



The Development of Pteridophyte Catalog of Curug Lawe Petungkriyono as Learning Source for Senior High School Students

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Abstract

This research aims to identify the variety of fern species in Curug Lawe area of Techno-forestry Park, Petungkriyono; then develop the catalog, investigate the validity and analyze the effectiveness of the catalog as Biology learning source for senior high school students. The study was done in Curug Lawe Petungkriyono as exploration place and SMA N 1 Petungkriyono for validity test. The design of catalog used Sugiyono (2012) and research method for effectiveness test is One-Shoot Study Case. The object of study is all fern plants found through the way to Curug Lawe. The research result shows that percentage of catalog validity by expert and biology teacher is 94.5%. The percentage of students' classical completeness of students' learning results is 78%, while percentage of incomplete students is 22%. The mean of students' response questionnaire after the learning is 83% with very good criteria. Generally, teacher and students give positive and very good response toward the applied learning. The conclusion of this research is Pteridophyte Catalog is proper and effective to be used as Biology learning source for senior high school students.

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INTRODUCTION

Learning is the interaction process between learners, between learners with educators and also learning resources in a learning environment (Kemendikbud, 2016). Besides that, the role of the teacher in the learning also requires learning resources. The result of preliminary observation indicates the learning source used in SMA N 1 Petungkriyono is still limited to textbooks and copies of material from teachers. The used printed book is still dominated by words and less images that give the impression of Biology is too much rote. Therefore, it is necessary to develop an interesting learning source, such as catalog.

Catalog is one of information means that are printed, online and file that presents images. According Widalismana *et.al* (2016), the use of catalog in learning activities can increase student's activity and learning. Hilmi (2016) states that the use of plants catalog to support learning activities will be more meaningful if the images used are images of the original habitat so it is more representative.

The achievement of Biology learning goal is in the learning process organized by the teacher. The learning process involves many learning components such as teachers, students, media and learning resources. But so far the teacher has not use of learning resources maximally. The learning resources, which are used by teacher, are limited to students and teacher's handouts only. In addition, Biology books in the school contain too long descriptions and little images that give the impression Biology is too much rote. The book has not given a real picture of the studied object. The existing learning resources have not utilized the surrounding's potential learning source.

The environment is one learning sources. The learning resources of the school environment can be utilized in outdoor classroom learning. Learning outside the classroom can be done in forests, gardens, parks, and others. Learning outside the classroom can develop students' knowledge and skills if it is well structured, well-planned, well-taught, and effectively followed (Dillon *et al.*, 2006). School's difficulty in organizing outside learning is in the determination of time because it takes a long time, cost, transportation, and energy. Those limitations that make teacher prefers to bring learning objects into the classroom for learning activities. The learning object of nail plants is preserved specimens, drawings or photographs of nail plants as learning resources obtained from their natural habitat.

Widhiono (2009) has been exploring the biological riches of flora and fauna in protected forests of Techno-forestry Park region, Petungkriyono. One of the results of his research is found 19 species of nail plants. The variety of nail plants is one of the potential environments that can be used as a source of student's learning. Learning resources of the surrounding environment utilization is expected to increase the likeliness of learners to the environment so that impact on joint efforts to preserve the environment.

Curug Lawe is part of Techno-forestry Park area in Petungkriyono. Techno-forestry Park Petungkriyono is forest area in Central Java which has the potential to be a source of Biology learning. This is because of the region Techno-forestry Park Petungkriyono is one of the smallest forests in Central Java that has not been fragmented and deforested into land of agriculture (Ranny, 2013). However, this potential has not been utilized as a source of learning so far.

Abdullah (2012) states that learning resources that tend to be utilized are books, papers, boards, maps, globe, films, drawings, diagrams, magazines, journals and newspapers. Images are one source of learning that is often used because images provide an overview of the object being studied.

According Widalismana *et.al* (2016) the use of catalogs in learning activities can improve student activity and learning outcomes. Catalog is one of information means that can be printed,

online and files which presents the image. Hilmi (2015) states the use of the original image in the learning activities will be more effective and representative.

Based on the observation of the needs and background above, research is needed to explore the diversity of ferns (Pteridophyta) in Curug Lawe Techno-forestry Park Petungkriyono as a learning resource.

RESEARCH METHOD

The research was conducted at Curug Lawe which is part of the Techno-forestry Park area in Petungkriyono as area for collecting data of nail plant species variety and SMA N 1 Petungkriyono for the catalog's effectiveness test. The research was conducted in May–December 2017. The research design for developing the catalog adopts the R&D design by Sugiyono (2012), while for the effectiveness test used pre-experimental design with one-shot case study. The effectiveness test is performed on the students class X MIPA SMA N 1 Petungkriyono.

