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DEVELOPING PLANTAE ATLAS FOR PLANT IDENTIFICATION AND BASIC SCIENCE PROCESS SKILLS TRAINING

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Abstract

Science process skills are thinking skills in problem solving and planning research in order to gather scientific information. Therefore this research will train basic science process skills, namely the skills of observing, classifying, predicting and asking questions as well as for means of identifying plants.The purpose of this study were to produce the Plantae Atlas for the means of plant identification, to train basic science process skills and to describe the validity of theoretical and empirical feasibility. This research trained the basic science process skills how to observe, classify, predict and ask a question. This developmental research produced the Plantae Atlas that were limited tested at SMAN 19 Surabaya with a total of 15 students of class X MIA 4. Data collection in this study used validation, observation and questionnaires methods. The results of this study indicated that the theoretical feasibility of validation was 93% which was categorized as very feasible. The empirical feasibility reached a score of 92% which was categorized as very good. Student response positively by 98% which was categorized as very feasible. Thus Plantae Atlas cocluded as feasible theoretically and empirically.

Keywords: Plantae Atlas, basic science process skills, Plantae, theoretical, empirical

INTRODUCTION

Science process skills are thinking skills in problem solving and planning research in order to gather scientific information. In fact the quality of science education in some countries especially in indonesia is still categorized as low (Sunyono, 2018). Science process skills are important to be applied in learning because they are able to grow experience in the learning process. The experience in questin is in the form of provision to carry out scientific methods to obtain new knowledge or the development of knowledge through practical activities (Karamustafaoglu, 2011). Science process skills are very important to develop so that students can learn independently and develop themselves through learning from the universe. In addition, through science process skills, students can learn to conduct research and solve problems which are one aspect of life skills that everyone must have.

Observation or practicum activities is one example of basic science process skills. Plantae Atlas material has the core demands of learning that must be achieved, namely the observation and classification of plants. Plant can be classified through observation and identification. According to Simpson (2009), plant identification can be done by comparing plants identified in herbarium specimens that have been identified or through the help of taxonomic literature. Identification is an activity that aims to determine which plants are considered to have similarities with other plants that have been classified or given previous names.

Identifying plants requires a means of identification. According to Solika's research (2015), the development of Atlas of Plant Diversity: *Fabales, Apocynales*, and *Magnoliales* developed can be used for means of identification. This can be seen from 20 users when the trial was known to get a percentage of 85% able to identify plants well. Therefore atlas can be used as a means of identifying the characteristics of atlas in accordance with several types of identification tools such as photo books, flora, monographs, manuals and identification keys. This research developed a means of identification, namely Plantae Atlas. Through this atlas, identification can be applied with photos, descriptions or illustrations of plant parts.

Plantae Atlas that will be developed in this study has advantages such as an icon symbol that shows basic science process skills, including observing, classifying, asking and predicting skills. The skills of basic science processes must be carried out by students when using Plantae Atlas. The existence of basic science process skills aims to train basic science process skills towards students. Based on the background described is interested in conducting a study entitled "Developing Plantae Atlas For Plant Identification and Basic Science Process Skills Training". The purpose of this study was to produce the Plantae Atlas for the means of plant identification and training basic science process skills, describing the validity of theoretical feasibility and empirical feasibility.

METHOD

This research was a developmental research that tested for 15 students of class X MIA SMAN 19 Surabaya. The instrument used in this study were a validation sheet used by two material expert lecturers and one biology teacher, the activity implementation sheet and the student response sheet. The developmental stage of Plantae Atlas carried out in the Biology Department of FMIPA Universitas Negeri Surabaya and the stage of plant exploration and limited trials conducted at SMAN 19 Surabaya. This study refered to the Fenrich developmental model consisting of 5 stages analysis, planning, design, development, implementation. However the implementation stage was not carried out. Data collection methods used are the method of validation, observation and questionnaire. The analysis technique used was descriptive, namely the analysis of validation data at Plantae Atlas, analysis of student observation activity data and analysis of student responses.

