UNIVERSITAS SEBELAS MARET
BIOEDUKASI: JURNAL PENDIDIKAN BIOLOGI
https://jurnal.uns.ac.id/bioedukasi
1693-265X (Print) | 2549-0605 (Online)

Development of Web-Module Enrichment Based on Scientific Approach on Plant Diversity Submaterial by Utilizing Local Potential

Luthfiana Sabila Nur 'Afifah [1], Setiyo Prajoko [2], Muhammad Radian Nur Alamsyah [3,*]

Biology Education, Faculty of Teacher Training and Education, Universitas Tidar, Indonesia
[1]elshab99@gmail.com [2] setiyoprajoko@untidar.ac.id [3]m.radian.na@untidar.ac.id
* Corresponding author: setiyoprajoko@untidar.ac.id

Submission : 12/12/2022
Revision : 10/02/2023
Accepted : 27/02/2023

ABSTRACT

The city of Magelang has the local potential of the Kebun Bibit Senopati which has a variety of plants that can be used as teaching materials for plant diversity sub-materials. The potential diversity of Anthophyta plants in the Kebun Bibit Senopati can be packaged as a learning resource in the form of a web-module enrichment based on a scientific approach that is more practical and can be accessed anytime and anywhere. This study aims to determine the diversity of anthophytes in the Kebun Bibit Senopati, Magelang City, determine the feasibility of the enrichment web module, and determine the teacher's response to the enrichment web module. This research was carried out using the R&D method with a 4-D model which was limited to the development stage and modified by pre-experimentation. From the results of observations and identification of anthophytes in Kebun Bibit Senopati, it is known that there are 70 species of anthophytes that have been identified and grouped into 23 orders. The assessment of the feasibility of the web-enrichment module from media expert validators is 83.54%, material expert validators are 88.5%, and pedagogical expert validators are 81%. The feasibility of the web module is equipped with the results of the N-gain value, which is in the high category, which is effective as an enrichment learning teaching material. The teacher's response to the development of the web module is strongly agreed upon, accompanied by the acquisition of assessment results from the teacher of 85.83%. The enrichment web module is considered very feasible and effective to be used as teaching material in learning the enrichment of plant diversity sub-materials.

Keywords: Web-Module, Plant Diversity, Anthophyta, Kebun Bibit Senopati

Introduction

Biology is an integral part of science offering a wide range of learning experiences and scientific process skills to understand concepts relevant to life. Biology is unique in the process of digging up information in looking for causal relationships because it involves the process of verbal reasoning, cybernetic thinking, probability thinking, and analytical thinking (Hikmawati, 2017). According to Marjan (2014) a learning approach that can improve learning outcomes and skills in scientific processes according to the nature of biology is a scientific approach. Biology learning can be implemented with a scientific approach (scientific approach) so that students can actively construct a concept and principle through a series of activities. It has been proven that learning biology with a scientific approach has a positive influence on students' cognitive, affective and psychomotor learning outcomes and has achieved the specified classical mastery (Machin, 2014).

The local potential is all forms of natural resources in the community that are useful for improving living standards (Bahri, 2016). Learning biology needs to utilize local potential to develop science process skills in students. This is in line with Law No. 20 of 2003 article 36 (Undang-Undang No 20 Tahun 2003 pasal 36) concerning the National Education System. Utilization of local potential can support the achievement of biology learning objectives. Utilization of local potential can be used as the focus of school programs to support student needs and to develop students' sensitivity to local potential needs to be familiarized (Situmorang, 2018). Magelang City has the local potential of the Kebun Bibit Senopati which has a variety of plants that can be used as material for biodiversity sub-matter. Various plants are found in the Kebun Bibit Senopati, one of which is Anthophyta or flowering plants. The main characteristic that Antophyta has is the presence of flowers which function as a means of reproduction. Anthophyta is the largest group of vascular plants in the plant family with a very large number of species (Woods & Caley, 2012); (Bahadur et al., 2015). Antophyta plant species are very diverse with an estimated 90% of all plant species that are widespread in the world, or the equivalent of 235,000 to 400,000 species or 236,000–352,000 flowering plants (Bahadur et al., 2015). Anthophyta plants in the Malesia region (Malaysia, Indonesia, Brunei, the Philippines, Papua New Guinea, and Timor Leste) are influenced by Asiatic and Australian flora with Anthophyta diversity including: Orchidaceae, Rubiaceae, Lauraceae, Euphorbiaceae, Dipterocarpaceae, Myrtaceae, Moraceae, and Ericaceae (Huda et al., 2020).

