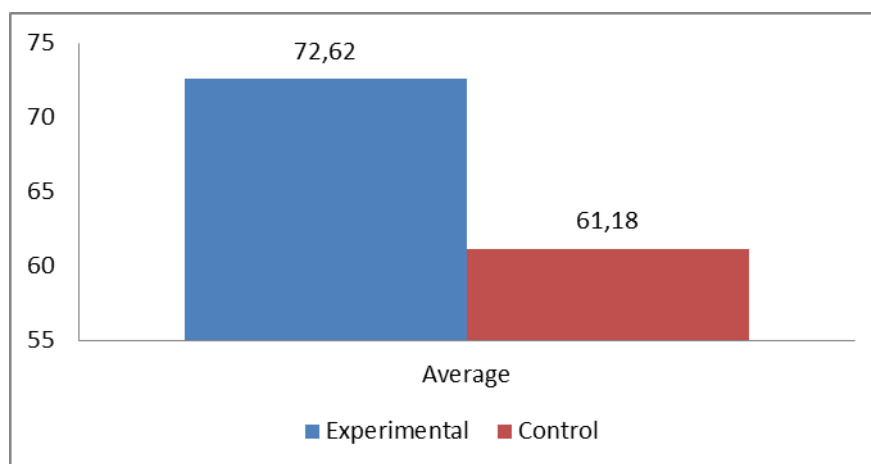


Figure 3. The Average of Psychomotor Scores of the Students

Based on observation results of experimental group shows many students have been correct to classify the species of the found fungi, meanwhile the control group still has difficulties to classify them. It is because the experimental group using booklet completed by determining key so they can classify the fungi correctly, meanwhile the control group only sees and matches the pictures in the textbook with the fungi found in the field. However, not all of the intended pictures are same. Based on the students' statements, they experience higher responses toward the learning activity done

outside of the class by exploring surrounding natural environment. It is supported by research done by Zumroh et al. (2018) stating that exploring nature can influence toward social changes such as discipline, responsibility, respect other's opinions, motivating students to be careful of their environment, and training their cooperation.

The cognitive learning achievement is gained from pretest and posttest of the students. The average score of pretest, posttest, and gain score of both groups can be seen in Table 3 as follows.

Table 3. The Data of pretest, posttest, gain score, and classical passing grade

Class	Average		Score Gain	Total Value	Classical Completeness
	Pretest	Posttest			
Experimental	27,48	79,19	0,71	79.19	83,7 %
Control	33,52	71,17	0,56	71,17	81,0 %

The pretest learning achievement gained for control group has average 33.52. Meanwhile, the average of experimental group is 27.48. The pretest score in the beginnings of learning is

gained before the intervention. Based on the pretest of experimental group and control group, they did not pass the passing grade, 75. Based on Ardianti's et al. (2012) argument that pretest is

given to find out whether the students have understood the material in which will be delivered. Pretest can be also said as activity to test initial level of students' knowledge toward the materials to be delivered, this activity is done before the learning process started (Pratama et al., 2016).

The initial knowledge had by students is needed to foster new learning concept (Rogiqoh & Martuti, 2015). Knowledge concept had by the students will ease teacher to deliver a certain learning concept to be delivered. So, there is a relationship between concept which be learnt among students and teachers. It can influence learning process and students' cognitive learning achievement (Pratama et al., 2016). After giving pretest, it is continued by learning in which experimental group is given an intervention while the control group only uses textbooks. The learning was conducted in Arboretul Sylva, Western Borneo.

After the learning ended, posttest was given to find out the ability of the students

related to the material. Alvitarsari et al. (2016) states posttest is a final evaluation when the material has been taught to find out whether the students have understood the material. Posttest is a way to get description of the abilities achieved after the ending of learning (Pratama et al., 2016). The result of posttest for control group is 71.17 and experimental group is 79.19.