The collected data is in the form of main data and supporting data. The main data is the variety of nail plants species in Curug Lawe Techno-forestry Park Petungkriyono area, the validity test result by material experts, media experts and biology teachers and also learning outcomes to test the effectiveness of the catalog. Supporting data is in the form of sheets of responses (students). Applied lesson in the classroom is based on syntax of Cooperative learning approach.

Methods of data analysis in this research are identification of nail plant, descriptive analysis presentation for catalog validity and readability of catalog by student, reliability analysis, discriminating power, validity and level of student's difficulty for problem analysis and percentage descriptive analysis for student's learning result data.

RESULTS AND DISCUSSION

The Diversity of Pteridophyte Species in Curug Lawe Techno-forestry Park of Petungkriyono

The found nail plants in Curug Lawe of Technoforestry Park area are 40 species which consists of 3 classes. The identified species is Filicopsida class at most. Based on the type of spore that is earned by the fern, the homospora fern is dominated. Homospora fern is a nail plant that produces the same type and size of spore. The comparison of homospora, transition, and heterospora percentage is presented on Figure 1.

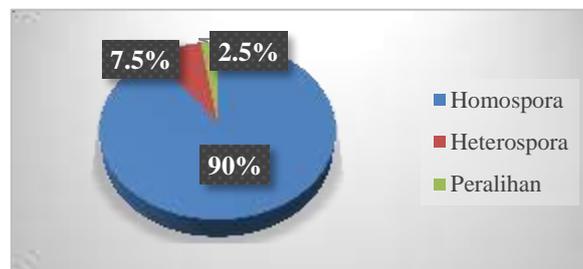


Figure 1 The Comparison of homospora, transition, and heterospores in Curug Lawe Techno-forestry Park area of Petungkriyono

Based on its habitat 70% of the nail plants that live in the research area is terrestrial nails. The terrestrial nail plant is a nail plant that likes damp places, sandy soil and open places

exposed to the sun directly. Curug Lawe is part of Techno-forestry Park Petungkriyono natural tourist area. Techno-forestry Park Petungkriyono is a cold forest area with humid environment where moisture level is 75.2%-98% and has low light intensity that is 137.9 Lux-3440.8 Lux (RPKH Pekalongan Timur, 2003).

The environmental condition of the Curug Lawe is moist and the low level of light intensity cause the high variety of nail plants species in Curug Lawe Petungkriyono. The nail plant fits in a humid environment because in its life cycle it requires water to help the sperm go to the ovum (Campbell, *et.al*, 2012).

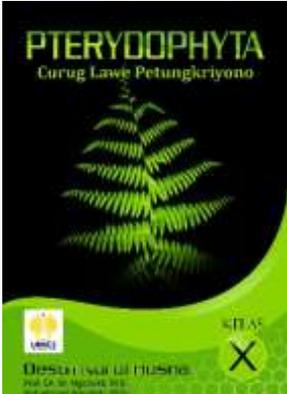
Characteristic of Pteridophyte Catalog of Curug Lawe Petungkriyono

Pteridophyta Catalog of Curug Lawe Petungkriyono is a learning resource of Plantae sub material Pteridophyta. The catalog contains diversity of identified nail species. The design of the learning resources of the catalog is designed and adapted to the basic competencies, indicators of competency achievement, and the nail material learning characteristics. The contents of the catalog display photos of each type of nail plant (*Pteridophyta*) supported by common names, scientific names, descriptions, classifications and benefits.

The front cover of the Pteridophyte catalog consists of catalog titles, author names, institution and picture of one of found ferns in Curug Lawe Techno-forestry Park in Petungkriyono. The back cover consists of catalog title and an example of one of the nail plants found. While the contents of the catalog for examples, the general review of nail plants, the way of identification of nail plants, the samples of determination key, the classification of nail plants, the description of the data collection, the various forms and the location of sorus, the speciesrichness of nail plants, the example of data presentation of phenetic analysis of ferns, examples of data presentation of phylogenetic analysis of nail plants and glossary.

The catalog is designed with interesting front and back covers and the contents contain new information for students. It is because besides interesting display of the books, students' reading interest is also influenced by the serving of the new information (Cambria & Guthrie, 2010). Presentation of picture on catalog given caption parts of plants. Picture observation result given caption to increase knowledge and understanding (Mustofa, M. *et. al.* 2013). The view of Pteridophyte Catalog of Curug Lawe Petungkriyono design is presented in table 1. Validity of Pteridophyte Catalog of Curug Lawe Petungkriyono as learning source for senior high school students.