Students who have above-average learning abilities or have achieved KKM (Minimum Completeness Criteria) can carry out enrichment programs. According to Rosmawati (2017) an enrichment program is a training program designed for people who learn quickly in certain classes with very good academic achievements. Enrichment activities can be interpreted as providing an additional or expanding experience for students beyond the level of mastery of learning or having reached the KKM set by the subject (Darmaningrat, 2018). The specific objectives of enrichment learning are as follows: 1) So that students master the material better by asking them to make a summary of the material provided by the teacher, to become tutors for their unfinished friends. 2) Increasing social awareness because they are motivated to help their friends who have not finished their studies. 3) Increase students' understanding of the subjects given by the teacher by reading newspapers or books in the library. 4)

Foster a sense of responsibility in students by reporting or conveying information obtained from reading newspapers or books in the library or other sources (Sudiwito et al, 2018). According to Vembriarto (1981) enrichment learning includes deepening (vertical dimension) and/or expansion (horizontal dimension) of basic learning material in general. Enrichment programs can be developed into program units that can be placed in the form of enrichment modules. Enrichment activities for students who have achieved KKM (Minimum Completeness Criteria) can be developed by analyzing the potential diversity of Anthophyta plants in the Kebun Bibit Senopati and their utilization.

Teachers and students must be familiar with learning strategies with innovations that keep popping up. According to Zubaidah (2019), the challenge of learning biology today is to combine new and old knowledge to answer problems that require the integration of approaches and results from various sub-disciplines of biology. The current form of learning innovation is online learning. Online education is an effective and perspective system today (Lenar et al, 2014). Online learning can use digital platforms that package learning activities to be more practical and flexible. The online learning model requires teacher creativity and skills in using technology, besides that students must also be able to access web applications used in their learning (Mansyur, 2020). Web-based learning is an example of e-learning that uses internet technology as a learning tool known as Web-Based Training (WBT) or Web-Based Education (WBE), so that it can be defined as the application of web technology in the world of learning in the educational process (Russman, 2011). Used websites in learning can create a conducive learning environment for students and increase student motivation, as well providing the ability for teachers and students to manage and guide dynamic learning activities inside and outside the classroom (Aljraiwi, 2017). Utilization of the website for biology enrichment modules can be designed systematically and attractively to the maximum and can be used independently with the help of the internet.

Teaching materials can represent teachers as educators designed to support learning so that the material contained must be oriented towards student learning goals (Warsita, 2011). The main teaching materials for online learning in general are modules that help teachers convey the available material to students, especially during online learning (Wulandari, 2022). Modules are teaching materials that are developed systematically and in such a way that the curriculum is adjusted to enable students to study independently within a certain time unit. Modules are arranged in a communicative and systematically structured manner which includes effective learning stages to allow students to learn on their own, and characteristic aspects such as physical aspects, preparation aspects, learning aspects, content aspects, assessment aspects, usage aspects, and summary aspects (Adinugraha & Ratnapuri, 2020). The module can function as a reference for presenting learning material. The module must contain material that must be mastered by students according to competency standards by paying attention to the accuracy of the scope, scope, and depth of the material. This is to avoid covering material that is lacking or excessive or shallow or too deep (Warsita, 2011).

Media that utilizes technology is felt to greatly influence the success of the learning process. The potential diversity of Anthophyta plants in the Kebun Bibit

Senopati can be packaged into learning resources in the form of enrichment web-modules based on a scientific approach that is more practical and can be accessed anytime and anywhere. Web-module enrichment can package the potential diversity of plant species at the Kebun Bibit Senopati into a learning resource in a more practical form and can be accessed anytime and anywhere. This can be an opportunity for autonomy to control students independent learning activities (Astari et al., 2017). Therefore, it is necessary to develop enrichment web-modules to answer problems by taking advantage of existing opportunities.

Methods

This research uses the R&D (Research and Development) method with the model used, namely the development of the 4-D model. This study uses a modified 4-D model development research design according to Thiagarajani (1974). The stages of implementing this development research are Define, Design, and only up to Develop. The Dissemination stage was not carried out because it was still a trial product. This study was modified using a pre-experiment with the One Group Pre-test Post-test Design. The definition stage is carried out by analyzing information related to the potential of plants in Kebut Bibit Senopati Magelang City and analyzing the needs of Biology teachers and students in learning. The design stage is carried out to design enrichment web modules that are developed according to the material presented. The purpose of the development stage is to produce a revised module based on comments, suggestions, and assessments from expert lecturers and the results of limited trials.

The subjects of this study were Anthophyta plants in the Kebun Bibit Senopati, Magelang City as learning objects developed and students as product trial respondents. The population in this study were students of SMA Negeri 4 Kota Magelang. The sample used in the study was students of class X MIPA. Sampling aims to determine the effectiveness of the developed web-module enrichment. The primary data sources in this study were the results of identification of anthophyta plants, analysis of learning resources, results of biology teacher interviews, student needs questionnaires, validation assessments from expert validators, teacher responses related to the enrichment web-module developed, pre-test and post-test results for measuring students' understanding of concepts, documentation and other field notes. As for the secondary data in this study, namely library research to support the scope of material in the enrichment web-module that was developed. Data collection through test and non-test activities. Data collection through test activities, namely pre-test and post-test to measure students' ability to understand concepts. While collecting data through non-test activities, namely observation, interviews, and questionnaires.