The level of theoretical feasibility of Plantae Atlas was analyzed based on the results of the average validation by the validator. Plantae Atlas was said to be theoretically feasible if the average score of the assessment reaches ≥75% (Riduwan, 2012). The level of empirical feasibility of Plantae Atlas was analyzed based on student activity when using Atlas. The Plantae Atlas was said to be empirically feasible if it reaches an average score of ≥75% (Riduwan, 2012). The level of empirical feasibility of Plantae Atlas was also analyzed based on the results of student responses to Atlas. Plantae Atlas was said to be empirically feasible if the positive response reaches an average score of ≥75% (Riduwan, 2012).

RESULT AND DISCUSSION

This research resulted in the Plantae Atlas for identification plants and basic science process skills training. Plantae Atlas was arranged based on a combination of two means of identification, namely identification keys and manuals that are equipped with images in the form of photos of organs, fullcolor plant stature, sketches of anatomical images which include cross stem incisions and basic science process skills. Plants that can be identified by Plantae Atlas include herbaceous plants consisting of species of *Tradescantia pallida*, *Coleus atropurpureus*, *Portulaca oleracea*, *Impatiens balsamina*, *Anredera cordifolia*, *Sanseivera hyacinthoides*. Plantae Atlas was in the form of printed media with a size of B5 18.2 cm x 25.7 cm like on the Plantae Atlas's cover in figure 1.

Picture 1. Plantae Atlas's cover

The validation of Plantae Atlas aims to determine the feasibility of Plantae Atlas theoretically. Validation was carried out by 3 validators namely two biology lecturers, material experts from the Department of Biology, Universitas Negeri Surabaya and one biology teacher at SMAN 19 Surabaya. Average validation results as shown in Table 1.

Table 1. Average Validation Score of Plantae Atlas

No.	Component	Percentage (%)
	Feasibility of presentations	
1.	Physical form	97.9
	Cover	89.5
	Alphabet suitability	95.8
	Average score	**94**
2.	**Feasibility of contents**	
	Title	100
	Foreword	91.6
	Table of contents	100
	Picture symbol	100
	Picture icon	100
	Introduction	91.6
	Instruction for use	91.6
	Morphological summary	85.2
	Anatomical summary	86
	Contents	91.6
	Skill sheet	91.6
	Photo criteria	91.6
	Identification key	91.6
	Activity sheet	91.6
	Bibliography	91.6
	Glossary	91.6
	Average score	**93**
3.	**Feasibility of language**	
	Language terms	91.6
	Average score	**92**
	Total score	**93**
	Interpretation score	**Very feasible**

Based on Table 1 shows that the total average overall score got a percentage of 93% with the interpretation of criteria very feasible. Plantae Atlas was said to be theoretically feasible if the average score of the assessment reaches ≥75% (Riduwan, 2012). In the Table 1 shows that the results of the average validation of Plantae Atlas can be seen that the highest percentage was presentation feasibility which was equal to 94% with very feasible interpretation of criteria (Table 1). This was because Plantae Atlas has fulfilled all physical form, cover and suitability of letters criterias. It also suitable with learning outcomes. Plantae Atlas printed with art paper so that the printed text were clear and invisible. The good quality of presentation will attract students, so that students are expected to be motivated by the atlas. According to Ibrahim (2010), the means of identification should be

practical, flexible, easily obtained, in accordance with the objectives, and can motivate users.

The language feasibility got very feasible criteria with the lowest percentage of 92% with very feasible interpretation of criteria (Table 1). There were still many biological terms in the Plantae Atlas which were difficult for students, especially on morphology and anatomy section. As in accordance with the input validator on the Plantae Atlas the biological terms in the summary section of morphology and anatomy were given a special sign with bold writing and equipped with a glossary.

