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Developing Environmental Integration Teaching Materials To Improve Cognitive Flexibility

ABSTRACT

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This study aims to develop an innovative model of environmental integration learning in boosting cognitive flexibility. Research location at State Special Education School 7 in Jakarta (SLB N 7 Jakarta). The research method used an Research & Development approach with the Dick and Carey development model. The sample of this research is the teachers of SLBN 7 Jakarta totaling 54 teachers. The sampling technique uses random sampling techniques. There are two groups of teachers, namely the treatment group consisting of 27 teachers, namely the group of teachers who read teaching materials and the control group consisting of 27 teachers, namely the group of teachers who do not read teaching materials. Teacher knowledge is tested by developing test objectives. Data analysis used descriptive statistics and t-test to verify product differences and effectiveness. The output of the product is in the form of teaching materials for environmental education learning strategies. The results showed that there was an increase in teachers' cognitive flexibility about environmental integration learning effectively and significantly after reading the teaching materials. It is hoped that the teacher can change a more positive attitude towards the environment through an integrated learning environment.

Keywords: cognitive flexibility, teaching materials for learning strategies for environmental education

Introduction

Special Education Teachers are teachers who are professional in the field of knowledge of students with special needs. Teachers become the foundation for the future by having knowledge / skills / attitudes related to environmental problems such as the use of environmentally friendly products. Teachers must have a more advanced mindset in making decisions about environmentally friendly consumption and teach students about environmentally friendly products. In this case the teacher must be an agent of change (agent of change). Therefore, it is necessary to ensure that teachers or prospective teachers have knowledge / skills / attitudes related to environmental problems.

Teachers' knowledge in mastering the concept of environmental education will greatly assist teachers in integrating environmental education principles in designing learning kits. Learning that is integrated with the values of environmental education is a sustainable development education program that will have a major impact on improving the world of education globally. Therefore, teachers' knowledge about environmental education is needed in order to make an integrated learning environment.

Teachers must be able to apply their knowledge in solving environmental problems in a structured manner based on their cognitive flexibility. Cognitive flexibility is the ability to think about things in different ways. That is, the learning process should ideally be able to improve the cognitive flexibility of teachers. The principle of cognitive flexibility basically refers to the working system of the human brain, where in the human brain all the information obtained is stored in memory which can then be recalled when needed to be rebuilt into new knowledge under different conditions.

Data was obtained that teachers of the Special Education School at SLBN 7 Jakarta in making learning kits were in accordance with procedures but had not yet integrated the environment. Until now, special education teachers have faced difficulties due to the scarcity

of teaching materials that can be used as learning resources for integrated learning environments. Even though teaching materials are available, the problem often faced by teachers in learning activities is choosing, determining, and utilizing appropriate learning materials or teaching materials in order to help students achieve competence. This is due to the fact that in the curriculum or syllabus, teaching material is only written in an outline. It is the teacher's job to describe the material so that it becomes complete teaching material even though the learning objectives will be achieved if supported by learning kits.

On the basis of this, it is necessary to compile a guide on teaching materials for Environmental Education Learning Strategies as a reference for teachers in understanding, planning, implementing and evaluating the results of environmental integrated learning.

Thus, the purpose of this study is to develop teaching materials for Environmental Education Learning Strategies in boosting cognitive flexibility.

Materials and Methods

This study used the Research and Development method from Ball and Gall (M.D. Gall, J. P. Gall, and W.R. Borg, 2007) and the instructional development of the Dick and Carey model (W. Dick, L. Carey and J.O. Carey, 2009). The steps for developing an instructional package include:

1) Identifying instructional needs and write general instructional goals. The stage of identifying learning needs begins with reference to the ability of knowledge about environmental education learning strategies, which is very much related to the development of instructional packages. The general instructional objectives obtained are: The teacher understands the learning strategy of environmental education.

2). Conducting instructional analysis, is a process of describing general competencies into special competencies arranged logically and systematically by looking at and considering the learning objectives to be achieved.

3). Identifying the teacher's initial abilities and knowledge of context of education for sustainable development. This step is intended to determine the behavior that has been and has not been mastered by the teacher before participating in the learning process. This step is important because it has implications for the preparation of learning materials and learning systems.