Expert validation questionnaire analysis uses a Likert scale scoring model with a calculation of 1 to 5. Calculation of the average score uses the formula and the results are listed in the same criteria as the feasibility analysis listed in table 1. The following is the formula for calculating the average answer.

$$Ps = \frac{S}{N} \text{ X } 100\%$$

Information:

Ps = component presentation

S = total score of the components of the results

N = maximum number of scores

Table 1. The Feasibility Criteria

Percentage of Respondents' Assessments	Qualitative Criteria
76-100	Very Feasible
51-75	Feasible
26-50	Fairly Feasible
0-25	Less Feasible

Test product effectiveness using pre-test and post-test questions to measure students' understanding of concepts after using the web-module. The calculation results can show the effectiveness of the enrichment web-module developed. Analysis of student pre-test and post-test scores using the Normalized Gain with the formula:

$$Normalized\ Gain\ (\text{g}) = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

Enrichment web-modules based on scientific approach sub-material plant diversity by utilizing local potential at the Senopati Nursery, Magelang City can be declared effective if the N-Gain value results are obtained in medium or high criteria. The calculation results of the formula above are converted into normalized gain (g) with the following criteria.

Table 2. Conversion Criteria Normalized Gain

Normalized Gain (G)	Qualitative Criteria
0,7 ≤ (g)	High
0,3 ≤ (g) < 0,7	Medium
(g) < 0,3	Low

Source: (Hake, 1998)

Results and Discussion

The results of this research are in the form of teaching material products for sub-material enrichment of plant diversity by utilizing local potential at the Kebun Bibit Senopati, Magelang City for class X students. The following results of the research have been carried out. The identification study aims to explore the potential of anthophyta in the Kebun Bibit Senopati. The results of observation and identification show that there are 23 orders of anthophyta in the Kebun Bibit Senopati which are presented in Figure 1.

