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# The Effectiveness of Environmental Education Learning Strategy Teaching Materials (SPPLH) in Improving Teachers' Cognitive Flexibility

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***ABSTRAK***

*Penelitian ini bertujuan untuk mengetahui keefektifan bahan ajar Strategi Pembelajaran Pendidikan Lingkungan (SPPLH) dalam meningkatkan fleksibilitas kognitif guru. Metode yang digunakan dalam penelitian ini adalah metode penelitian dan pengembangan. Penelitian ini menggunakan pendekatan kuantitatif. Tempat penelitian dilaksanakan di SLBN 7 Jakarta. Waktu penelitian dilakukan pada bulan Maret 2020 sampai Oktober 2020. Teknik pengambilan sampel dilakukan dengan Random Sampling. Produk pembelajaran ini dikemas dalam bentuk bahan ajar SPPLH sebagai referensi unik dalam ilmu _ dengan memperhatikan karakteristik guru SLBN 7 Jakarta. Hasil penelitian menunjukkan bahwa berdasarkan hasil uji t, uji t Fleksibilitas Kognitif 4,42 > t tabel 2,042. Terdapat perbedaan yang sangat signifikan antara skor fleksibilitas kognitif yang diberikan bahan ajar SPPLH, dimana skor post pre test t treatment sebesar 19,68 lebih tinggi dibandingkan guru yang tidak diberikan bahan ajar SPPLH yaitu kontrol skor post pre test 9.12. Berdasarkan hasil analisis, SPPLH. Model bahan ajar efektif meningkatkan fleksibilitas kognitif guru dalam pembelajaran inovatif lingkungan terpadu.*

**ABSTRACT**

This study aims to determine the effectiveness of Environmental Education Learning Strategy (SPPLH) teaching materials in increasing the cognitive flexibility of teachers. The method used in this research is the research and development method. This study uses a quantitative approach. The place of research was carried out at SLBN 7 Jakarta. The time of study was carried out from March 2020 to October 2020. The sampling technique was carried out by Random Sampling. Product study this packed in form SPPLH teaching materials as unique references in science _ with notice characteristics of SLBN 7 Jakarta teachers. The results showed that based on the results of the t-test, Cognitive Flexibility $t_{test}$ 4.42 > $t_{table}$ 2,042. There is a very significant difference between cognitive flexibility scores who were given SPPLH teaching materials, where the score of post-pre-test t treatment was 19.68 higher than teachers who were not given SPPLH teaching materials, namely the post-pre test score control of 9.12. Based on the results of the analysis, the SPPLH. The teaching materials model effectively boosts the teacher's cognitive flexibility in an innovative learning integrated environment.

## 1. INTRODUCTION

The environment is everything around humans, and directly or indirectly, the environment can affect the development of human life. The environment is a space occupied by living things and other things (Borba, 2021; Mulang, 2021). Environment life is unity with all things, forces, states, and beings life, including humans and their behaviour, which influences natural that alone, survival life, and well- the being of a man and creature another life (Harahap, 2015; Mahdayeni et al., 2019; Omar et al., 2018). Activities to protect the environment, such as planting, understanding, and awareness about the importance of preserving environmental quality, will be better if it is started through education. The importance of instilling a foundation on environmental education in education units starts from

