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Development Of Class X Ecosystem E-Catalog at SMA Negeri 12 Semarang

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Article Info	Abstract
	Digital technology has not yet been integrated to create an innovative learning media ecosystem. Utilization of local potential as a medium for ecosystem learning is still rarely done. Student learning outcomes in ecosystem Materi are still less than optimal. This can be seen from the scores of many students who are still incomplete. So it is necessary to develop an E-Catalog for class X ecosystems at SMA Negeri 12 Semarang. The aim of this research is to analyze the validity, practicality and effectiveness of the E-Catalog. This type of research is research and development with an ADDIE design (Analyze, Design, Development, Implementation, Evaluate). Media validity is measured using a validity assessment questionnaire by Materi and media experts. The practicality of the media is measured by teacher and student response questionnaires. The effectiveness of the Ecosystem E-Catalog is measured by learning outcome tests. Data were analyzed using descriptive percentage techniques. The results of the validator assessment stated that the Ecosystem E-Catalog media was very valid. In the small scale trial, 50% of students thought the Ecosystem E-Catalog was very practical and 50% of students thought it was practical. In a large-scale test, teachers and 69% of students thought the Ecosystem E-Catalog was very practical. All students have completed learning about Ecosystem materi . The Ecosystem E-Catalog is very valid, very practical and effectively used for teaching and learning activities at SMA Negeri 12 Semarang.

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INTRODUCTION

In the world of education, an appropriate curriculum is needed as the key in determining the direction, objectives and evaluation of learning activities. The educational curriculum will continue to improve along with developments over time to achieve maximum learning processes (Bustari, 2023). The latest curriculum program that has been designed by the government is Merdeka Belajar. To improve the quality of the Independent Curriculum with literary works, concrete efforts are needed to integrate local potential in every aspect of learning, so that students can understand and apply potential values in everyday life (Durrotunnisa & Nur, 2020).

Developing and introducing local potential as a learning resource helps in learning (Lase & Zai, 2022). Optimizing local potential in learning media requires training teachers in using it. The benefits of learning activities using local potential can increase students' insight (Rikza Syahrul Ramadhan & Bagus Setiawan, 2023). Development of media based on local potential as one of the learning media innovations (Rejekiningsih. T. et al., 2021). Innovation in educational technology aims to integrate technology into learning so that the effectiveness and efficiency of learning increases (Nugraha & Frinaldi, 2023).

Educational Innovation is a service idea to improve the quality of learning (Asih, 2023). The role of teachers in educational innovation is needed so that they can manage learning creatively and efficiently. Teachers are required to be able to develop innovative learning (Prihatini & Sugiarti, 2022). In implementing learning, teachers must realize the indicators that have been designed with the help of innovative learning media (Saylendra et al., 2022). Innovative learning can trigger students' interest in learning.

Maximum understanding of student materi is very necessary during the teaching and learning process. This is in accordance with gestalt theory which states that learning is an activity to understand (insight). Insight is knowledge about various problems that are connected to one another. Solutions to individual problems can be found by utilizing the role of insight (Suyatno & Juharni, 2023). According to Wisman (2020) humans use cognitive processes as a basis for acting through thinking during the behavior.

Cognitive processes occur in the memory system to influence learning. Learning at the high school level is very diverse. An example of learning that is closely related to the surrounding environment is biology. Biology is a subject that studies the relationship between concepts and living things. In Biology subjects, it is hoped that students can allocate various biological concepts that can be found in various areas of human life (Miharja et al., 2019). Biological materi is closely related to the living environment. Ecosystem materi is a real example of studying the environment. The living creatures that make up an ecosystem are very diverse. Ecosystems include all organisms in a certain area and the abiotic factors that interact with them, or a community with its physical environment (Campbell, 2012). Ecosystems can be understood and studied at any size, as long as there are underlying components (biotic and abiotic) that work together to achieve some kind of functional stability. An ecosystem is a dynamic unit consisting of a community of various species that interact with their environment, both biotic and abiotic.

