The strengthening of ecology literacy in eleventh grade senior high school students through development of Group Investigation (GI) module in geographic lessons of SMA Negeri 3 Sungai Kakap, Kubu Raya Regency

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Abstract. The purposes of this research were: (1) Determine the characteristics of the development of Group Investigation (GI) based modules (2) Determine the feasibility of Group Investigation (GI) based geography modules developed to improve Ecological Class XI Literacy. This type of research is Research and Development (R&D). The development stage of R&D is the 4D model, in this study there searchers only focused on the 3-D stage (Define, Design, Develop). This research design before and after the pre-test - post-test method. The researcher subjects were students of class XI IPS at SMA Negeri 3 Sungai Kakap. Data collection techniques used were test, questionnaire and documentation methods while data analysis techniques were used t test or t-test. Based on data analysis, the following results can be presented: (1) Characteristics of Group Investigation (GI) -based modules on preservation of environmental materials and sustainable development are at the integration stage of learning-based Investigation and insertion of environmental values inproducts produced to enhance the strengthening of Ecological Literacy on environmental material class XI SMAN 3 Sungai Kakap Kubu Raya. (2) The results of the validation of the experts team showed an average, an average assessment module of 81% and included a very decent criterion, the response testshowed positive response to the percentage of students and included with a very decent criterion. (3) Calculation of the effectiveness of using N-Gain and our t-test, where N-Gain sees how much increases in the results of pre-test to post-test calculations in the experimental class 0.512% and the control class is 0.419% and the t-test to determine H1 hypothesis is accepted or rejected and the results obtained t = 3.69 > table = 1.68 means that the research hypothesis (H1), is accepted, which means there is a difference between the concluded experimental and control classes, the experimental class is more effective than the control class with the experimental class an average of 0.512% and a control class 0.419%.

1. Introduction

Geography education is one of the fields of science that studies about the environment. Ecological Literacy in students can be measured with a certain level and several countries are included in the curriculum. Education is a source of stimulus that can give motivation to self/ self to beable to have readiness to be have/attitude on the affective dimensions then It is able to encourage a positive psychomotor dimension of the environment in accordance with the expected learning outcomes [1]

The results of the Program for International Student Assessment (PISA) 2012 showed that the environmental literacy of students in Indonesia is still below average [2]. PISA is a three-year international survey aimed at evaluating education systems throughout the world by testing students' skills and knowledge. Considering the low level of Ecological Literacy that Indonesian students have, so Ecological Literacy needs to be embedded in the Indonesian education curriculum. The results of
the PISA were corroborated by the results of a preliminary study on Ecological Literacy that conducted at several schools in Kubu Raya Regency. The term of Ecological Literacy is still considered foreign and almost never properly assessed by a number of geography teachers in Kubu Raya Regency. Geography learning is still oriented towards the assessment of aspects of knowledge and competence of students, learning outcome in the cognitive realm, so the literacy of students is lacking in particular Ecological Literacy which the result of learning that is an attitude of caring for the environment.

Based on preliminary studies in several schools in Kubu Raya Regency, attitude competencies in geography learning such as students' awareness of the environment are also not properly assessed by some geography teachers. In the learning process, geography teachers put more emphasis on cognitive competence (knowledge). Attitude competencies are only verbally evaluated, asked and not equipped with an assessment instrument to assess attitudes, especially student awareness of the environment. Teachers have not been able to do a professional assessment of all competencies due to the large load of material that must be completed and geography teachers in several schools are still oriented towards the assessment of aspects of knowledge that are tested through summative tests specifically on environmental material.

The teacher must be able to provide variations in the learning process by adjusting the learning model with the characteristics of the material and students as the audience. Specific pedagogy for specific material (subject specific pedagogy) is carried out to improve students' comprehension of related material and provide an interesting learning experience for students. Based on a preliminary study through interviews with a number of geography teachers in Kubu Raya Regency, it is found that some geography teachers have not been able to develop their own learning tools, which more specifically pay attention to the suitability of the material and learning models applied and consider the characteristics of students. The Development of textbooks in geography subject for students (Modules), assessment instruments are more often obtained from the internet, manual books and various other sources. A material has different characteristics from other material. The characteristics of students and certain learning models also need to be considered in preparing learning plans for a particular material. Environmental material is in conformity with the Group Investigation (GI) model and is very closely related to students' daily lives. The learning design that is specific to the field of study for habituation and bring about the strengthening of Ecological Literacy then becomes an important part in learning environmental material. [3]: The Group Investigation Model emphasizes the participation and activities of students to search for material (information) lessons to be learned through available material, for example from textbooks or students can search through the internet.