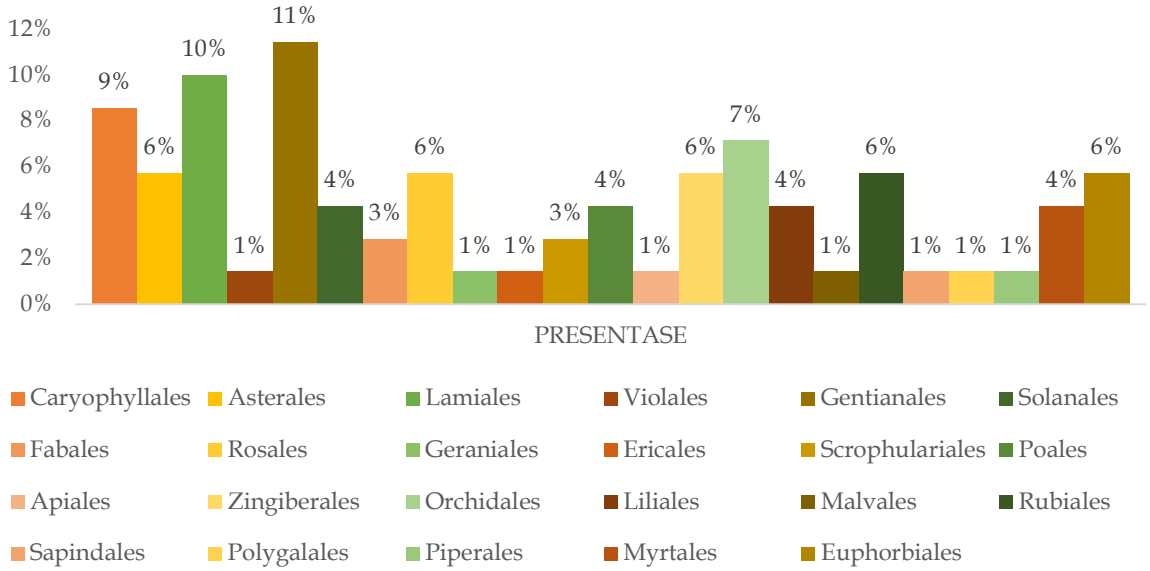


Figure 1. Percentage of Anthophyta for each Order

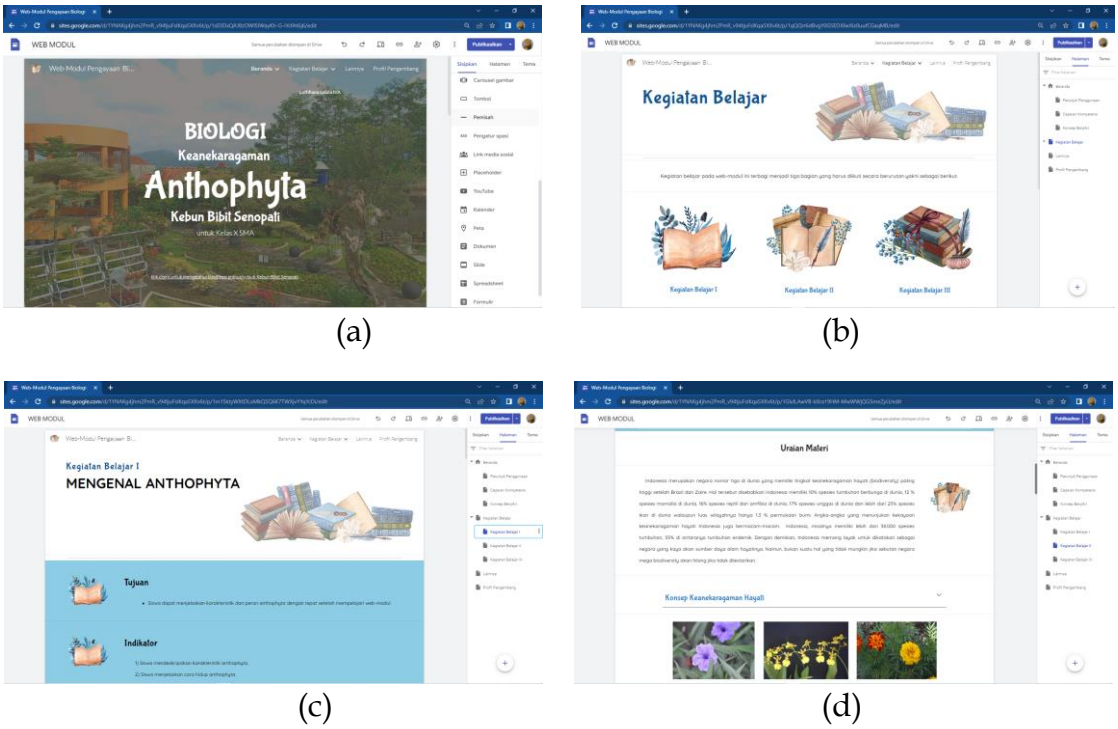
From the results of observation and identification of anthophyta at the Kebun Bibit Senopati, it is known that there are 70 species of anthophyta that have been identified. Based on the percentage of the number of anthophyta species grouped into 23 orders. The order most commonly found in the Kebun Bibit Senopati is the Gentianales order. The dominating Anthophyta is known with a percentage of the number of species> 8%. The dominant order is Caryophyllales with a percentage of 9%, Laminales with a percentage of 10%, and Gentianales with a percentage of 11%. There are 6 species of Caryophyllales found at the Kebun Bibit Senopati, namely *Iresine herbstii, Portulaca grandiflora, Portulaca oleracea, Rivina humilis, Celosia cristata, Bougainvillea spectabilis*. There were 7 species of laminae found including *Lantana velutina, Lantana camara, Lantana viburnoides, Thunbergia mysorensis, Coleus atropurpureus, Chrysothemis pulchella, Petrea volubilis*. Eight species of gentianales were found including *Allamanda chatartica, Strophanthus sarmentosus, Adenium obesum, Plumeria alba, Plumeria pudica, Plumeria acuminata, Nerium oleander, Wrightia religiosa*. The orders that are least frequently found are Violales, Geraniales, Ericales, Apiales, Malvales, Sapindales, Polygales, and Piperales.

Appointment of local potential as a source of learning in accordance with Law no. 20 of 2003 concerning the National Education System. Meanwhile, the use of technology in education is regulated in Permendikbud No. 22 of 2016 concerning Process Standards for Elementary and Secondary Education. Internalized local potential in learning biology as a tool for presenting biology material that presents phenomena and facts of an area with the concept of understanding (Situmorang, 2018). According to Alamsyah et al., (2020) the use of anthophyta as a learning resource can discuss the morphology of the characters, the types of species, and their classification. The results of the analysis direct the need for developing independent learning resources based on local potential and utilizing technology.

The results of interviews in the initial observation with the Biology teacher support the development of an enrichment web-module utilizing local potential at the

Senopati Nursery. The results of the analysis based on observation revealed that 53.33% of students felt it was still difficult to understand the Biodiversity material. Then followed by data showing that 93.33% of students felt they needed alternative teaching materials to deepen Biodiversity material other than the learning resources that teachers usually use in learning in class. In addition, 98.33% of students agreed with the development of enrichment web-modules. Therefore, it can be seen that limited learning resources are a problem faced by teachers and students.