The results of observations of local potential in Jepara show that Kura - Kura Ocean Park is a museum that contains marine biota from the Jepara coast. Turtle - Turtle Ocean Park can be used to study ecosystem materi in the sub-chapter of biotic and abiotic components in waters. The aquarium in the museum contains various species that interact with the aquarium environment, both biotic and abiotic. Turtle - Kura Ocean Park can be explored as a learning resource by creating supportive teaching media.

The results of observations of the Tapak Mangrove Forest in Semarang show that this place is a tourist spot that can be used to study ecosystem materi s. The forest area is characterized by dense mangrove trees and a diversity of flora and fauna. Mangrove forests are breeding grounds and food sources for various types of birds, fish, crabs and other organisms. The Tapak Mangrove is still in good condition so it can be used as a student learning resource for ecosystem materi . According to Prastiyono et al (2023), it is known that Mangrove Forests can be used as a school learning resource.

Based on observations and interviews conducted at SMA 12 Semarang, it is known that ecosystem teaching media is still lacking and has not utilized local potential and technological developments. The teaching media used by teachers is very limited. The observation results include the fact that there are constraints on learning time which has not been maximized on ecosystem materi due to the existence of a program in the Merdeka Curriculum, namely Strengthening the Pancasila Student Profile (P5) with a Block schedule. The block schedule is carried out for one month and will continue towards PTS (Mid-Semester

Assessment). P5's truncated time resulted in the creation of interesting and effective media being delayed. According to teachers, the difference is very noticeable in the change from the old curriculum to the newest curriculum. This is because the independent learning curriculum places more emphasis on learning outcomes in the form of processes compared to the old curriculum which emphasized learning outcomes in the form of content.

Implementation of learning on ecosystem materi for class X SMA Negeri 12 Semarang by students observing only the environment around the school. Students' mastery of ecosystem materi is still not optimal because examples are not always available around the school environment. This can be seen from the results of student learning, many of which are still incomplete. Ecosystem learning will be disrupted if there are changes in weather and time. Students will learn without observation and only use a limited number of textbooks. The teacher stated that he had not developed teaching media from local potential. Therefore, teaching staff need to develop alternative media that students need to support students' learning processes and outcomes, so that there is a need for learning media from the results of ecosystem exploration at Kura - Kura Ocean Park Jepara and Mangrove Tapak in Semarang in order to maximize learning on ecosystem materi . The use of the Ocean Park and Tapak Semarang Mangrove Forest is carried out because these places are rich in flora and fauna which can be used as learning resources for students to study ecosystem materi.

From the results of the observations that have been made, it can be seen that there is no additional media and teaching materi s that can support the learning process for class X on ecosystem materi . There is no innovative media that utilizes local potential and technology as a driver for students to maximize learning outcomes. Therefore, it is necessary to develop the Ecosystem E-Catalog media for class X at SMA 12 Semarang.

RESEARCH METHOD

This research was designed using the Research and Development (R&D) research method. R&D is a method for creating products or developing and perfecting existing products. Products developed through R&D must be tested for effectiveness through an accurate validation process (Okpatrioka, 2023). The research design used was ADDIE. According to Robert Maribe Branch (2009) in the ADDIE model there are 5 stages, namely Analyze, Design, Develop, Implement and Evaluate. The stages of the ADDIE development model can be seen in Figure 3.1 below:
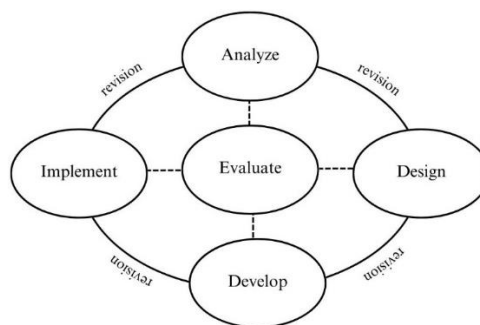

Figure 3.1 ADDIE Branch Development Model

(Source: ADDIE Instructional Design Book, Branch, R.M. page 2)