4). Writing specific instructional goals based on general instructional objectives that are formulated with clear, definite and measurable sentences.

5). Developing a benchmark reference test based on specific instructional objectives that have been written, it is necessary to develop a test that is aligned with the measure of ability that must be achieved.

6). Developing learning strategies in textbooks, that are using strategies in the form of continuous learning so that the conditions and results are in accordance with the needs in the field.

7). Developing instructional materials, related to the model to be developed, namely the Environmental Education Learning Strategies textbook.

8). Arranging designs and implement formative evaluations, namely a team of environmental education experts at the State University of Jakarta and a field test, namely the SLBN 7 Jakarta teachers, totaling fifty-four teachers consisting of two selected teacher groups, namely the treatment group consisting of twenty-seven teachers is a group of teachers read the "Environmental Education Learning Strategies (SPPLH) textbook" and the control group consisted of 27 teachers, namely the group of teachers who did not read the "Environmental Education Learning Strategies (SPPLH) textbook".

Result and Discussion

A. Result

1. Information Collection

The results of field observations and information obtained in the preliminary study of several special education teachers in East Jakarta, namely to address the needs of special education teacher's in implementing learning that integrated the environment, the teacher needs to master the knowledge of the concept of environment education but apparently the teacher have minimal knowledge about the concept of environment education , the teacher only understands the knowledge of the concept of environment education as limited as education related to the environment. By not understanding the concept of environment education, the teacher does not integrate the concept of education for sustainable development in learning programs and applies sustainable learning to mentally disabled students and even teachers who do not make learning kits.

The available environmental integrated textbooks is still very limited both in terms of quantity and quality. The substance of the material discussed in the teaching materials is less fully presented which contains values that are integrated with the objectives of environmental education. The framework for developing teaching materials is expected to be able to describe a syntax of textbooks that can encourage and help teachers to interact and learn independently (self-instructional).

The solution that needs to be done is to provide information about the knowledge of environmental education concepts in the form of "SPPLH books" so that teachers can make environmentally integrated learning tools so that teachers can implement sustainable learning.

2. Planning

Based on the results of the preliminary study, the initial step in the development of teaching materials in this study is to formulate objectives related to learning strategies for

environmental education. The objectives to be achieved from the SPPLH teaching materials to increase the cognitive flexibility of teachers are expected by teachers to: a). Understanding Learning Strategies, b). Understanding Environmental Education, c). Understanding Environmental Education Learning Strategies.

The results of the material analysis that have been carried out are then used as the basis for developing the SPPLH material. Material development begins with formulating Core Competencies, Basic Competencies and Indicators, which are then translated into several basic competencies and indicators of teacher learning outcomes achievement. The design of competency standards, basic competencies, achievement of learning outcomes, and the main material is outlined in the syllabus. The textbook syllabus can be seen in the table below:

In detail, the subject matter developed in the SPPLH textbook is as follows:
Material (1). Definition of learning strategies, material (2) types of learning strategies, material (3) components of learning strategies, material (4) aspects of learning strategies, material (5) learning strategies for environmental education, material (6) methods of learning strategies, material (7) Evaluation of Learning Procedure Components.

3. Compilation and development product

The next step is to develop textbook material so that a draft textbook is produced. The development of material is supported by several relevant source books as reference material to explain important concepts related to SPPLH. While, environmental phenomena that are often found around the teacher's environment are used as a learning resource so that it is easier to increase teacher activities regarding environmental education in understanding the concepts given. The principles of material preparation refer to the design of teaching materials designed for research purposes.

a. Product Feasibility

The results of product development are subjected to theoretical and empirical feasibility tests. The process of feasibility testing was carried out by a team of environmental education experts and field testing of teacher respondents. After going through a series of due diligence processes, the product results of this development product were determined to be in the form of an "SPPLH Book". View image. 1. Cover of SPPLH Book

Figure 1. Cover buku strategi pembelajaran pendidikan lingkungan hidup

The development of the SPPLH book to solve the problems faced by Special Education teachers, namely the problem of knowledge about Environmental education learning strategies. Through this SPPLH book, it is hoped that it will become an alternative reference for teachers in increasing the cognitive flexibility of teachers about SPPLH.