Based on the scores gained, then is was continued by N-gain test from the difference in score between before and after the treatment. The score gained for control group is 0.56 categorized medium and N-gain score of experimental group is 0.71 categorized high. According to Evawani et al. (2013) states that learning media is said to be effective when it can improve students' conceptual mastery after being implemented in learning, shown by medium categorized N-gain score.

U Mann Whitney test in this research covers analysis of posttest data of experimental and control groups to find out the differences between them. The test is as follows:

Table 4. U Mann Whitney Test of Experimental and Control Groups

	Value
<i>Mann-Whitney U</i>	346.000
<i>Asymp. Sig. (2-tailed)</i>	0.000

The difference in scores between those classes is seen from the analyzed N-gain scores analyzed by U-Mann Whitney because at that time the requirement of the gained data was abnormal. Based on the test, it is gained significant score $0.000 < 0.05$ (Appendix C-12), then H_0 is denied, meaning there is difference between learning achievement of those groups, the one with intervention and the one without intervention. This research aligns with research

done by Pratiwi et al. (2014), learning achievements between those groups is known to have better improvement seen in experimental group.

The backwash of the booklet toward the analyzed learning achievement using Effect Size test gains score 0.6, included in medium category and has backwash 38.2 based on Cohen's interpreting table. The Effect Size result is presented in Table 5.

Table 5. Effect Size Result

Score from posttest of Experimental	Score from Posttest of Control	Standard Deviation Class Control	Effect size	Category
79,19	71,17	13,79	0,6	Medium

A good learning material will influence learning achievement after the intervention. The

backwash of booklet toward the learning achievement can be seen from the given test.

Based on learning done, it is gained score from posttest of experimental group with average score 79.19, meanwhile the control group's average score is 71.17. It shows learning using the booklet will positively influence learning achievement. If it is seen from Cohen's interpreting table, then learning using booklet greatly influences, 38.2%, categorized medium toward the improvement of students' learning achievement. If it is seen based on Effect Size calculation, it is gained score 0.6.

CONCLUSION

The variety of fungi species in Arboretum Sylva is about 21 species, consisting from two classes: Ascomycota and Basidiomycota. The validity of media and content material experts are categorized to be valid so the booklet can be used in learning the material. The responses of readability and practice of the booklet by students and teachers are considered well. The effectiveness of the booklet can be seen from affective, psychomotor, and cognitive learning achievements. Cognitive learning achievement has significant improvement, differences, and backwash. The affective learning achievement and psychomotor are categorized well.