Through the development of module fields of study based on Group Investigation (GI) by conducting learning stages in accordance with learning Group Investigation (GI) namely, Grouping, Planning, Investigating, Organizing, Presenting, Evaluating. For learning with environmental material later, is one of the keys to the effectiveness of learning outcomes in the affective domain in the form of strengthening Ecological Literacy.

Learning Group Investigation (GI) is a series of learning activities that emphasize the process of thinking critically and analytically to seek and find their own answer to the problem in question. This process is usually carried out through teacher and student questions and answers [4]. The Group Investigation (GI) method that promotes active involvement of students is proven to get student learning outcomes and attitudes. The Group Investigation (GI) method fosters the development of among others scientific literacy and understanding of scientific processes, vocabulary knowledge and understanding of critical thinking concepts and being positive. It was also stated that the Group Investigation (GI) method not only enhances students' understanding of concepts in science, but also shapes scientific attitudes in students [5].

SMA Negeri 3 Sungai Kakap, Kubu Raya Regency is a national Adiwiyata school as a form of EfSD, needs to develop modules in Geography subjects on Environmental material. This is done to strengthen Ecological Literacy students. Data on the strength of students' Ecological Literacy, has also been obtained by spreading the New Ecological Paradigm (NEP) questionnaire instrument to ecological components including limitstogrowth, anti-anthropocentrism, balance of nature, anti-exemptionalism, and eco-crisis. Based on the five ecological components, it is translated
into 15 Likert scale statements. The higher the score, the higher the environmental concern. The ability of students' knowledge prior to the application of the Group Investigation (GI) -based module is still relatively low, the basic knowledge of students with an averagere of 56 below the KKM is 65. Data on attitude sconcerned about the environment, need to be known nimine a suring howmuch students care about the environment. The NEP scale was used to examine the concern of students of class XI IPS SMA Negeri 3 Sungai Kakap to wards the environment shows an averagere score of 57.4% of students in the moderately care category. Scores for each dimension of NEP was calculated with a Likert scale indicates that on the limits of growth dimension the average score of students is 61.80, theanthropocentrism dimension is 54.02 the balance of nature dimension is 52.95, anti-exemptionalism dimension of 50.90 and eco-crisis dimension of 59.75. The Ecology Literacy scale was used to measure the concern of students of class XI IPS SMA Negeri 3 Sungai Kakap towards the environment showed an average score of 54.25% of students in the category of ecology literacy is still weak. Scores for each Ecology Literacy dimension was calculated with a Likert scale indicates that on the environmental dimension according to students' opinion, the average students is 55.80 environmental dimensions according to what students have done is 52.95 and the dimension of questions about the environment is 54.02.

Through these considerations the development of a Group Investigation (GI) -based geography module to strengthen ecology literacy, positive attitudes and actions of students can be built on the environment and provide an interesting learning experience for students, so that students' comprehension of environmental material can be improved. Therefore, to solve the problem above, it is necessary to develop a geography module based on Group Investigation (GI) to strengthen ecology literacy on environmental material, which aims to improve the ecology literacy and students' awareness of the environment, especially students in class XI SMA Negeri 3 Sungai Kakap Kubu Raya Regency in academic year 2018/2019.

2. Methods
The place of the research was at SMA Negeri 3 Sungai Kakap, Kubu Raya Regency. This research is a type of research development (Research and Development) or referred to as R & D research. Researchers used the 4-D R&D model designed by Thiagarajan [6]. The 4-D model by Thiagarajan was chosen because it is suitable for the development of learning tools. How ever, the limitations of research time and research interest are only up to development for the need in this study research hers only focus on the 3-D stage. R & D In this study combined with experimental research. Experimental research itself enters the final stage in 3-D, which is the implementation of products in learning. [7] confirms that experimental research is a scientific approach that is very systematic, structured, strict and accurate in carrying out procedures, and guarantees certainty of results. There fore, the research here is carried out using two research designs namely R&D and experimental research, but as explained earlier that experimental research here is part of the development of the module. The research and development carried out aims to develop a Group Investigation (GI) -based geography learning module that is used to teach certain material. The module was created on the subject of Geography environmental material.

