

DEVELOPING ECOLOGY AND ENVIRONMENTAL LEARNING MATERIALS BASED ON INTEGRATION CURRICULUM AND SCIENTIFIC LITERACY FOR NATIONAL PLUS SCHOOL STUDENTS IN INDONESIA

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ABSTRACT

The integration curriculum is a blend of the current national curriculum in Indonesia (*Kurikulum 2013*) and foreign curriculum from CIE (Cambridge International Examination). The problem is the unavailability of teaching materials is adequate for both curriculums simultaneously to be held. The aim of this study was to reveals the feasibility of learning material on ecology and environment topics based on integration curriculum and all the scientific literacy components. The feasibility of learning material is obtained through the validation by scientific literacy content experts, design experts, assessment from biology teachers and students' responses. This research used Borg and Gall model which had 10 stages. However, this study is solely limited to preliminary field testing. Data validation was analyzed in descriptively qualitative. The research result showed that according to integration curriculum and scientific literacy by content experts, the feasibility of learning material was very feasible, in which the feasibility based on science as a body of knowledge has an average score 93.75%, whereas science as a way of investigation 88.54%, science as a way of thinking 87.5% and for interaction of science technology and society 86.25%. The feasibility of learning material's design corresponded to the design expert was very feasible with 87.20% as well. Result of biology teacher assessment on learning material was 92.96% (very feasible). Students' response to the preliminary field individual testing was 83.92% (very feasible), small group testing was 78.56% (feasible) and large group testing was 80.84% (very feasible). The student's learning outcomes were increasing between experimental and control groups. The results of the unpaired t-test that have been obtained indicate that the significance value or Sig. (2 tailed) = 0,000 below 0.001. This indicates that there is a significant difference of using learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy to students' learning outcomes of IGCSE 2 / grade X students, because Sig. (2 tailed) < 0.05.

Keywords: *ecology, environmental, integration curriculum, learning material, scientific literacy.*

INTRODUCTION

The impact of globalization is multidimensional; the impact is also felt in the field of education, especially higher education that directly interacts with the international community. Specifically, globalization is driving the changing role of higher education institutions. Higher education institutions are challenged to change the curriculum in total. One form of curriculum development that has recently received serious attention is the integration curriculum. According to Government Regulation No. 31 of 2014 Article 1 verse 6, that the Cooperation Education Unit referred to as *SPK (Satuan Pendidikan Kerjasama)* is an educational unit organized or managed on the basic of cooperation between Foreign Education Institution accredited / recognized in the country and the Indonesian Education Institution on the formal or informal path in accordance with the provisions of legislation (*Kemdikbud, 2014*).

The integration curriculum is a blend of the current national curriculum in Indonesia

(Curriculum 2013) and foreign curriculum (some schools usually use CIE as awarding bodies from UK). The integrated curriculum is more concerned that in a subject must be integrated thoroughly. This integration can be achieved through focusing lessons on a particular problem with alternative solutions through the various disciplines or subjects required so that the boundaries between subjects can be eliminated. The existence of the learning process is not focused on studying the subjects, but the subjects are only used as a means to approach the problems that are the focus of the study. This enables each learner to acquire a learning experience appropriate to his or her own interests and talents, and can psychologically be a means of personal development intact. The subjects, however, are subjected to by the educator when the subject takes place as a guide and center for the integration of the topic, so that the learning and teaching spirit does not leave the subjects set by the government to meet national education objectives.

So far, the implementation of integration curriculum in national plus schools has been going well and has a positive impact for all parties. But this integration curriculum also has many shortcomings. Based on the questionnaire and interview from some national plus school teachers, the results are as follows. More than 80 percent of teachers claim that material present on National Curriculum (*Kurikulum 2013*) cannot include material demanded on CIE and the material contained in CIE cannot include the material demanded in National Curriculum (*Kurikulum 2013*). Then the unavailability of teaching materials is adequate for both curriculums simultaneously to be held. Although there is overlapping material, but still there is no cohesion between the two learning materials. Teachers need learning materials that integrate National Curriculum (*Kurikulum 2013*) with CIE in order to teach students better.