REFERENCES

- Agustanti, T. H. (2012). Implementasi Metode Inquiry untuk Meningkatkan Hasil Belajar Biologi. *Jurnal Pendidikan IPA Indonesia*, 1(1), 16–20.
- Alvitasari, D., Ngabekti, S., & Irsadi, A. (2016). Pendekatan Jelajah Alam Sekitar dengan Memanfaatkan Laboratorium Biologi dan Kebun Wisata Pendidikan UNNES sebagai Sumber Belajar Materi Keanekaragaman Hayati. *Unnes Journal of Biology Education*, 5(2), 198–206.
- Ardianti, S. D., Christijanti, W., & Dewi, P. (2012). Peran Media Animasi dengan Metode Pembelajaran Time Token terhadap Aktivitas dan Hasil Belajar. *Unnes Journal of Biology Education*, 1(1), 74–78.
- Atikah, N., Solihatin, E., & Martono, A. (2013). Hubungan antara Keterampilan Dasar Guru dalam Mengajar dengan Hasil Belajar PKN Siswa. *Jurnal PPKN UNJ Online*, 1(2), 1–14.
- Evawani, T., Rahayu, E. S., & Retnoningsih, A. (2013). Pengembangan Perangkat Pembelajaran Bermakna Menggunakan Lembar Kerja Siswa Divergen pada Materi Ciri-ciri Makhluk Hidup. *Journal of Educational Research and Evaluation*, 2(1), 20–25.
- Hiola, F. (2011). Keanekaragaman Jamur Basidiomycota di awasan Gunung Bawakaraeng (Studi Kasus: Kawasan Sekitar Desa Lembana Kecamatan Tinggi Moncong Kabupaten Gowa). *Bionature*, 12(2), 93–100.
- Imtihana, M., Martin, F. P., & Priyono, B. (2014). Pengembangan Buklet Berbasis Penelitian Sebagai Sumber Belajar Materi Pencemaran Lingkungan di SMA. *Unnes Journal of Biology Education*, 3(2), 62–68.
- Khairani, I. & Safitri, R. (2017). Penerapan Metode Pembelajaran Problem Solving untuk Meningkatkan Hasil Belajar Pserta Didik pada Materi Usaha dan Energi di MAN Rukoh Banda Aceh. *Jurnal Pendidikan Sains Indonesia*, 5(2), 32–41.
- Pambayun, P. S. & Dewi, N. K. (2015). Pengembangan Modeul Pencemaran Lingkungan Berorientasi PAIKEM Menggunakan Limbah BATIK sebagai Sumber Belajar di MA. *Unnes Journal of Biology Education*, 4(1), 29–36.
- Pratama, M. A., Purwantoyo, E., & Mubarok, I. (2016). Pengaruh *Index Card Match* Bergambar Terhadap Motivasi dan Hasil Belajar Kognitif pada Materi Struktur dan Fungsi Sel. *Unnes Journal of Biology Education*, 5(2), 116–122.
- Pratiwi, D., Suratno, & Pujiastuti. (2014). Pengembangan Bahan Ajar Biologi Berbasis Pendekatan SAVI (Somatic, Auditory, Visual, Intellectual) Pada Pokok Bahasan Sistem Pernapasan Kelas XI SMA dalam Meningkatkan Motivasi dan Hasil Belajar Siswa. *Jurnal Edukasi UNEJ*, 1(2), 5–9.
- Ridlo, S. & Alimah, S. (2013). Strategi Pembelajaran Biologi Berbasis Kompetensi dan Konservasi. *Biosaintifika: Journal of Biology & Biology Edocation*, 5(2), 122–129.
- Rizki, S. & Wildaniati, Y. (2015). Efektifitas Bahan Ajar dan Media Berbasis ICT pada Materi Persamaan Fungsi Kuadrat. *Jurnal Pendidikan Matematika*, 4(2), 1–8.
- Rofiqoh, W. E. Y., & Martuti, N. K. T. (2015). Pengaruh Praktikum Jamur Berbasis Keterampilan Proses Sains Terhadap Hasil

- Belajar Biologi Materi Jamur. *Unnes Journal of Biology Education*, 4(1), 9–15.
- Sandhya, M. C., Prabhu, K. N., & Earanna, N. (2017). Mushroom Diversity of the Gandhi Krishi Vigyana Kendra (GKVK) Campus, University of Agricultural Sciences, Bangalore, Karnataka (India). *International Journal of Current Microbiology and Applied Sciences*, 6(4), 2279–2286.
- Sugiyono. 2014. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta
- Tjokrokusumo, D. (2015). Diversitas Jamur Pangan Berdasarkan Kandungan Beta-Glukan dan Manfaatnya Terhadap Kesehatan Diversity of Edible Mushrooms on Their Beta Glucan Content and Health Benefits. *Pros Sem Nas Biodiv Indon*, 1(6), 1520-1523.
- Yuliani, F. & Herlina, L. (2015). Pengembangan Buku Saku Materi Pemanasan Global untuk SMP. *Unnes Journal of Biology Education*, 4(1), 104–110.
- Zumroh, N., Rahayu, E. S., & Dewi, N. K. (2018). Keefektifan Model Pembelajaran Window Shopping dan Pendekatan Jelajah Alam. *Journal of Biology Education*, 7(2), 221–225.