Table 1 Display of Pteridophyte Catalog of Curug Lawe Petungkriyono Design

Front Cover	Title Page	Content
		



The result of catalog validation was done by material experts, media experts, and biology teachers. The catalog is assessed using the feasibility standard of teaching materials according to BSNP 2016 covering 4 components of feasibility, ie content, language, presentation, and graphic. The material expert judges the content and language components. Media experts judge the components of presentation and graphic. Biology teachers assess all components. Assessment results are used to revise the deficiencies so that the catalog is appropriate to use in learning. The result of validation is shown in Figure 2.

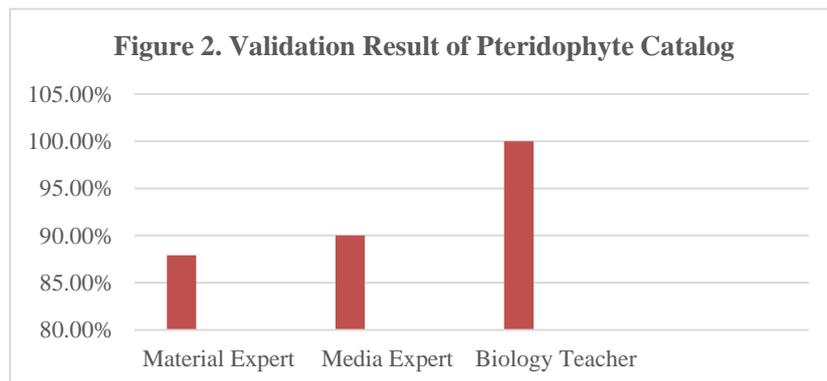


Figure 2 Validation Result of Pteridophyte Catalog

The result of questionnaire catalog validation by material expert is 87.9%, as for the correction from the material expert can be described that there are some photographs of the nail plant parts are less clear, so it needs to be enlarged in order to be seen clearly. Writing the name of a nail plant (*Pteridophyta*) that is not in accordance with the rules of writing a scientific name should be corrected. There is lack of consistency between the catalog usage guidelines and the contents of the catalog also. In addition, the presentation of the glossary is not sequential, so it should be sorted in alphabetical order.

Result of catalog validation by media expert is 90%. The results of media expert correction can be described that the writing of KD and Indicators in the catalog should be bold or italic to differentiate with others so that it is easy to read. Writing instructions for using catalogs will be easier to understand when displayed with charts. Before showing the images of nail plant species (*Pteridophyte*), it is better to give the introduction, for example description of Curug Lawe Technoforestry Park area as a place of exploration of nail plants (*Pteridophyte*).

The result of validation by the biology teacher is 100%. The results of the biology teacher's response can be described that the material in the developed Pteridophyte catalog is good. Developed learning resources have met the feasibility standards of teaching materials according to BSNP so it is feasible to be used as a source of learning Pteridophyte materials.

The validity of the catalog stated by material experts, media experts and biology teachers is 94.5% with very valid criteria. Based on the practicality components, the content completion percentage is 91.1%, the language feasibility is 96.9%, the feasibility of the presentation is 100% and the feasibility of graphic is 90%. It shows that the developed catalog is worthy of being used as a learning resource for Pteridophyte Biology material.

Legibility of Pteridophyte Catalog of Curug Lawe Petungkriyono

The result of the students' responses to the catalog of nail plants (Pteridophyte) in Curug Lawe Techno-forestry Park Petungkriyono area can be seen in table 2.

Table 2 Students' Reponse to Pteridophyte Catalog

No	Statement	Score	Percentage
1	Interesting display	4	78%
2	Interesting color composition on catalog	5	80%
3	The font and letter size in the catalog are easy to read	7	84%
4	There is a typo/typing error that makes catalog difficult to read	9	70%
5	The language used in the catalog is easy to understand	7	84%
6	The pictures/photos in the catalog are clear and easy to understand	4	78%
7	Picture descriptions are easy to understand	6	82%
8	The terms used are easy to understand	2	75%
9	The presentation of the material in the catalog is interesting and easy to understand	8	86%
10	Study instructions are clear and easy to understand	7	84%
11	The learning objectives are clearly defined in the catalog	6	82%
12	The Techno-forestry Park Petungkriyono brings back	8	86%
13	The variety of nail plants in area in surrounding environment	1	91%
14	Pteridophyte material is more easily understood using catalog	8	86%
15	The surrounding environment including Techno-forestry Park Petungkriyono area can be used as a learning resource of Pteridophyte material	9	87%
16	After studying various nail plants (Pteridophyte) and its benefits awaken the importance of protecting the environment for biodiversity to exist	1	91%
17	After studying the material in the catalog, encouraged to see the nail plants (Pteridophyta) around the house and school by following the steps of identification.	7	84%
Average		789	83%
Criteria		Very Appropriate	

Student response to the catalog of nail plants (Pteridophyte) in general as a source of learning material Pteridophyta obtained a total score 789 with a maximum score is 952, so it is obtained average percentage as 83%.