The cognitive instruments we use are not in accordance with the abilities that must be achieved by students. The National Curriculum (*Kurikulum 2013*) emphasizes the students' scientific literacy skills that should be trained at all times. Another problem is in the ability of scientific literacy is still very low score achieved by the students in PISA (Program for International Student Assessment) in 2006, 2009, 2012, and 2015 respectively is 395, 383, 382, and 403 with the average general score for the whole country is 500. Data from PISA 2015 indicates that Indonesia is at the level of 62 with a mean performance below the OECD average. From the results of the above, the ability of our students is still below the average or in the low scientific literacy category (OECD, 2016:5).

Based on the explanation above, it is necessary to conduct developed a learning material on ecology and environmental topics based on integration curriculum and scientific literacy. The existing activities on the learning material with a scientific literacy can encourage and inspire students to be able to understand, implement, and develop ways of thinking rationally. This study aim was to carry out with the objective of assessing the feasibility of scientific literacy ecology and environmental learning material based on integration curriculum that has been developed according to scientific literacy by content experts, design expert, biology teacher and students in Senior High School. The process and product of this research are expected to learning material based on integration curriculum and scientific literacy had been feasible.

RESEARCH METHOD

2.1. Research Design

2.1.1. Development Research Design

Borg and Gall development models were used in this research. Several stages was conducted in this research, includes the step of analysis, design and development stage through validation from product experts / examiners and field users of the temporary product test.

Development of product followed these stages: (1) identifying learning needs, (2) product planning, (3) designing preliminary product, (4) preliminary product development, (5) preliminary product field testing, (6) main product revision, (7) main product field testing, (8) operational product revision, (9) operational product field testing and (10) final product revision.

This study was limited only for preliminary field testing. In order to reach this purpose, the learning material for ecology and environmental topics based on integration curriculum and scientific literacy has been developed and validated by content and design experts, biology teachers' assessment and students' response.

2.1.2. Quasi Experiment Research Design

The quasi experiment was carried in four classes of IGCSE 2 / X grade of Chandra Kumala School and two classes IGCSE 2 / X grade of Shafiyatul Amaliyyah School students. The classes were separated become two major groups, which are control group and experiment group. After the development of preliminary product, it was tested to increase students' scientific literacy skills. The control class used the learning material from textbooks (Cambridge University Press for CIE and Erlangga for K13). The experimental class used the developed learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy.

2.2. Study Samples

2.2.1. Development Research Samples

The development of product was started on April 2018 and preliminary field testing was carried out on December 2018 to know the feasibility of product. The preliminary field testing was carried out in Chandra Kumala School, Perumahan Cemara Asri, North Sumatera (Cambridge School ID Centre 124). The sample of preliminary field testing was used individual, small group, and large group.

2.2.2. Quasi Experiment Research Samples

Sample used in quasi experiment research was 82 students in four classes of Chandra Kumala School / CKS (Cambridge School ID Centre 124) and 31 students in two classes from Shafiyatul Amaliyyah School / YPSA (Cambridge School ID Centre 237), selected by purposive sampling, totaling 113 students.

Table 1. The sample used in quasi experiment procedure to the developed learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy for IGCSE 2 / X grade students

School	Class	Total	Notes
Chandra Kumala	X - A	19 students	Experiment classes, total 40 students
	X - B	21 students	
	X - C	21 students	Control classes, total 42 students
	X - D	21 students	
Shafiyatul Amaliyyah	US - A	16 students	Experiment class, total 16 students
	US - B	15 students	Control class, total 15 students
Total			113 students