3. Results and Discussion
3.1. Characteristics Modules
Characteristics of Group Investigation (GI) based modules on the material Environmental Conservation and Sustainable Development. The characteristics of the Group Investigation (GI) based module on environmental preservation and sustainable development material are found in the integration of Group Investigation (GI)-based learning stages and the insertion of environmental values in the products produced consisting of the grouping, planning, investigating, organizing, presenting, evaluating, from phase 1. Grouping (making group), phase 2. Planning (determining the material being studied), phase 3. Investigating (exchanging information and ideas, discussing, clarifying, gathering information, analyzing data, making inferences), phase 4. Organizing (group members writing report presentations, presenting presenters, moderators, and reporters), phase 5. Presenting (one
group presents, another group observes, clarifies, asks a question or response), phase 6 Evaluating (each student corrects their reports).

The initial design of Group Investigation (GI) based lesson plan includes several components such as identity, core competencies, basic competencies, indicators, subject matter, approaches, methods, media, learning tools, learning resources, learning steps and assessment.

3.2. Module Development

The development in this research was carried out on the components of the learning steps in the lesson plan namely by entering the syntax of Group Investigation (GI) according to [8]. Activities planned in the lesson plan include four activities namely the topic of the environment in activity one, standard quality environmental quality in activity two, pollution, destruction and environmental risk in activity three. The policy of implementing sustainable development in Indonesia at the fourth Lesson Plan meeting prepared for four meetings was adjusted to the 2013 curriculum syllabus from the government which mandated the completion of a discussion on environmental preservation materials for six hours. The 6 JP time allocation is divided into four meetings, namely the first 2 JP is used to complete the first activity on the topic of environmental balance and change in accordance with the syntax of Inquiry from phase 1 to phase 5. 1 JP to complete the second activity on the topic of environmental quality standards up to phase 3 namely formulating a hypothesis. Completion of the learning steps at the second meeting was carried out at the third meeting with an allocation of 20 minutes from 2JP, followed by the implementation of the third activity on the topic of pollution, destruction and environmental risk, to the final phase in the syntax of Group Investigation (GI). 1 JP at the fourth meeting was used for reflection and delivery of the latest material related to sustainable development, environmental risk, to the final phase in the syntax of Group Investigation (GI). 1 JP at the fourth meeting was used for reflection and delivery of the latest material related to sustainable development.

The assessment system included in the lesson plan consist of cognitive, affective and psychomotor assessments that were made according to indicators of environmental preservation and sustainable development. The lesson plan is also equipped with an affective and psychomotor assessment observation sheet, according to Niron (2009) about the effectiveness of the lesson plan which is strongly influenced by several principles of learning plan which include, learning plan must be based on student conditions, learning plan must be based on the applicable curriculum, learning plan must take into the available time, learning plan must be as sequence of systematic learning activities, learning plan if necessary equipped with work sheets/assignment sheets/observation sheets, learning plan must be flexible, learning plan must be based on a system approach that prioritize the integration of objectives/competencies, material, learning and evaluation activities.

The insertion of environmental values covering five dimensions of the new Ecological Paradigm and Ecological Literacy in the lesson plan is outline in the activities. In the first activity about environmental balance the environmental value is inserted in the form of a dimension of balance of nature so that students realize the importance of environmental balance and are motivated to always maintain environmental balance, in addition to the environmental value is also inserted in the form of a new crisis dimension so that students know the impact caused by environmental quality and pollution with various environmental problems presented at the first activity.

The insertion of environmental values in the second activity with the topic of environmental quality standard lies in the limit to grow dimension, with hope it can foster students’ awareness that a environment that has already been damaged by pollution will be difficult to recover as it was. The insertion of environmental values in the three activities with the topic of pollution and destruction as well as environmental risks lies in the dimensions of anti-anthropocentrism and anti-exceptionalism, to foster student awareness that selfish behavior in the utilization of natural resources in the environment will negatively impact and uses technology can also threaten environmental sustainability.