The design of the enrichment web-module takes into account various objective data and information obtained from the analysis of needs and conditions. The draft material that has been prepared has been confirmed with the biology teacher, namely adjusting the learning objectives and achieving aspects of knowledge that apply in schools. Formulation of learning objectives, indicators of achievement of knowledge aspects, and materials in accordance with KD 3.2. Overall, the web-module framework for enrichment consists of an introduction that contains preface and main menu, instructions for use, competency achievements, students' thinking concepts, learning activities, bibliography, glossary, and developer profile. Web-modules are compiled using Microsoft word which are then implemented on the Google site. Use of Google sites to design web-modules by designing layouts, views, navigation systems, formative tests, and integrating videos and photos that support web-modules.



(a) (b)

(c) (d)

Figure 2. Web-module display: (a) Start page; (b) Menu of learning activities; (c) student learning activities; (d) description of the material on the web-module

One of the indicators that determines the feasibility of the web-module is the assessment and input from experts. Feedback and suggestions from experts become materials for improving web-modules. Following are the results of expert validation of web-modules. Media expert validation was carried out to determine the eligibility

value of the media and expert input regarding the web-module. Material expert validation is carried out to determine the feasibility value of the material and expert input related to web-modules. Pedagogical expert validation was carried out to determine the eligibility value of the web-module based on the suitability of the characteristics of the module in general and to obtain expert input regarding the web-module. Expert validation was carried out by lecturers of the Biology Education study program at Tidar University. Following are the validation results obtained.

Table 3. Media Validation Results

Aspect	Total Score	Percentage	Indicator
Introduction	18	90%	Very Feasible
Use	11	73,4%	Feasible
Appearance	57	87,6%	Very Feasible
Help service	13	86,7%	Very Feasible
Design	16	80%	Very Feasible
Average		83,54%	Very Feasible

The feasibility assessment of the enrichment web media obtained as a whole was 83.54% in the "very feasible" category. Assessment based on aspects of introduction, use, appearance, support services, and design of the enrichment web-module. The introduction is judged on the clarity of the title describing the contents of the web-module and the operational ease of use of the web-module. In terms of the use of web-modules, it is assessed on the regularity of the buttons and the practicality of use being a factor that influences the practicality of use. In general, the appearance of the web-module can be seen from the combination of color combinations, presentation of text, images and videos. Assistance services in the form of instructions for use and designs that present relevant and interesting material and images/videos. Wijayanti et al., (2021) stated that presenting an interesting module can reduce learning boredom by creating a different atmosphere.

Table 4. Material Validation Results

Aspect	Total Score	Percentage	Indicator
Introduction	18	90%	Very Feasible
Fill	40	80%	Very Feasible
Affirmation	21	84%	Very Feasible
Closing	15	100%	Very Feasible
Average		88,5%	Very Feasible

The feasibility value of the web-module material as a whole is 88.5% with the interpretation of "very feasible". Web-module feasibility is based on introduction, content, assignment, and closing. The introduction contains menu presentations, learning procedures, learning outcomes and concept maps. The contents of the material are broadly assessed from suitability, scope, integration of local potential, relevance of examples and language. The material content in learning media must be

presented clearly, so that the information conveyed can be received by students effectively (Istifarida et al., 2017). Assignments are reviewed from the presentation and proportion of student questions/assignments and in the closing section in terms of the availability of a summary and list of references. Teaching materials in any form must be arranged in a systematic and structured manner so that teachers can deliver teaching materials that can increase students' understanding of learning, create an efficient and effective atmosphere as well as a comfortable and enjoyable learning environment (Bahtiar, 2015).

Table 5. Pedagogical Validation Results

Aspect	Total Score	Percentage	Indicator
Instructional	16	80%	Very Feasible
Scientific attitude	15	75%	Feasible
Scientific Approach	22	88%	Very Feasible
Average		81%	Very Feasible

The pedagogical feasibility of the enrichment web-module scored 81% in the "very feasible" category. Pedagogical feasibility is reviewed based on instructional, scientific attitude, and scientific approach. Web-module enrichment meets instructional eligibility based on the availability of learning objectives, materials that are appropriate to KI and KD, clarity of study instructions and student worksheets. Independent learning resources such as modules must be designed systematically (Kemendikbud, 2017). Web-modules are also assessed based on the fulfillment of aspects of a scientific attitude and scientific approach in student learning activities. A learning approach that can improve learning outcomes and scientific process skills.

The Biology teacher who taught class X gave responses related to the web-module with a questionnaire and the following results were obtained.

Table 6. The results of the teacher's response

Aspect	Total Score	Percentage	Indicator
Practicality	33	82,5%	Very Feasible
Attractiveness	34	85%	Very Feasible
Content	36	90%	Very Feasible
Average		85,83%	Very Feasible

The teacher's assessment of the enrichment web-module is 85.83% in the "very feasible" interpretation. Teacher responses were obtained based on their practicality, attractiveness, and content. Practicality gains a positive rating based on its use. Attractiveness is assessed based on the quality and compatibility of the display on the web-module. Based on the content, the web-module gets a very good response based on its presentation. This shows that the developed web-module can be used as an alternative to independent learning, especially in enrichment learning. In line with Warsita's (2011), teaching materials can represent teachers as educators designed to support learning activities.