2.3. Instruments

2.3.1. Development Research Instruments

Development research data was collected by using questionnaire instrument. Instrument for content expert review consist of 51 questions related to integration curriculum and scientific literacy aspect availability on this product, instrument for design expert consist of 27 questions related to product design and presentation, whereas instrument for biology teacher review consist of 16 questions and for students response consist of 16 questions through this product feasibility. The data primary was collected used a point 4 Likert scale. The responses to each statement were noted in a four scale that was 1 (bad/ not feasible); 2 (not good/less feasible); 3 (good/feasible); 4 (excellent/very feasible). The respondents will give a number of each item on questionnaire based on the established criteria. Data validation from the questionnaire response from teachers and students were analyzed descriptively qualitative. The feasibility of learning material was obtained through validation by scientific literacy content experts to assess feasibility of content based on science as a body of knowledge, science as a way of investigation, science as a way of thinking, interaction of science technology and society, design expert to assess feasibility of learning material design, biology teachers' assessment and students' responses.

2.3.2. Quasi Experiment Research Instruments

Data collection tool for quasi experiment is in the form of test results to learn, the subject matter "Ecology" consisting of 30 items. Where each item consists of five answer choices (a,b,c,d and e). If the students answers correct, they were given a score 1 (one), if the students answers wrong, they were given a score 0 (zero). This test is done at the beginning of learning (pre-test) and at the end of learning (post-test). The test is based on the analysis of curriculum and before being used, it first has been reviewed using the basic preparation of test validity.

RESULTS AND DISCUSSION

3.1. Results

3.1.1. Development Research Result

1. Identifying Learning Needs

The stages were started with analyzing the problems and needs to collect information in the form of a literature review, curriculum analysis, observation of teaching materials used in biology in National Plus Schools that become a background of this development research.

2. Product Planning

Product development was starting from the planning stage which consists of designing: the format of learning material, the presentation component of learning materials and teaching materials / content.

3. Product Design

Product design was starting from the planning stage which consists of designing: paper size, layout, color, selecting font and font size.

4. Preliminary Product Development

Result of product development stages is the realization of planning stage. The parts that have been planned in the planning stages were arranged and designed to become the draft product in this stage. Draft of finished product then validated and assessed by 4 (four) content experts and 3 (three) design expert as validators and 3 (three) biology teachers as reviewers of the learning materials. Draft of product that have been validated from the experts, then reviewers will gain ratings and feedback for improvement before having a preliminary field testing to

find the feasibility of this product. The results of validation will help researcher to make revisions of draft product.

5. Preliminary Field Testing Product

3.1.1. Draft assessment based on integration curriculum and scientific literacy content expert

The results of research and development from content expert based on integration curriculum and scientific literacy can be seen at Table 2 and Figure 1.

Table 2. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Content Expert

Component	Sub Component	The number of item	Validator				Total Score	%	Criteria
			1	2	3	4			
Feasibility of Integration Curriculum and Scientific Literacy Content	1. The suitability of content to KI, KD and indicators in both syllabuses (CIE and <i>K13</i>)	4	16	15	15	15	61	95.31	Excellent
	2. The accuracy of concept	3	11	11	10	11	43	89.58	Excellent
	3. The learning support materials	4	14	13	14	13	54	84.37	Excellent
	4. Science as a body of knowledge	4	13	16	15	16	60	93.75	Excellent
	5. Science as a way of investigating	6	20	24	21	20	85	88.54	Excellent
	6. Science as a way of thinking	8	27	29	29	27	112	87.5	Excellent
	7. Interaction of science, technology and society	5	17	16	18	18	69	86.25	Excellent
	8. Reflection	4	14	16	15	15	60	93.75	Excellent
Total		38	132	140	137	135	544	89.47	Excellent

Based on the results above, the average percentage of the feasibility components of integration curriculum and scientific literacy contents in Table 2. was obtained that the highest sub component assessment of the content suitability to KI, KD and indicators in both syllabuses (CIE and *K13*) has 95.31%, the accuracy of concept has 89.58%, the learning support materials has 84.37%, science as a body of knowledge has 93.75%, science as a way of investigating has 88.54%, science as a way of thinking has 87.5%, interaction of science, technology and society has 86.25% and reflection has 93.75%. This means that the learning materials can be categorized as “excellent” or feasible to be used.