Group Investigation (GI) based modules on environmental preservation were recreated and developed for both students and teachers including, cover design and content design, with the format: module identity sheet, preface, characteristics of the teacher module (specifically for the teacher module), table of contents, sheet core competencies, basic competencies and indicators, module usage
instructions, concept charts, sub-theme distribution sheets (activities 1 and 2, each of which consists of the
who least eps of the Group Investigation (GI) learning model recommends the learning steps
(specifically for the teacher module), 1: Grouping, (making Groups), phase 2: Planning (determining
the material being studied), phase 3: Investigation (exchanging information and ideas, discussing,
clarifying, gathering information, analyzing data, making inferences), phase 4: Organizing (group
members write reports, plan report presentations, determine presenters, moderators, and note takers),
phase 5: Presenting (one of the group presents, the other group observes, clarifies, asks questions
responds), phase 6: Evaluating (each student corrects their report). Important not esheets, practice
questions, practice questions as well as discussion and scoring guide lines (specifically for
the teacher module), glossary, bibliography and author's identity. Characteristics of Group
Investigation - based Appraisal Instruments made and developed are divided into two parts in the
form of pretest and posttest assessment instruments. The making is adjusted to the learning indicators.
Each consists of five essay items with cognitive levels of bloom taxonomy varying from C1 to
C6. Problem pretest and posttest were made to determine the beginning and then do the cognitive
ability es of students before and after the learning using module based Group Investigation (GI).

3.3. Effectiveness Module

Effectiveness of Group Investigation (GI) - based modules on environmental preservation material
to strengthen students' Ecological Literacy. The result obtained from the N-Gain in the experimental
and control class is the experimental class from pre-test to post-test of 0.512 while in the control
class is only 0.419. The results obtained from the t-test to find out whether there are differences
in attitudes towards environmental care before and after the application of the Group
Investigation (GI) based module states that t > Nk; 1 in other cases H1 accepted. Because the test result
\( t = 3.69 \) and \( N_k = 1.68 \) which means that \( H_0 \) is rejected and \( H_1 \) is accepted. \( H_1 \) states that there are
differences in the result of the NEP question naire and the Ecological Literacy questionnaire for
measuring environmental attitudes of students before and after the Group Investigation (GI) based
module is applied in learning in class XI IPS of SMA Negeri 3 Sungai Kakap. The difference that can
be seen from the increase in the Average score for all study samples from 54.25% to 76.7 in the
category of good, friendly care for the environment. The increase in NEP scores and Ecology
Literacy from all dimensions indicates the role of the use of Group Investigation (GI) - based modulesin
strengthening students' environmental care attitudes. Thus the researcher concludes that the use of
Group Investigation (GI) - based modules is more effective because in the learning process it can
foster an attitude of environmental care towards students.

According to [9], a good attitude of caring for the environment is indicated by scores from the
NEP and Ecological Literacy scales of more than 60, while a score of 46-60 has the criteria of caring
enough for the environment. The results showed the
students' environmental care criteria after the application of the Group Investigation (GI)
based module were in the good environmentally friendly category, which meant that an increase in
over all score was followed by an increase in environmental care criteria from Caring enough to caring
for the environment. The increase in environmental care criteria, which can be seen from this study is the loss
of the criteria for a low environmental awareness attitude / students as a sample of studies that do
not care about the environment before the Group Investigation (GI) based module is applied. In the
NEP questionnaire there were 3 students from the entire study sample, 36 students who were in the
category of not caring for the environment. 8 of 36 students were in the category of caring enough for the
environment before the Group Investigation (GI) based module was applied, and the
results of the Ecological Literacy question naire were 19 students from the whole sample
which 36 students are in the category of weaken their ecology Literacy, and that is the category were
9 students and 8 students in the strong category. After the Group Investigation (GI) based
module was applied in the class room learning there was an increase in the environmental care
category, as many as 31 out of 36 students were in the strong category Ecological literacy awareness
of the environment and 3 out of 36 students were in the mode rate category of Ecological literacy
environmental awareness, and as many as 2 students are in the category Ecological literacy
Ecology after the implementation of module-based Group Investigation (GI). The difference
and the occurrence of strengthening the attitude of caring for the environment after the
implementation of module products based on Group Investigation (GI). Strengthening the
the...
The attitude of caring for the environment in this study can not only be seen from the average increase in NEP scores and Ecological Literacy as a whole, can also be seen from the scores of each dimension of NEP and Ecological Literacy increasing. The average score of students on the dimensions of limits to growth before the application of the Group Investigation (GI) based module was 81 to 83 in the "care for the environment" category; the dimension of anti-anthropocentrism is 67 in the category of "caring enough for the environment" to 77 "caring for the environment" the balance of nature dimension is 67, in the category "caring enough for the environment to be 83 with the category" very concerned about the environment "; the anti-exemptionalism dimension of 80 in the category of very concerned about the environment became 81 with the category overy Concerned about the environment and the dimension of eco-crisis of 67 to 79 in the category of "very concerned about the environment".