Web-module enrichment was tested to find out its effectiveness based on the increase in students' posttest results. Implementation of trials by students of class X MIPA 1 SMA Negeri 4 Magelang City. Test instruments were tested for construct validity and empirical validity before being used in limited trials on students conducted by expert lecturers. The results of the construct validity analysis obtained multiple choice questions with a total of 45 items that fulfilled the relevance aspect; clarity aspect; validity aspect; aspects of language with some improvements in the construction aspects of the questions.

Empirical validity in the form of validity tests and reliability tests were calculated using Microsoft Excel 2016. The results of the validity test of 45 multiple choice questions were declared valid because they met the criteria for r count > r table 0.349. The instrument is also declared reliable because the calculation results show that r11 is equal to or greater than 0.70. The results of these calculations are listed in the following table.

Table 7. Empirical Validity Calculation Results

Empirical Validity	The Calculation Results	Interprestation
Validity test	r count > r table 0,349	Valid
Reliability test	r11 0,908 > r table 0,70	Reliable

Source: researcher documentation

Web-module enrichment was tested to determine its effectiveness based on improving student learning outcomes with the N-gain formula. The level of effectiveness of the enrichment web-module is obtained from the calculation of the N-gain value. Obtaining the N-gain score is based on the average pretest and posttest scores of students with question levels C1 to C4 based on Bloom's taxonomy. The results of the N-gain score on student learning outcomes are 0.75 in the "high" category shown in the following table and figure.

Table 7. Calculation results N-gain

Pretest Average	Posttest Average	Gain score	Interprestation
42,63	84,60	0,75	Tinggi

These results prove that the use of enrichment web-modules can assist students in understanding and mastering the concept of Biodiversity material. Therefore, the enrichment web-module based on a scientific approach to the Biodiversity sub-matter by utilizing local potential at the Kebun Bibit Senopati is declared to be effectively used for enrichment learning. In accordance with Pujiastutik (2019) it has been proven that web-based e-learning media is effective for improving learning outcomes.

Utilizing local potential as a learning resource in web-module enrichment is closely related to contextual learning. Contextual learning is learning that is associated with real situations by applying knowledge in life (Sukirno et al., 2020). The application of contextual learning can provide direct experience to students in exploring knowledge related to real life (Ratumanan, 2015). Contextual learning systems can encourage students to be able to construct their knowledge (Suryani et

al., 2016). So that the implementation of learning is more meaningful if it can integrate local potential in contextual learning.

The advantages of using the enrichment web module as teaching materials include: 1) practical and flexible which can be accessed by an internet network anywhere and anytime and can be done in groups and independently; 2) clear instructions for use; 3) the operation of attractive and multisensory representations can increase student learning motivation, so that student learning outcomes can increase; 4) the availability of relevant images or videos can make it easier for students to learn the material, 5) the material presented is complete, systematic, and easy to understand and 6) fulfills the scientific approach aspect. Agree with Hikmawari (2017) which states that the use of digital text, microcameras, text-to speech, videoblogs, and online learning methods can color biology learning. The use of practical and flexible learning resources can eliminate students' limitations so they can explore their abilities and understand their potential (Kurniasih et al., 2022). The use of websites in learning can increase student enthusiasm for learning because the material contained is not only in the form of text but can also be filled with interesting pictures and videos and can be accessed easily by gadgets (Santoso et al, 2016).

An increase in student learning outcomes in enrichment learning activities shows that students can optimize their learning abilities. The implementation of enrichment learning aims to increase understanding of the material and so that students can learn optimally both in terms of their abilities and the acquisition of learning outcomes (Sudiwito et al, 2018). The achievement of enrichment learning goals helps students to adapt well to their environment and achieve happiness in life (Rosmawati, 2017). The use of web-module enrichment as an alternative enrichment teaching material does not interfere with students' mastery of basic learning materials. In addition, the use of web-enrichment modules allows students to continue to optimize their learning abilities according to the abilities and speed of student learning.

The Scientific Approach approach used in the web-module enrichment can have an impact on student learning outcomes. According to Marjan (2014) a learning approach that can improve learning outcomes and skills in scientific processes according to the nature of biology is the Scientific Aprroach. Students' science process skills are also affected by students' low academic ability (Prajoko, 2017). The scientific approach or Scientific Approach emphasizes the activeness of student learning. Scientific Approach encourages students to explore knowledge independently and introduces students to problem formulation and problem solving efforts through the 5M concept of observing, asking, associating, reasoning, and communicating. The application of the 5M concept in Scientific Approach can be used to provide direct experience to students so that the knowledge gained is more memorable, tested and accountable. Setiawan (2020) has proven that learning with a scientific approach can train students' scientific literacy competencies.