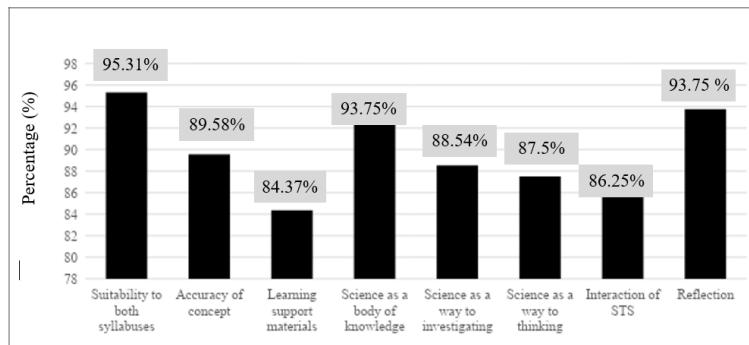


Figure 1. Diagram of Content Feasibility Assessment of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Content Expert

3.1.2. Draft assessment based on design expert

The results of research and development from design expert based on integration curriculum and scientific literacy can be seen at Table 3 and Figure 2.

Table 3. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Design Expert

Component	Sub Component	The number of item	Validator			Total Score	%	Criteria
			1	2	3			
Book format	1. Size	3	12	12	12	36	100	Excellent
	1. Cover lay out	3	11	10	12	33	91.67	Excellent
Cover design	2. Cover typography	4	13	13	16	42	87.5	Excellent
	3. Cover illustration	4	10	9	11	30	71.42	Good
Content design	1. Arrangement / content lay out	6	21	21	24	66	91.67	Excellent
	2. Typography	5	16	19	20	55	91.67	Excellent
	3. Content illustration	3	11	8	12	31	86.11	Excellent
Total		28	94	92	107	293	87.20	Excellent

Based on the results above, the average percentage of the feasibility design / presentation contents in Table 3 was obtained that the total percentage of the presentation has 87.20%. The percentage of book format has 100%, cover design has 83.53% and content design has 89.81%. This means that the learning materials can be categorized as “excellent” or feasible to be used.

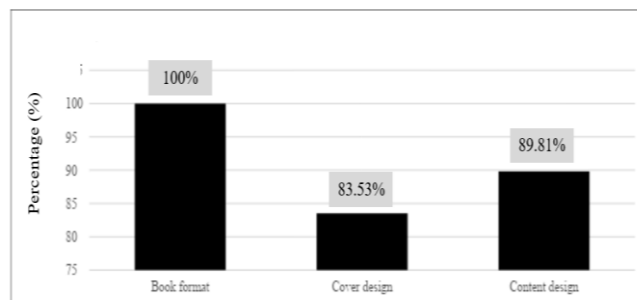


Figure 2. Diagram of Graphic Design Feasibility Assessment of Product Design Presentation on Ecology and Environmental Topic Based on Integration Curriculum and Scientific by Design Expert

3.1.3. Draft assessment based on teacher’s review

The results of assessment from biology teachers to the learning material based on integration curriculum and scientific literacy can be seen at Table 4 and Figure 3.