The creation of the Ecosystem E-Catalog was carried out in Semarang and Jepara in February 2023 – December 2023. The location for the small-scale test research was carried out at SMA Negeri 12 Semarang in January 2024 and the large-scale test research at SMA Negeri 12 Semarang in the even semester of February – March 2023/2024 academic year. The population in this study used classes X and XI of SMA for the 2023/2024 academic year. The small-scale trial sample used 1 class XI SMA N 12 Semarang, namely XI F12. Large-scale test using 1 Class X at SMA N 12 Semarang, namely X E2. The sampling technique used was purposive sampling technique. According to Lenaini (2021), it is known that purposive sampling is a non-

random sampling method with the aim of respondents being able to provide relevant information. Purposive sampling is used to avoid generalizing the population and obtain more specific and relevant results

The validity of the Ecosystem E-Catalog is measured using non-test techniques. The instruments used were media validation questionnaires and materi validation questionnaires which were assessed by materi expert lecturers and media expert lecturers. The type of instrument used is a Likert scale instrument with a score of (1-4) and uses descriptive percentage analysis techniques. The practicality of the E-Catalog was measured using the Non-test technique. The instrument used was an E-Catalog practicality questionnaire sheet which was assessed by students and biology teachers. The aspects assessed in the practicality instrument are aspects of attractiveness, convenience and usefulness. The type of instrument used is a Likert scale instrument with a score of (1-4). The effectiveness of the E-Catalog is measured by student learning outcomes. Student learning outcomes are seen from learning completeness. The technique used is a test. Student learning outcomes are measured using test questions with pretest and Posttest multiple choice questions.

RESULTS AND DISCUSSION

The development of audio-based bioplastic learning media includes five stages, namely analysis, design, development, implementation and evaluation. The data obtained from the five stages includes the feasibility, practicality and effectiveness of learning media.

Feasibility of Ecosystem E-catalog Learning Media

After the product is developed, it is then validated by media experts and Materi experts. Validation by media experts and Materi experts is carried out to determine the feasibility of the E-Catalog. Validity of the ecosystem E-Catalog based on the assessment of media experts and Materi experts (Table 4.1)

Table 4.1 Validity of the Ecosystem E-Catalog based on expert assessment of media and materi

Expert Validator	Total score	Maximum Score	Percentage	Category
Media	64	64	100%	Very Valid
Materi I	61	64	95%	Very Valid
Materi II	58	64	91%	Very Valid

In Table 4.1, it is known that the E-Catalog developed in the category is very valid both in terms of content and materi . The media expert validator assessed that the preparation of the E-Catalog in every aspect was in accordance with what was expected. Materi experts I and II stated that the aspects of suitability of Materi content, construction, language and benefits in the E-Catalog were very appropriate.

Media expert validators strongly agree that the application of the E-Catalog is easy. These conveniences include 1) Ease of understanding instructions for using the E-Catalog, 2) Ease of accessing the E-Catalog, 3) Ease of accessing multimedia in the E-Catalog, and 4) Ease of using navigation buttons. Apart from convenience, the documentation on the media is also of high quality by looking at the graphic aspect. The resolution of images, videos and illustrations is very good. Therefore, E-Catalog can be assessed as having very good Technical Quality criteria.

Materi experts I and II assess that the content in the E-Catalog is of very good quality. This is proven by the precision of the content in the media, namely 1) The Materi for each sub-chapter is relevant to learning achievement. 2) Original images in the media that depict local potential. 13) Illustrative images that illustrate each Materi explanation. 4) The objectives conveyed are correct. On the other hand, media experts assess that interactive learning and local potential in the E-Catalog can increase students' interest in learning.

Therefore, E-Catalog can be identified as having Quality of Content and Goals criteria.

Media experts and Materi experts strongly agree that E-Catalog has benefits, including providing opportunities for students to learn independently. This media can also encourage students' motivation to learn. Local potential in media can maximize student learning. Media use is considered flexible because the media and quizzes can be accessed at any time. Therefore, E-Catalog can be classified as having Instructional Quality criteria.