Conclusion

Based on the results of anthophyta diversity research at the Kebun Bibit Senopati, there are 23 orders consisting of 70 species. The order most commonly found in the Kebun Bibit Senopati is the Gentianales order. The orders that are least frequently found are Violales, Geraniales, Ericales, Apiales, Malvales, Sapindales, Polygales, and

Piperales. The product resulting from the development is declared very suitable for use as a learning resource for biological enrichment in class X SMA/MA plant diversity material. This is based on the feasibility assessment of the media expert validator of 83.54%, the material expert validator is 88.5%, and the pedagogy expert validator is 81%. The feasibility of the web-module is complemented by the results of the N-gain value, which is in the high category, which means it is effectively used as an enrichment teaching material.

References

Adinugraha, F., & Ratnapuri, A. (2020). Potensi penggunaan modul keanekaragaman hayati dengan pendekatan kearifan lokal dan budaya sebagai alternatif bahan ajar biologi SMA/MA. *Jurnal Pro-Life*, 7(3), 225-236. https://doi.org/10.33541/jpvol6Iss2pp102

Alamsyah, M. R. N., Pamungkas, S. J., Meganingrum, A. R., & 'Afifah, L. S. N. (2020). Studi Anthophyta di Kota Magelang sebagai Sumber Pembelajaran Saintifik pada Perkuliahan Biosistematika Tumbuhan. *Bioedusiana: Jurnal Pendidikan Biologi*, 5(2), 160-175.

Aljraiwi, S. S. (2017). The Effect of Classroom Web Applications on Teaching, Learning and Academic Performance among College of Education Female Students. *Journal of Education and Learning*, 6(2), 132-145. http://dx.doi.org/10.5539/jel.v6n2p132

Astari, N. N., Wibowo, Y., & Ratnawati, R. (2017). Pengembangan Modul Pengayaan Materi Keanekaragaman Hayati Untuk Siswa Sma Kelas X Di Gunungkidul. *Pend. Biologi-S1*, 6(6), 353-363.

Bahadur, B., Rajam, M. V., Sahijram, L., & Krishnamurthy, K. V. (2015). Preface. *Plant Biology and Biotechnology: Plant Diversity, Organization, Function and Improvement.* https://doi.org/10.1007/978-81-322-2286-6

Bahri, H. (2016). Pengelolaan Pendidikan dan Pembelajaran Berbasis Potensi Lokal. Nuansa: *Jurnal Studi Islam dan Kemasyarakatan*, 9(1). http://dx.doi.org/10.29300/nuansa.v9i1.372

Bahtiar, E. T. (2015). Penulisan bahan ajar. *Pelatihan Penyusunan Bahan Ajar untuk Mendukung Pelaksanaan Tri Dharma Perguruan Tinggi*, 1-11. http://dx.doi.org/10.13140/RG.2.1.1441.6083

Darmaningrat, E. W. T., Ali, A. H. N., Wibowo, R. P., & Astuti, H. M. (2018). *Pemanfaatan aplikasi digital learning untuk pembelajaran pengayaan di sekolah menengah kota Surabaya*. SESINDO, 2018.

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American journal of Physics*, 66(1), 64-74. http://dx.doi.org/10.1119/1.18809

Hikmawati, V. Y & Leo M. T. (2017). Urgensi Strategi Membaca Pada Pembelajaran Biologi Masa Depan. *Jurnal Bio Educatio*, 2 (2). 20-48. http://dx.doi.org/10.31949/be.v2i2.758

Huda, M. K., Amrul, H. M. Z., & Susilo, F. (2020). Keanekaragaman Tumbuhan Berbunga Di Kawasan Malesia. *BIOLINK (Jurnal Biologi Lingkungan Industri Kesehatan)*, 6(2), 162-170. https://doi.org/10.31289/biolink.v6i2.2762

Istifarida, B., Santoso S., Yusuf Y. (2017). Pengembangan E-Book Berbasis Problem Based Learning-Gis untuk Meningkatkan Kecakapan Berfikir Keruangan pada Siswa Kelas X SMAN 1 Sragen 2016/2017. *Jurnal GeoEco*. 3(2) : 133-144

Kemdikbud. (2017). *Panduan Praktis Penyusunan E-Modul Tahun 2017*. Jakarta: Direktorat Pembinaan SMA, Kemdikbud.