Table 4. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Biology Teachers

No	Indicators	Biology Teachers				Total Score	%	Criteria
		1	2	3	4			
1	Learning objective	4	4	4	4	16	100	Excellent
2	Appropriate to students’ development level	4	4	3	4	15	93.75	Excellent
3	The use of term and image / picture	3	4	3	4	14	87.5	Excellent
4	Presentation of teaching materials	4	4	4	4	16	100	Excellent
5	Provide benefits for teachers and students	4	4	3	4	15	93.75	Excellent
6	Opportunity for independent learning and group	3	4	4	4	15	93.75	Excellent
7	Motivate students to communicate, interact and collaborate	1	4	4	4	13	81.25	Excellent
8	Invite students to think holistically and analytically	3	4	3	3	14	87.5	Excellent
9	Stimulate students to think critically	4	4	3	4	15	93.75	Excellent
10	Easily understood language	4	4	4	4	16	100	Excellent
11	The material in accordance with ecologist principle	4	4	3	4	15	93.75	Excellent
12	Presenting concrete examples	4	4	4	3	15	93.75	Excellent
13	Be based on scientific literacy	4	4	3	4	15	93.75	Excellent
14	Suitable example to the daily life	3	4	4	3	14	87.5	Excellent
15	The material in accordance with integrated curriculum	4	4	4	3	15	93.75	Excellent
16	Facilitate students to learn integrated curriculum	4	4	3	4	15	93.75	Excellent
Total Score		57	64	59	60	238	92.96	Excellent

From the data can be seen that the average score of the first teacher is about 89.06%, the second teacher is about 100%, the third teacher is about 92.18%, the fourth teacher is about 93.75% and the average percentage is about 92.96%. This means that the learning materials can be categorized as “excellent” or feasible to be used.

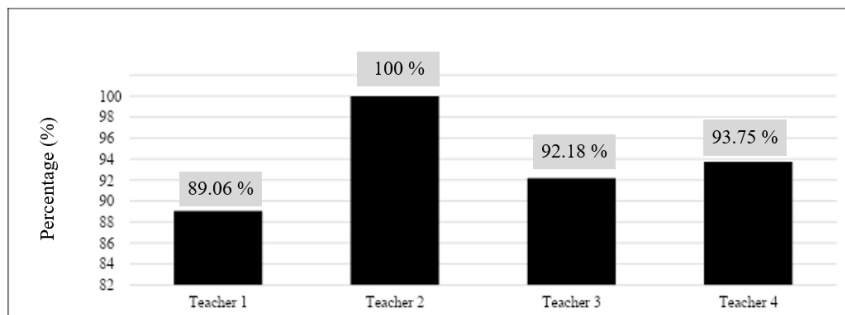


Figure 3. Diagram of Feasibility Assessment from Biology Teachers on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy

3.1.4. Draft assessment based on students' response

The results of response from students' to the learning material based on integration curriculum and scientific literacy can be seen at Table 5, Table 6, Table 7 and Figure 4.

Table 5. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Students in Individual Testing

No	Indicators	Average (%)	Criteria
1	Easy to understood	83.33	Excellent
2	Motivated to study hard	75	Good
3	Opportunity for independent learning	83.33	Excellent
4	Activity and learning objective clear and easy to understand	83.33	Excellent
5	Learning instruction easy to understand	75	Good
6	Help students in learning the daily case	75	Good
7	Interesting design, writing and pictures	83.33	Excellent
8	Presented coherently	83.33	Excellent
9	Encourage activeness in learning	91.67	Excellent
10	Font and letter size	83.33	Excellent
11	Pictures quality	83.33	Excellent
12	Language used	91.67	Excellent
13	Unambiguous	83.33	Excellent
14	Make learning more fun	100	Excellent
Average percentage		83.92	Excellent

Table 6. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Students in Small Group Testing

No	Indicators	Average (%)	Criteria
1	Easy to understood	80.55	Excellent
2	Motivated to study hard	69.44	Good
3	Opportunity for independent learning	75	Good
4	Activity and learning objective clear and easy to understand	88.88	Excellent
5	Learning instruction easy to understand	77.77	Good
6	Help students in learning the daily case	72.22	Good

7	Interesting design, writing and pictures	83.33	Excellent
8	Presented coherently	77.77	Good
9	Encourage activeness in learning	69.44	Good
10	Font and letter size	86.11	Excellent
11	Pictures quality	75	Good
12	Language used	88.88	Excellent
13	Unambiguous	72.22	Good
14	Make learning more fun	83.33	Excellent
Average percentage		78.56	Good