Practicality of Ecosystem E-Catalog Learning Media

Small-scale test student responses to the practicality of the Ecosystem E-Catalog can be seen in Table 4.2

Table 4.2 Small-scale test student responses to the practicality of the Ecosystem E-Catalog

Practicality	Amount	Percentage
Very Practical	18	50%
Practical	18	50%
Quite Practical	0	0%
Impractical	0	0%
Very Impractical	0	0%

In Table 4.2 it is known that 50% of students think that E-Catalog is very practical to use and 50% of students think that it is practical. The use of E-Catalog media is considered by students to be very interesting, easy and useful. The attractiveness of media can stimulate student learning. In line with Nurfadhillah et al., (2021) stated that learning media that is interesting to students can be a stimulus for students in the learning process. According to small-scale results on the attractiveness aspect, it is known that the presentation of illustrations, questions and local potential in the E-Catalog can increase students' interest and curiosity.

In the aspect of convenience, students think that the language used is easy to understand. Some students also have problems opening the E-Catalog. This is because the gadget used does not have enough storage space. For students who have gadgets with sufficient or very sufficient storage space, they will not experience problems. According to students, E-Catalog can be used to study ecosystems and is more flexible because it can be used anywhere. This is in accordance with Vinatan's (2023) research which shows that perceived usefulness and perceived convenience can have a positive influence on students' interest in learning.

According to the results of small-scale tests, the Ecosystem E-Catalog learning media was stated to be able to foster students' interest in learning because it was easy for students to understand Ecosystem materi . In line with Nurfadhillah et al., (2021), it is known that the use of learning media can foster students' interest in learning in the Materi presented by the teacher so that it can be understood easily. According to students' opinions when the trial was carried out, the Ecosystem E-Catalog was so unique that it made students curious about using it. This is supported by the behavior of students in the field who take part in ecosystem learning of their own accord

In the large-scale test, all students responded that the Ecosystem E-Catalog developed in this research was practical and very practical (Table 4.3)

Table 4.3 Student responses to the practicality of the E-Catalog in Large-Scale Trials

Practicality	The number of students	%
Very Practical	25	69%
Practical	11	31%
Quite Practical	0	0%
Impractical	0	0%
Very Impractical	0	0%

In Table 4.4, it is known that in the large-scale test, 69% of students considered the E-Catalog to be very practical and 31% of students considered it practical. The results of small-scale student responses to the practicality of the E-Catalog in each aspect can be seen in Table 4.4

Table 4.4 Large-Scale Test Student Responses to the Practicality of E-Catalogs in Each Aspect

Aspect		Statement	Percentage			
			Very agree	Agree	Disagree	Don't agree
Interesting	1.	The presentation of illustrative images in the E-Catalog media increased my interest in studying the materi	61%	39%	0%	0%
	2.	The presentation of E-Catalog media questions increased my interest in doing the work	33%	67%	0%	0%
	3.	The local potential in E-Catalog media increased my curiosity about the materi	47%	53%	0%	0%
Convenienc	4.	E-Catalog media uses language that is easy for me to understand	39%	61%	0%	0%
	5.	I can access the E-Catalog media buttons easily	47%	53%	0%	0%
	6.	I can access multimedia in the E-Catalog easily	33%	67%	0%	0%
	7.	I can access E-Catalog media at any time	56%	44%	0%	0%
	8.	I can access E-Catalog media on my laptop/Ipad/IOS/Android	50%	50%	0%	0%
	9.	I can use E-Catalog media to study ecosystem sub-materi	36%	64%	0%	0%
	10.	The E-Catalog media quiz helps to measure my abilities	47%	53%	0%	0%
Benefit	11.	Jepara's local potential E-Katalog media helped me understand the materi	53%	47%	0%	0%
	12.	I can use E-Catalog media for independent learning	50%	50%	0%	0%