Statement of typing errors which makes it difficult to read catalog gets a percentage of 70%. Based on the questionnaire results there are many typing errors or typing. This is not appropriate, because the Pteridophyta catalog contains only a typographical error of 1%. The result

of the questionnaire of 70% writing is probably due to the statement "There is a typing error/typing which makes it difficult to read the catalog" is the only negative statement in the questionnaire. This leads misunderstanding in students. Adams (2014) states that the preparation of less precise instruments such as word placement can lead decrease in the understanding of meaning by students.

Pteridophyte catalog which presents various species of ferns (Pteridophyta) in Curug Lawe Techno-forestry Park in Petungkriyono has benefits in several areas such as health, economics, and food. The variety of the nail plant species must be maintained so that the benefits are saved. The existence of the knowledge delivery to students who use the surrounding environment is expected to foster student awareness. According to Ramadoss & Moli (2011), learning that comes from the environment around the learner can build comprehensive concepts such as cognitive development, affective and student behavior. The student's built-in behavior is expected to encourage students to take concrete action in keeping the potential and diversity of local nail species.

Effectiveness of Pteridophyte Catalog of Curug Lawe Petungkriyono

The learning using the Pteridophyta Catalog of Curug Lawe Petungkriyono has been done on a small-scale trial in the class X MIPA SMA N 1 Petungkriyono with 14 students. Comparison of students who complete and incomplete the minimum completeness criteria, is presented in figure 2.

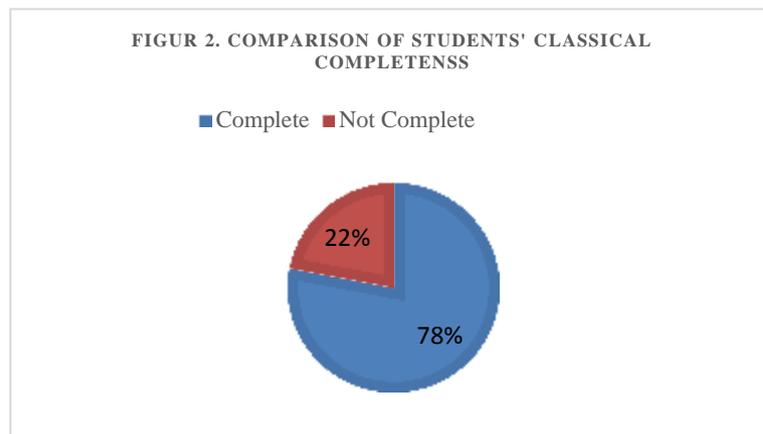


Figure 2 Comparison of Students' Classical Completeness

Based on the results of classical completion of students' learning result have met the criteria that is the percentage of students complete is 78%. Student's learning completeness is assessed from LKS (Students' Work Sheet) and evaluation tests. The weight of value for LKS is 1 and evaluation test is 2, thereby student's classical completeness can be helped by LKS value. The value of LKS is taken from the result of group discussion whereas the test is done individually. There are 2 students who get test scores under KKM (minimum completeness criteria) (under 70), but because supported by high score of LKS, that student is complete.

The material presented in the Pteridophyte catalog is based on basic competence (KD) and indicators of competency achievement. Good learning results show good mastery of the material. In addition, learning outcomes also show students' understanding of the catalog usage guidelines, the classification and description of nail plants. Students also have good photo/picture observation, therefore students can understand the material presented in the catalog well.

The classical completeness of the students' learning achievement reaches 78%, it proves more than 50% of students can absorb learning using catalog well. But there are still students who have not

completed; students who did not complete because of some factors include the use of language, the use of the term and the scientific name of nail plants in the catalog.

The questionnaire results show that 22% of students do not understand the terms used in the catalog. The use of the scientific name of nail plants in the catalog also affects the students' unfinished grades. Scientific names cannot be avoided in Biology learning, teachers can apply several methods that can assist students in remembering the scientific name of nail plants.

Some methods teachers can use to assist students in remembering scientific names include mnemonic and repetitive methods. The mnemonic method is a method of memorization using abbreviations combination. Another method that can be used is the method of repeating. The repetitive method is done by repeating the scientific name that will be memorized. According to Amri & Jafar (2016), one of effective ways that can be used to memorize the scientific name is by repetition.

CONCLUSION

According to research results and discussion above, it can be concluded that Pteridophyte Catalog of Curug Lawe Petungkriyono is appropriate and effective as senior high school students' learning source. The result of validity test of catalog by experts and Biology teacher is very appropriate and students' classical completeness is passed. In general, teacher and students give positive and very good response to the applied learning which use Pteridophyte Catalog.

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