Table 7. Feasibility Components of Learning Materials on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy by Students in Large Group Testing

No	Indicators	Average (%)	Criteria
1	Easy to understood	83.75	Excellent
2	Motivated to study hard	74.37	Good
3	Opportunity for independent learning	77.5	Good
4	Activity and learning objective clear and easy to understand	81.87	Excellent
5	Learning instruction easy to understand	84.37	Excellent
6	Help students in learning the daily case	79.37	Good
7	Interesting design, writing and pictures	83.75	Excellent
8	Presented coherently	80.62	Excellent
9	Encourage activeness in learning	73.12	Good
10	Font and letter size	83.75	Excellent
11	Pictures quality	85.62	Excellent
12	Language used	85.62	Excellent
13	Unambiguous	76.87	Good
14	Make learning more fun	81.25	Excellent
Average percentage		80.84	Excellent

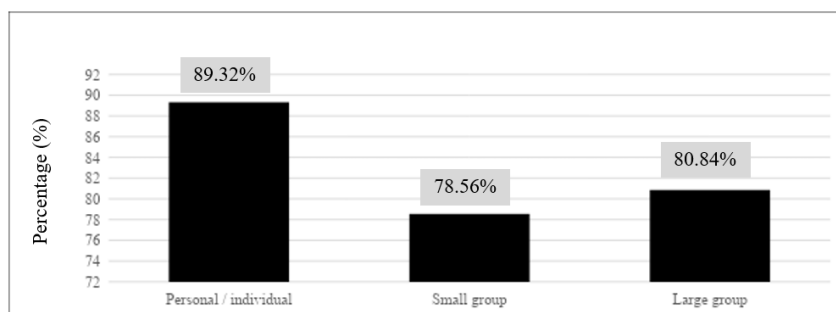


Figure 4. Diagram of Feasibility Assessment from Chandra Kumala Students on Ecology and Environmental Topic Based on Integration Curriculum and Scientific Literacy

According to the preliminary testing which has been conducted in Chandra Kumala School to find out the response for product, it was obtained that any decreasing of percentage score from personal / individual testing to small group testing, about 10.76%. But there was any increasing from small group testing to the large group testing, about 2.28%. This preliminary testing aimed

to find out the feasibility of the learning material, it can be used or not in learning activities. From the results, it can be concluded that the learning material on ecology and environmental topics based on integration curriculum and scientific literacy that has been developed otherwise been feasible and meet the criteria of “very good” or “excellent”.

3.1.2. Quasi Experiment Research Result (Effectiveness Test Result)

The student's learning outcomes from control and experimental groups were increase. The results of the unpaired / independent t-test that have been obtained indicate that the significance value or Sig. (2 tailed) = 0,000 below 0.001. This indicates that there is a significant difference between the experimental and control groups, because Sig. (2 tailed) < 0.05. Then Ha is accepted and Ho is rejected. There is a significant difference of using learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy to students' learning outcomes of IGCSE 2 / grade X students. The results of calculation with SPSS 21 was presented below:

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Grade	Equal variances assumed	4.237	.042	4.162	111	.000	10.25909	2.46514	5.37424	15.14393
	Equal variances not assumed			4.148	97.352	.000	10.25909	2.47303	5.35103	15.16714

Figure 5. The Results of Calculation with SPSS 21 to Find the Significance Difference Between Experimental and Control Classes

3.2. Discussion

3.2.1. Development Research Discussion

From the theory, the feasibility of teaching materials is obtained from the average scores from several aspects that have been agreed upon for feasibility testing. These aspects consist of aspects of curriculum integration, scientific literacy, instructional design and graphic design / layout which are also divided into several components.

The learning materials on ecology and environment topics based on integration curriculum and scientific literacy for IGCSE 2 / X grade students has been categorized as "excellent" and is suitable for use based on the curriculum of integration and scientific literacy. All sub-components of scientific literacy cover the KI-KD and indicators in both syllabuses, the accuracy of concepts, the learning support materials, and science as a body of knowledge, science as a way of investigating, science as a way of thinking, interaction of science, technology and society have fulfilled the criteria of “very good” or “excellent”.