In Table 4.5 it is known that in the aspect of attractiveness, 61% of students stated that they strongly agreed that the presentation of illustration images of the Ecosystem E-Catalog increased interest in studying the materi . 67% agreed that the questions in the E-Catalog could increase interest in studying and working on the questions. 53% of students agree that the local potential in the E-Catalog increases curiosity because the local potential in the E-Catalog does not exist in the school environment. Students' curiosity can be seen when actively discussing the local potential environment during learning. The Ecosystem E-Catalog increases students' curiosity about environmental values and environmental issues by applying conservation values. Ecosystem E-Catalog can preserve conservation values. In line with research (Putri et al., 2023) states that the development of a catalog of local potential to preserve conservation values is carried out through the stages of needs analysis, product creation, validation of materi and media experts, product revision and then product finalization.

The Ecosystem E-Catalog is an interesting learning media for students. This can be used as a stimulus to increase student enthusiasm during the learning process. Enthusiasm in learning is very necessary for optimal learning results. In line with research by Hasan Basri et al., (2022) stated that interesting learning media used by teachers can increase students' enthusiasm in learning.In terms of convenience, 61% of

students agreed that the language in the Ecosystem E-Catalog was easy to understand. Using easy language can provide benefits in the learning process. Using easy language will make students understand better when reading ecosystem materi . According to Al Aslamiyah et al., (2019) stated that language is used according to student development so that the media that has been developed has good benefits.

Ease of access to buttons and multimedia in the E-Catalog greatly influences students' interest in learning. Because if students have difficulty accessing it, it will result in them being indifferent to opening the media. 56% of students strongly agree that the E-Catalog can be accessed at any time and can be accessed on any electronic media. E-Catalog can be accessed on Laptop/IOS/Android and so on. Using an E-Catalog that can be accessed at any time can make it easier for students to learn independently. The ease of access to the E-Catalog on various types of gadgets means that all students can open and study materi using the media.

In terms of benefits, 64% of students think that E-Catalog media can be used to study ecosystem materi . It can be said that the benefits of E-Catalog are right on target. 53% of students stated that quizzes on E-Catalog media could measure student abilities. The quiz used in E-Catalog media is a type of interactive quiz in the form of a game. According to Sumomba Melita et al., (2024) stated that the educational game-based interactive quiz that was developed was very practical to use in measuring students' abilities.

53% of students agreed that the local potential of Jepara's Ecosystem E-Catalog media helped understand the materi . Good media is media that can make students understand the materi . Use of the Ecosystem E-Catalog can be used independently. Independent use can give students more freedom to learn with their own learning styles. Independent learning can create an understanding of knowledge concepts and influence student learning outcomes. In line with Wijayanto's (2019) research, students who study independently will gain an understanding of knowledge concepts that last a long time and can influence student learning outcomes.

The teacher responded that the Ecosystem E-Catalog was very practical to use for learning. In terms of attractiveness, teachers strongly agree that presenting illustrative images in the E-Catalog can increase students' interest in understanding the materi . Interestingly, learning media for students can make it easier for teachers when teaching in class. This can be seen from positive student responses if the media used attracts their attention. A positive response that can occur is a willingness to listen to the teacher. Presenting questions packaged in game form can save teacher time. This is in accordance with the teacher's response if questions in the form of games can make it easier to increase student interest so that the learning process can take place according to the specified time. Presenting local potential in media is considered by teachers to be very helpful, because not all teachers have media in which there are original examples of utilizing local potential. The local potential that exists in the E-Catalog can be used by teachers for apperception, focused discussion and reinforcement during learning. The presence of apperception can make students ready to participate in learning. In line with Hidayanti et al., (2021) who stated that apperception has the function of creating an effective start to learning so that students are ready to take part in learning activities.