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b. Fill in the " book of SPPLH".

The contents of this product include: Material (1). Definition of learning strategies, material (2) types of learning strategies, material (3) components of learning strategies, material (4) aspects of learning strategies, material (5) learning strategies for environmental education, material (6) methods of learning strategies, material (7) Evaluation of Learning Procedure Components.

c. Characteristics of " book of SPPLH ".

(1) This book of SPPLH was designed and developed with reference to the characteristics of the ability of special education teachers related to knowledge of SPPLH.

(2) The book of SPPLH was designed and developed in reference to the specific competencies to be achieved by the teacher. These competencies are structured systematically starting from explaining concepts definition of learning strategies, types of learning strategies, components of learning strategies, aspects of learning strategies, learning strategies for environmental education, methods of learning strategies, and Evaluation of Learning Procedure Components.

(3) The goal of SPPLH book is special education teacher who provides learning to special needs students.

(4) This book of SPPLH was designed and equipped with independent tasks.

The design of a SPPLH book refers to the purpose of environmental education which emphasizes the process of recognizing values and explaining concepts in order to develop skills, attitudes needed to understand and appreciate the reciprocal relationships between

humans and the biophysical and social environment. Thus environmental education that is integrated with the SPPLH book aims to increase cognitive flexibility teacher about environment education.

Teacher activities in comprehensive environment education must be supported by knowledge about Environmental Education Learning Strategy . The Environmental Education Learning Strategy system between the operational, organizational, legal, financing and education for sustainable development education aspects is interrelated, cannot stand alone. The Environmental Education Learning Strategy is integral and integrated in a sequence with a continuous sequence, namely: definition of learning strategies, types of learning strategies, components of learning strategies, aspects of learning strategies, learning strategies for environmental education, methods of learning strategies, and Evaluation of Learning Procedure Components.

Referring to definition, components, aspects of Environmental Education Learning Strategy that will be developed, the syllabus on SPPLH was developed. At the stage of preparing the syllabus and developing material teaching, the characteristics of the teacher as the user of the product produced are very important considerations.

The development of material teaching of Environmental Education Learning Strategy is tailored to the characteristics of the local teacher, while the problem presented is based on environmental phenomena that are close and known to the teacher. Environmental phenomena such as damage and changes in the environment, as well as environmental pollution are environmental problems used as learning resources in developing material teaching Environmental Education Learning Strategy.

The design of book of SPPLH illustrates that Environmental Education Learning Strategy as a learning resource is an elaboration of a contextual approach that explains the relationship between the knowledge it has and the facts found in everyday life. While the

teacher's socio-cultural conditions are the basis of reference for developing learning package materials that are based on local wisdom. Thus the resulting material teaching will provide opportunities for local teachers to construct their cognitive flexibility based on facts and information obtained, so that the material studied becomes more meaningful.

The framework of SPPLH book produced consists of; *introduction, environmental exploration, strengthening concepts, digging information, ecological activities, learning problem solving, developing concepts, environmental messages*, and *closing sections that cover material summaries* and *practice questions*.

(1) *Title of the topic*, containing the title of the topic and presented in facts and phenomena about environmental education learning tsrategy. The presentation of facts and phenomena aims to deliver and attract the attention of the teacher in studying the topic.

(2) *Environmental Exploration*, presents several facts and phenomena in the environment. The teacher makes observations, through this activity is expected to improve cognitive flexibility about environmental education.

(3) *Strengthening the concept*, explaining the strengthening of the description of the material and explaining important concepts according to the topic to be achieved. So that it can help teachers understand the material that has been explained.

(4) *Exploring Information*, contains explanations and descriptions of material that are wider with the topic and objectives to be achieved. In this section accompanied by images that can explain the material described. In this section it is expected to be a source of information to solve the problem of environmental education .

(5) *Ecosystem Activities*, which contain activities that can help teachers understand concepts and theories. The development of concepts in this section contains questions to master the understanding of the concepts that have been learned.

(6) *Problem Solving Learning,* contains learning activities of teachers who are able to produce solutions regarding environmental education.

(7) Concept Development, contains the question of teacher's understanding of the book of SPPLH development being studied.