Development of learning materials has been prepared to meet the requirements for a good and standard teaching material, based on the regulations of the Ministry of Education of the Republic of Indonesia and Cambridge International Examination (CIE).

The concepts and theories of the material and activities of this book are obtained from several textbooks (national and international), empirical research from various journals, recent year exam and discussion that are in line with the current developments and the latest news from websites and online newspapers.

The feasibility of product presentation from instructional design is also classified as "excellent". There are three sub-components of assessment, namely: the presentation technique, the presentation of instructional and the completeness of presentation. The average results from the three aspects of instructional design also get "excellent" results.

The criteria of science as a body of knowledge was fulfilled because the learning material was presenting: 1) the concepts, theories, hypotheses, models and empirical facts related to ecology and environment, 2) the latest information to be known by students related to ecology and the environment, 3) the questions for students to remember the information related to ecology and the environment, 4) the facilities to students to understand the relationship between biological and ecological concepts. The score obtained was 93.75% (excellent).

The criteria of science as a way to investigating was fulfilled because the learning material was presenting: 1) the requirement for students to answer ecological questions using ecological concepts, 2) the ecological and environmental data or questions through the use of graphs, 3) the requirement for students to answer questions about ecology and the environment by using tables, 4) the question that requires students to make calculations, 5) the requirement for students to explain the answers to each evaluation of ecological and environmental material, 6) the presentation of material involving students in experiments about observation and utilization and the role of ecology. The score obtained was 88.54% (excellent).

The criteria of science as a way of thinking was fulfilled because the learning material was presenting: 1) the description of how a scientist conducts experiments on ecology, 2) the historical development of an idea, 3) the description of teaching materials that emphasize empirical and objective science, 4) the illustration and using of assumptions about ecology, 5) the science that runs on inductive and deductive considerations, 6) the description of teaching material that presents a causal relationship, 7) the motivation to discuss scientific evidence to solve ecological and environmental problems, 8) the scientific methods and problem solving related to ecological and environmental topics. The score obtained was 87.5% (excellent).

The criteria of interaction of science, technology and society was fulfilled because the learning material was presenting: 1) the scientific and technological uses for society, 2) the negative impacts of science and technology for the community, 3) the social problems related to science and technology, 4) the field photos and drawings related to ecological and environmental topics, 5) the careers and jobs in the fields of science and technology. The score obtained was 86.25% (excellent).

The assessment of product's design feasibility consist of several indicators, namely: (1) the feasibility of size format, (2) the feasibility of cover's design which include layout of learning materials cover, cover typography design, cover illustration; and (3) the feasibility of learning materials content design which include layout, typography and illustration / drawing of contents.

The feasibility of this learning materials design included in the criteria of "very good" or "excellent". This was obtained from front type, size, easy to read and printing in an appropriate size. This learning material was packed with a good packaging, hard cover paper using 260

grams art paper and laminated, so it looks shiny and waterproof. The paper of learning material was using A4 size with 80 grams paper to make it quite thick to be printed both sides.

This learning material also assessed by and responded by some biology teachers and students in Chandra Kumala School. Teachers and students become respondents for this research by giving a review to learning materials on ecology and environment topics based on integration curriculum and scientific literacy for IGCSE 2 / X grade students that developed. From the results of the assessment which carried out by 4 biology teachers to some indicators in the questionnaire instrument used, it obtained a positive response where all the items included in the criteria of “very good”.

The students also give the positive response for this learning material. In individual testing the assessment result was about 89.32%, small group testing the assessment result was about 78.56% and large group testing the assessment result was about 80.84%. The criteria for these responses were “good” and “excellent” or feasible to be used.

3.2.1. Quasi Experiment Research Discussion

Based on the results of quasi experiment, the data shown that there is a significant difference of using learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy to students' learning outcomes of IGCSE 2 / grade X students.