E-Catalog has convenience for teachers in the form of language, multimedia, buttons and access times. With the development of the E-Catalog ecosystem, teachers can provide direction to students for independent learning before learning begins. This media can also be used by teachers via laptop so that it can be displayed on the classroom LCD. This can overcome student gadgets that lack support and cannot open the E-Catalog. Teachers provide comments and suggestions that the E-Catalog is very good and very helpful but requires preparation of students' literacy and facilities on cellphones before implementing KBM. This is related to the use of internet packages.

Effectiveness of Ecosystem E-Catalog Learning Media

The effectiveness of the E-Catalog Ecosystem media can be seen from the completeness of student learning outcomes in large-scale trials. The results of student completion using E-Catalog are presented in table 4.5

Table 4.5 Results of Student Learning Completeness Using the Ecosystem E-Catalog

No	Learning outcomes	The highest score	Lowest Value	Average
1	Test scores (Posttest)	100	78	87.94
2	LKPD	93.75	79.69	85.88
3	Quiz	100	95	95.69
4	Student's Final Grade	95.58	84.06	89.37
Number of Completed Students		36 (100%)		
Incomplete Number of Students		0 (0%)		

In Table 4.6 it is known that the majority of students in class X E2 SMA Negeri 12 Semarang got a test average of 87.94. The highest and lowest test scores (Posttests) are 100 and 78. The results of the test scores are used to measure students' understanding of ecosystem materi . The average student LKPD score on the E-Catalog is 85.88 with the highest score being 93.75 and the lowest being 79.69. The average score for student LKPD 1 was 85.07, LKPD 2 was 87.14, LKPD 3 was 84.32 and LKPD 4 was 85.88.

Activities in the E-catalog are in the form of LKPD presented in PDF form. LKPD is used to activate students in learning and can make it easier for students to understand the materi . LKPD 1 is used to measure the learning objectives of ecosystem components and interactions within ecosystems. LKPD 2 is used to measure learning objectives for food webs and food chains. LKPD 3 is used to measure learning objectives for the types of ecological pyramids. LKPD 4 is used to measure learning objectives for types of biogeochemical cycles. Using LKPD can make it easier for students to get high completion scores. In line with Lase & Zai's (2022) research, it is known that the effectiveness of LKPD using learning outcomes tests obtained very high completion criteria, namely 90%.

LKPD 1 in the E-Catalog regarding student practicum activities regarding ecosystems. Learning using the practical method aims to enable students to find their own information regarding problems. This can enrich students' experiences to develop scientific attitudes. Practical activities can make students more active and more enthusiastic about learning. Practical activities can improve students' understanding and learning outcomes. According to Nisa (2017), learning using the practical method can improve students' understanding and learning outcomes to be good

Based on the learning results, it is known that the average quiz score is the highest. The use of quizzes is attempted to train students to be active before learning takes place. A quiz will be given at the end of the meeting. Students are expected to have prepared themselves from the start of learning to be able to answer the quiz. In line with Purnama Sari et al., (2018) stated that the quiz method is suitable for requiring students to be active in the sense of preparing themselves before class learning takes place.

Ecosystem E-Catalog can measure learning effectiveness if students complete > 85%. All class XE2 students have completed their studies. Students can be said to have a complete score if the student's final score is ≥ 75 and can be said to be incomplete if the final score obtained is < 75. Thus, the E-Catalog Ecosystem developed is effective in use because the completion results for class XE2 students are more than 85%. This is in accordance with the provisions of the Department of Education and Culture that students are said to have completed their studies if at least 85% of the total number of students have received a complete grade. This is also in line with Laeli, Ganefri, & Usmeldi (2019) who stated that if students' learning completeness has been achieved then the E-Catalog is categorized as effective for use in learning.

Based on the description above, the Ecosystem E-Catalog media is valid for use for class X learning

activities at SMA Negeri 12 Semarang. The teacher believes that the media is very practical and all students assess the media as practical and very practical. This media helps students study ecosystems. Student learning outcomes are maximized because E-Catalog media can help students easily learn about ecosystems. This is supported by student completeness > 85%.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the Ecosystem E-Catalog media is valid, practical and effective for use for teaching and learning activities at SMA Negeri 12 Semarang

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