Table 2. Average Aspects Performed by Students Based on the Observation of the Implementation of Students' Activities During Using Plantae Atlas

No.	Aspects	Percentage (%)
1.	Reading instructions for using Atlas	73
2.	Reading summaries of morphological and anatomical features.	87
3.	Finding objects at SMAN 19 Surabaya. (Observing skills)	80
4.	Observing 6 herbaceous plants based on morphological characteristics, which are stature, leaves, stems, roots. (Observing skills)	80
5.	Cut the stem of 6 herbal plants, observe anatomical features. (Observing skills)	93
6.	Observe and identify morphological and anatomical features. (Observing skills)	100
7.	Match the results of identification with Atlas.	100
8.	Writing down morphological features and anatomical features, giving a sign (√) shows an anomaly. (Observing skills)	100
9.	Look for differences and similarities. (Classification skills)	100
10.	Predicting species names. (Predicting skills)	100
11.	Make questions using the question "why, what, how". (Asking skills)	100
Average percentage		**92**
Percentage interpretation		**Very good**

Based on Table 2 shows that the total average overall score got a percentage of 92% with the interpretation of criteria very good. Six of eleven students aspects activity got 100% with very good interpretation. This was because the Plantae Atlas can be used as reference and completed with a skill sheet. This skill sheet can be found in the back of Plantae Atlas. It contained the commands that must be done by students regarding basic science process skills namely classification skills, predicting and asking questions. This skill sheet was expected to be able to train students basic science process skills. The skill sheet in Plantae Atlas was arranged so that it can be understood by the user. In addition, it includes command sentences in accordance with the basic science process skills that were trained.

The criteria that got the lowest percentage was to read the instructions for using the atlas which was equal to 73% with good criteria interpretation (Table 2). The low percentage was caused when there were four students from fifteen students who did not read the instructions for using Plantae Atlas first, but immediately read on the next page. If the activity stage was not carried out then it will disrupt the next stage of activity. This was because the instructions for use contain procedures for using Plantae Atlas.

Table 3. Recapitulation of Questionnaire Results Response of Students to Plantae Atlas

No.	Criteria	Percentage (%)
1.	Plantae Atlas interest for students	100
2.	Plantae Atlas's cover interest for students	87
3.	Plantae Atlas's presentation interest for students	100
4.	Language of Plantae Atlas easy to understand for students	80
5.	Summary material in the atlas help in finding the morphological concepts of each plant organ and the anatomy of plant stems	100
6.	Identification key be used to find the species name	100
7.	Photo on the Plantae Atlas plant clear	100
8.	Description of the photo clear and systematic	93
9.	Command sentence on the skill sheet easy to understand	100
10.	Biological scientific writing at Plantae Atlas consistent	100
11.	Plantae Atlas make it easy to identify the diversity of herbaceous plants that exist	100
12.	Plantae Atlas be implemented with basic science process skills in the form of observing skills	100

No.	Criteria	Percentage (%)
13.	Plantae Atlas be implemented with basic science process skills in the form of classification skills	100
14.	Plantae Atlas be implemented with basic science process skills in the form of predictive skills	100
15.	Plantae Atlas be implemented with basic science process skills in the form of questioning skills	100
16.	Plantae Atlas as a means of identifying and training basic science process skills	100
The average number of answers "yes"		**98**
Interpretation		**Very feasible**

Based on Table 3 shows that the total average overall score got a percentage of 98% with the interpretation of criteria very feasible. Thus Plantae Atlas can be said to be theoretically feasible. In the Table 3 shows that there were thirteen criteria that get the highest percentage of 100% with the interpretation of criteria very feasible (Table 3). This shows that in general students respond very well to Plantae Atlas as a means of identifying and training basic science process skills because it helped students in Plantae material. But there were criteria that got the lowest percentage of 80% with the interpretation of criteria feasible (Table 3). There were still many biological terms that were too difficult for students.

CONCLUSION

The developed Plantae Atlas was categorized theoretically and empirically feasible. Theoretically Plantae Atlas as a means of identification and training of basic science process skills developed included in the very feasible category based on the results of the validation of experts with a score of 93%. Empirically Plantae Atlas as a means of identification and training of basic science process skills developed included in the excellent category based on observations of student activities with a score of 92% and the results of student responses with a score of 98%.

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