This is because the learning material contains almost all indicators and learning objectives found in the two curriculum (CIE and *K13*), namely:

- 1) describe the flow of energy through living organisms including light energy from the sun and chemical energy in organisms and its eventual transfer to the environment;
- 2) define a food chain as showing the transfer of energy from one organism to the next, beginning with a producer;
- 3) define trophic level as the position of an organism in a food chain, food web, pyramid of numbers or pyramid of biomass;
- 4) identify producers, primary consumers, secondary consumers, tertiary consumers and quaternary consumers as the trophic levels in food webs, food chains, pyramids of numbers and pyramids of biomass;
- 5) describe the carbon cycle, limited to photosynthesis, respiration, feeding, decomposition, fossilization and combustion;
- 6) state the roles of microorganisms in the nitrogen cycle, limited to decomposition, nitrification, nitrogen fixation and denitrification (generic names of individual bacteria, e.g. *Rhizobium*);
- 7) define *ecosystem* as a unit containing the community of organisms and their environment, interacting together;
- 8) identify the lag, exponential (log), stationary and death phases in the sigmoid population growth curve for a population growing in an environment with limited resources;
- 9) discuss the problems which contribute to famine including unequal distribution of food, drought and flooding, increasing population and poverty.

In the quasi experiment data, based on the results of the unpaired t test that have been obtained indicate that there is a significant difference between the experimental and control groups, because Sig. (2 tailed) < 0.05. Then H_a is accepted and H_o is rejected. There is a significant difference of using learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy to students' learning

outcomes of IGCSE 2 / grade X students. This research is in line with several studies that also use the developed teaching materials.

In accordance with Setiyadi (2017) based on the implementation of learning using a scientific-based learning material is implemented well or high and students are actively involved in learning. In addition, it appears that the material developed is able to direct students to be actively involved and interact with their friends and interact with teachers to convey and solve problems or questions related to the contents of the learning material. So the learning material developed has met the practicality requirements. Therefore learning material that are developed are practical for use in learning activities.

Also in accordance with Ong'amo (2017) learning process takes place when a teacher engages students' sense of sight and further says that students retain fifty per cent of what they are taught while seeing and hearing as opposed to twenty per cent retention of what they are taught through hearing alone. Teachers also suggested that using resources while teaching helps in clarity of ideas. Students said they sometimes use resources during teaching and learning process. This made teachers and head teachers say that students are performing poorly in biology. The researcher further proved using tests that academic performance improved when students are taught using resources (51%) than when they are taught without resources (48%), any 3% increasing. This proves that the use of teaching materials that have been developed is indeed very good for improving scientific literacy skills, cognitive abilities and also student learning outcomes.

CONCLUSION

It was concluded that the feasibility of learning material based on integration curriculum and scientific literacy was very feasible, in which the feasibility based on science as a body of knowledge has an average score 93.75%, whereas science as a way of investigation 88.54%, science as a way of thinking 87.5% and for interaction of science technology and society 86.25%. The feasibility of learning material's design corresponded to the design expert was very feasible with 87.20% as well. Result of biology teacher assessment on learning material was 92.96% (very feasible). Students' response to the preliminary field individual testing was 83.92% (very feasible), small group testing was 78.56% (feasible) and large group testing was 80.84% (very feasible). The student's learning outcomes from control and experimental groups were increase. The results of the unpaired t-test that have been obtained indicate that the significance value or Sig. (2 tailed) = 0,000 below 0.001. This indicates that there is a significant difference between the experimental and control groups, because Sig. (2 tailed) < 0.05. Then H_a is accepted and H_o is rejected. There is a significant difference of using learning material for the ecology and environmental management topic based on integrated curriculum and scientific literacy to students' learning outcomes of IGCSE 2 / grade X students.

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Conflict of Interest

The conflict that may arise is the lack of school readiness for the implementation of the dual curriculum in schools.

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