Kurniasih, M. D., Utami, A. D., Prajoko, S., & Salma, A. (2022). Pengembangan Buku Panduan Mini Riset Mandiri Berbasis Keterampilan 4C untuk Mata Kuliah Reproduksi dan Embriologi Tumbuhan. *BIOEDUSAINS: Jurnal Pendidikan Biologi dan Sains*, 5(1), 255-266. https://doi.org/10.31539/bioedusains.v5i1.3530

Lenar, S., Artur, F., Ullubi, S., & Nailya, B. (2014). Problems and Decision in the Field of Distance Education. *Procedia - Social and Behavioral Sciences*. 131(904). 111–117. https://doi.org/10.1016/j.sbspro.2014.04.088

Machin, A. (2014). Implementasi pendekatan saintifik, penanaman karakter dan konservasi pada pembelajaran materi pertumbuhan. *Jurnal Pendidikan IPA Indonesia*, 3(1). https://doi.org/10.15294/jpii.v3i1.2898

Mansyur, A. R. (2020). Dampak covid-19 terhadap dinamika pembelajaran di indonesia. *Education and learning journal*, 1(2), 113-123. http://dx.doi.org/10.33096/eljour.v1i2.55

Marjan, J., Arnyana, I. B. P., & Setiawan, I. G. A. N. (2014). Pengaruh pembelajaran pendekatan saintifik terhadap hasil belajar biologi dan keterampilan proses sains siswa MA. Mu allimat NW Pancor Selong Kabupaten Lombok Timur Nusa Tenggara Barat. *Jurnal Pendidikan dan Pembelajaran IPA Indonesia*, 4(1).

Prajoko, S. (2017). *Pengembangan perangkat pembelajaran praktikum IPA berbasis masalah menggunakan bahan daur ulang untuk meningkatkan keterampilan berpikir kritis, keterampilan proses sains, dan sikap ilmiah pada mahasiswa Universitas Terbuka berkemampuan akademik berbeda* (Doctoral dissertation, Universitas Negeri Malang).

Pujiastutik, H. (2019). Efektivitas penggunaan media pembelajaran e-learning berbasis web mata kuliah Belajar Pembelajaran terhadap hasil belajar mahasiswa. Jurnal Teladan: *Jurnal Ilmu Pendidikan dan Pembelajaran*, 4(1), 25-36. http://journal.unirow.ac.id/index.php/teladan/article/view/46

Ratumanam, T.G. (2015). *Inovasi Pembelajaran*. Jakarta: Penerbit Ombak

Rosmawati, R. (2017). *Bimbingan Konseling Belajar*. http://repository.unri.ac.id.

Rusman. (2011). *Model – Model Pembelajaran*. Jakarta: Rajawali Pers.

Santoso, A. D., Pudjawan, K., & Suwatra, I. I. W. (2016). Pengembangan Website Pembelajaran Interaktif untuk Mendukung Blended Learning Pada Mata Pelajaran Bahasa Indonesia Di Smp Negeri 3 Banjar. *Jurnal Edutech Undiksha*, 4(2). https://doi.org/10.23887/jeu.v4i2.7730

Setiawan, A. R. (2020). Peningkatan literasi saintifik melalui pembelajaran biologi menggunakan pendekatan saintifik. *Journal of Biology Education*, 2(1), 1-13. http://dx.doi.org/10.21043/jobe.v2i1.5278

Situmorang, R. P. (2018). Analisis potensi lokal untuk mengembangkan bahan ajar Biologi di SMA negeri 2 wonosari. *Jurnal Pendidikan Sains (JPS),* 4(1), 51-57. https://doi.org/10.26714/jps.4.1.2016.51-57

Sudiwito, S., Hasyim, A., & Yanzi, H. (2018). Faktor-faktor yang mempengaruhi guru dalam pelaksanaan pembelajaran pengayaan. *Jurnal Kultur Demokrasi*, 5(9).

Sukirno, S., Setyoko, S., & Indriaty, I. (2020). Pengembangan Bahan Ajar Biologi SMA Kontesktual Berbasis Potensi Lokal Hutan Mangrove. *BIOEDUSAINS: Jurnal Pendidikan Biologi dan Sains*, 3(2), 208-216. https://doi.org/10.31539/bioedusains.v3i2.1780

Suryani, I., Mardiati, Y., & Herlanti, Y. (2016) Pengaruh Penggunaan Lembar Kerja Siswa LKS Berbasis Kontekstual Terhadap Hasil Belajar Siswa Pada Konsep Sistem Gerak Manusia. *Jurnal Edusains*, 8(2), 150-156. http://dx.doi.org/10.15408/es.v8i2.1823

Thiagarajan, S; Semmel, D.S; & Semmel, M.I. (1974). *Instructional Development for Training Teachers of Exceptional Children: A Sourcebook*. Indiana: Indiana University.

Vembriarto. (1981). *Pengantar Pengajaran Modul*. Yogyakarta: Paramita

Warsita, B. (2011). *Pendidikan Jarak Jauh: Perancangan, Pengembangan, Implementasi dan Evaluasi Diklat.* Bandung: PT. Remaja Rosdakarya Offset.

Wulandari, F., Yogica, R., & Darussyamsu, R. (2022). Analisis Manfaat Penggunaan E-Modul Interaktif Sebagai Media Pembelajaran Jarak Jauh Di Masa Pandemi Covid-19. *Khazanah Pendidikan*, 15(2), 139-144. http://dx.doi.org/10.30595/jkp.v15i2.10809