(8) Moral Message, containing moral messages that teachers should have to improve education for sustainable development which is an economic and environmentally friendly value.

(9) Summary, contains concepts that must be understood in the presentation that has been presented.

(10) Evaluation, aims to determine the understanding of the teacher after studying the SPPLH book that has been presented.

The parts contained in the framework of the SPPLH book describe an activity that must be carried out when the teacher studies the book. So that it is expected to help teachers understand the material presented on each topic of discussion, forming teachers to be independent in learning and be able to improve cognitive flexibility about environmental education learning strategies.

B. Discussion

The available environmental education teaching materials are still very limited in terms of both quantity and quality. The substance of the material discussed in the teaching materials is less fully presented which values that are integrated with the objectives of environmental education.

This SPPLH textbook contains information about teacher knowledge about environmental education learning strategies involving teachers to actively learn in building cognitive flexibility through the principles and characteristics of problem-based learning. Material

development [17] not only emphasizes the sense of mastery, but changes attitudes, mindsets and behavior of teachers to be more concerned about environmental, and able to apply the principles of environmental sustainability. In this case the teacher is directed to understand the education for sustainable development and its impact on the [6] environment by introducing environmental conditions, observing environmental problems and problems, and the right to overcome existing and possible environmental problems.

The framework for developing books of SPPLH, which are compiled, is expected to be able to describe a syntax of teaching materials that can encourage and assist special education teachers to interact and learn independently.

The SPPLH book is designed in a learning package model which is based on environmental education goals and utilizes the biophysical environment, as well as socio-cultural as a learning resource. The design of the SPPLH book describes a learning activity with an definition, types, and resources of an Environmental Education Learning Strategy which begins with the exploration of environmental phenomena, digging up information about understanding, types, and sources of SPPLH, and develop the ability to solve problems of environmental education. This helps the teacher to gain understanding and knowledge about the Environmental Education Learning Strategies they are learning to be used in solving the problems of the Environmental Education Learning Strategies.

The findings of this study contain a framework for instructional packages of education for sustainable development that describe a discovery approach that guides teachers to carry out exploration activities on the phenomenon of ecosystem problems on the environment, so they can find important concepts based on their findings. In accordance with the research findings of Balim (Balim, 2009), it is proven that discovery approaches can improve academic abilities, shape scientific attitudes, and increase cognitive and affective level retention. So the

knowledge gained through the learning process with discovery methods will last a long time, and have a better transfer effect.

But Suduc's study (Suduc, 2014) identified teacher opinions about education for sustainable development in the current Romanian education system and to evaluate teacher needs, two methods were used: (1) semi-structured interviews and (2) questionnaires.

While the results of De Graff's research (E. De Graff and A. Kolmos, 2003) indicates that the instructional package developed contains information about education for sustainable development that can involve teachers to actively learn in constructing knowledge through the principles and characteristics of problem-based learning. So the instructional package of education for sustainable development developed by De Graff through problem-based learning while in this study material teaching developed through an environmental approach.

The product in this study is a textbook SPPLH. The products read by the teacher about the Environmental Education learning strategy in a textbook model based on an objective environmental education approach and take advantage of the biophysical, socio-cultural environment and learning resources. Instructional design of knowledge and learning activities for environmental education in the concept of approach, environmental education starts with exploration of environmental phenomena, gathering information about learning strategies for environmental education, and developing the ability to solve problems related to the environment. This helps people to gain understanding and cognitive flexibility about the learning strategies of environmental education to the teacher which they learn later, especially environmental issues.

According to the results of the Rhedana study (Rhedana, 2012), the problem-based learning model can encourage critical and creative thinking in solving problems it faces. This opinion is in line with the results of research by Suhirman (Suhirman , 2012) which states

that problem-based learning can improve the ability to solve environmental problems. The problem solving process that is carried out can develop individual abilities and provide freedom in the learning process, thus providing sufficient opportunities for teachers to be able to develop their talents and abilities. According to Arends (Arends, 2004) that the principles of learning knowledge about environmental education are in line with the view of constructivism, which explains that: (1) knowledge is built by oneself both personally and socially, (2) knowledge is not transferred, except only with student activity themselves to reason, (3) A person is actively constructing continuously, so as to gain an understanding of a concept, (4) Mentor is only a facilitator who helps teachers so that knowledge formation processes can occur easily. Whereas Kankovskaya's research (Kankovskaya, 2016) analyzed state education standards and university education programs and identified problems in applying the concept of sustainable development in Russian higher education, and formulated principles for national innovation systems based on the concept of sustainability.