The average dimension of the Ecological Literacy dimension, prior to the application of the Group Investigation (GI) based module, the environmental dimension in the opinion of students amounted to 55.80 to 76 in the environmentally friendly category, the environmental dimension in accordance with what students had done was 52.95 to 73, the dimensions of the case about the environment by 53.25 to 70 and the dimensions of the environment in accordance with the state of self by 54.02 to 70.

Someone's readiness to care about the environment in Theory of Planned Behavior is influenced by several things, one of that is attitude, specifically referred to as environmental attitude [1]. The attitude of caring for the environment can arise after several stages are fulfilled namely, knowledge (knowing), acting (acting), and habits (habit). The higher the cognitive value of students the higher the NEP score and its Ecology Literacy, which means that the more students know and understand various information about the environment the stronger their caring attitude towards the environment. From various explanations of the results of this study, the application of the Group Investigation (GI) -based module in learning was declared effective in strengthening students' environmental care attitudes.

The following diagram presents data in the form of the results of strengthening ecology literacy through the NEP questionnaire and ecological literacy in the development of module-based Investigation Group (GI):

![Figure 1. Histogram Diagram of Strengthening the Attitudes of Students' Environmental Care through the NEP questionnaire After the Implementation of the Group Investigation (GI) -based Module in Learning](image-url)
4. Conclusions

Based on the results of the study it can be concluded that:

The characteristics of the Group Investigation (GI) -based module on environmental preservation and sustainable development material are found in the integration of Inquiry - based learning stages and the insertion of new ecological paradigm dimensions in the products were produced. The new ecological paradigm dimensions that are inserted are the dimensions of limits to growth, anti-anthropocentrism, balance of nature, anti-exemptionalism and eco-crisis. And the Ecological Literacy dimension is inserted environmental knowledge according to students’ own understanding, the environment in accordance with what students have done.

The development of the Group Investigation (GI) -based module with the assessment instrument with the 4D Thiagarajan development model has been through the validation stage by experts and limited and extensive trials on the respondents and declared eligible for use in learning in class XI IPS SMA Negeri 3 Sungai Kakap on preservation material environment and sustainable development.

The use of Group Investigation (GI) -based modules in the learning process in class was declared effective to strengthen students' environmental care attitudes, as indicated by an initial increase in NEP scores of 45 to 76. And initial Ecology Literacy Scores of 48 to 71. Initial data of NEP 57% of students were in the category of caring enough for the environment and data from ecology by 54.25% students in the category caring enough for the environment can go up in the category of caring for the environment with a percentage of 76% for the NEP score and 71% for the Ecology Literacy questionnaire for students in the category of caring for the environment. There are differences in scores NEP and score Ecology before and after implementation of module-based Group Investigation (GI) in learning as indicated by the results of tests in the test of statistical parametric namely t-test stating $t_1 \geq nKt_1$, in other respects $H \bar{1}$ accepted. Because the test results $t_1 \approx 3.69$ and $nKt_1 \approx 1.68$ which means that $H0$ is rejected and $H1$ is accepted. $H1$ stated that it was concluded there were differences in values in the study sample with the application of the Group Investigation (GI) -based module with those not using it, in learning in class XI IPS SMA Negeri 3 Sungai Kakap. Then concluded the experimental class is more effective than the control class with an average of 0.512% experimental class and 0.419% control class.

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Figure 2. Histogram Diagram of Strengthening the Attitudes of Students' Environmental Care through the Ecological Literacy questionnaire After the Application of the Group Investigation-based Module in Learning
2. Geography teacher, Madam Sri who helped in research process.
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