With this SPPLH book, the teacher not only reads, records, and repeats what is learned, but encourages an activity and thought process. Referring to the results of the study, the SPPLH book has motivated teachers to actively learn by building their understanding by exploring environmental phenomena and gathering information to get answers in an effort to solve the environmental problems presented. According to Mauffette (Y. Mauffette, 2017) providing learning experiences through problem-based learning can foster attraction to the material being studied. Mauffette further explained that actuality and contextual problems presented can encourage one's interest in a subject (subject matter). The same conclusion is also expressed from the results of Akınoğlu's research (O. Akınoğlu and R. Ö. Tandoğan, 2007), that problem-based learning can develop a positive attitude towards science learning, so that it can improve learning outcomes. In addition, the results of the study also explain that

students who learn through problem solving will get practical knowledge (applied) to be applied in daily life.

The results of this research of book of SPPLH that are used by teachers can familiarize teachers to learn independently so that they can increase the teacher's cognitive fleksibility. The habit of reading teaching books can be transmitted to students through the making of interesting teaching materials so that they can make changes to students because the teacher is the agent of change. This is in line with Sánchez's research (A. Sanchez's, 2004) which states that classical conditioning is a type of learning in which an organism learns to associate or associate stimuli. In classical conditioning, neutral stimuli (such as seeing someone) are associated with meaningful stimuli (such as food) and give rise to the capacity to issue the same capacity.

Research on the development of SPPLH to improve the cognitive flexibility of special education teachers about integrated learning environment is a research that has not been done by other researchers.

There are many studies on education for sustainable development such as Sritaratorn (K. Sritaratorn, 2011) developed computer instructional packages for multimedia programs that are quite well used for self-learning in students; Kitamura (Y. Kitamura, 2014) developed a new mode of safety education, an initiative that represented one of the important efforts in designing mobility for the future of Japan; Danilane (L. Danilane and G. Marzano,2014) described new consumer educational content, in accordance with the principles of sustainable development, since basic education; Nasibulina (A. Nasibulina, 2015) concluded the positive role of environmental ethics in the creation and development of education for sustainable development in the Bikal region of Russia; Suryawanshia (K. Suryawanshia and S. Narkhedeb, 2015) examined the obstacles to the application of Green ICT in Indian higher education institutions due to the lack of motivation and rational

implementation of the implementers of green policies among implementers; Phan Hoang (T.T.Phan Hoang, 2016) improved student knowledge about solid waste management workshops through environmental education in elementary school students in Da Nang city, Vietnam; Meilinda (Meilinda H, 2017)concluded that students' environmental literacy at Adiwiyata Green School in Surakarta was categorized as low; Alexandar (R. Alexandar and G. Poyyamoli, 2014) concluded that environmental education for sustainable development is more effective through an active teaching and learning approach; Yaki (Yaki, 2016) investigated the Instructional Technology Package (TIP) can improve the performance of secondary school students in Minna Nigeria; Safo (Safo, 2013) examined a Computer Assisted Instructional package that could improve the achievement of geometric learning in junior secondary students in Minna; Gambari (I.A.Gambari., 2014) examines computer-based instructional packages that can improve student performance in Physics subjects for high school students in Nigeria; Abidoye (J.A. Abidoye, 2015) examined multimedia instructional packages that can improve student achievement in Geography subjects for public high school students in Oyostate Nigeria and Omiola (M. A. Omiola, 2012) examined student performance in Physics subjects that use video learning packages not much better than students taught without use package.

Conclusion

The SPPLH book is designed based on the instructional model design which is based on the material substance as a whole containing the value integrated environmental.

The SPPLH book can improve the cognitive flexibility of Special Education teachers on Environmental Education Learning Strategies, so that with improving in teacher's cognitive flexibility it is expected to improve the quality of Special Education. This research can also add references and advance population and environmental education study programs.

Acknowledgement

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