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elementary to high school. It includes the importance of instilling the foundation of environmental education in Special Schools. School as a means of formal learning is the main factor in creating an effective education system. The importance of creating an excellent educational environment determines the success of education. Environmental factors are also one of the supporting factors for the success of education. 2016 was the beginning of the year it was developed educational program environment life at level education base up to education level medium through the Adiwiyata program (Cinantya et al., 2018; Maimunah et al., 2018). The highest education service is entitled to be obtained by students with special needs, such as students, in general, consisting of primary education to secondary education (Baiti et al., 2021; Wahyudi & Huda, 2019). The learning process in Special Schools involves teachers as educators. Special Education Teachers are teachers who are professional in the field of knowledge of students with special needs. For environmental education in schools to run well, teachers' or prospective teachers' understanding of environmental education needs to be developed. Therefore, it is necessary to ensure that teachers or future teachers have the knowledge, skills, and attitudes related to environmental problems to create integrated learning tools regarding environmental education. Teachers have an essential role in developing the quality and effectiveness of environmental education, and their impact in shaping students' attitudes and behavior towards the environment (Amini, 2015; Ernst & Erickson, 2018; Zachariou et al., 2017). Teachers' knowledge in mastering the concept of environmental education can be used to design learning tools that are integrated into environmental education. Environmental knowledge is one of the environmental materials included in the PKLH/Population and Environmental Education program. One of the characteristics that began to be carried out at the elementary school level was caring for the environment, this character was developed in schools according to the policies of the Ministry of Education and Culture. Students are not formed by instant but through a process created (Azhary et al., 2018; Maimunah et al., 2018). Teachers are required to be able to apply their knowledge in solving environmental problems in a structured manner based on their flexibility or cognitive flexibility.

Cognitive flexibility is the ability to think about things in different ways. That is, the learning process should ideally also be able to increase the cognitive flexibility of teachers. Cognitive flexibility includes generating diverse ideas, considering alternative responses, and modifying behaviour and cognition to changing environmental demands (Howlett et al., 2021; Ionescu, 2012). Flexibility cognitive is the ability individual to choose the method best with how to evaluate all choices to current situation and possibilities (Hommel et al., 2022; Sheppes et al., 2014). Generally, Cognitive Flexibility refers to the ability to shift cognitive sets, talents, thinking, or attention to understand, process, or respond to situations differently (Ellitan, 2020; Lase, 2019; Lubis et al., 2019). The principle of cognitive flexibility basically refers to the working system of the human brain, wherein the human brain, all information obtained is stored in memory and can then be recalled when needed to be reconstructed into new knowledge under different conditions. Characteristics flexible individual by the cognitive and able express method they acquire and use information can be said as advanced individual in Skills solving the problem.

The most important thing is teaching materials to support the learning process. Teaching materials must follow the curriculum due to the need for uniformity of teaching materials with predetermined competencies (Aufa et al., 2020; Xia et al., 2016). Based on the field analysis results, teachers are facing difficulties due to the lack of teaching materials that can be used as teaching materials for integrated learning environments. With the currently available teaching materials, teachers often find it difficult to choose, determine, and utilize suitable teaching materials for students to achieve learning goals. On this basis, it is necessary to develop a guide on environmental education teaching materials as a reference for teachers in understanding, planning, implementing, and evaluating environmental integrated learning outcomes. then the environmental integrated learning innovation model really needs to be done Through teaching materials for Environmental Education Learning Strategies that are read and understood by teachers, it is hoped that they can increase the flexibility of thinking or cognitive teacher flexibility so that teachers can design, implement and evaluate an integrated learning environment. The researchers developed teaching materials for Environmental Education Learning Strategies based on this background. The purpose of this research is to analyses the effectiveness of teaching materials for environmental education learning strategies to boost cognitive teacher flexibility. This research was conducted at SLB Negeri 7 Jakarta at the SDLB, SMPLB, and SMALB levels.

## 2. METHOD

This study uses research and development methods. The place of research was carried out at SLBN 7 Jakarta. The research population was all teachers of SDLB, SMPLB, and SMALB in SLB East Jakarta. The research sample is the teachers of SDLB, SMPLB, and SMALB at SLBN 7 East Jakarta, totalling 54 teachers. The sampling technique was carried out by Random Sampling. The research procedure uses the

Dick and Carey model. Several stages can be carried out simultaneously, including the first stage is planning which consists of surveys, literature review, and preparation of instruments. The second stage is the development stage which consists of preliminary research and development. And the third stage is the Field Test stage which consists of the field trial stage This research instrument is in the form of a test used to measure the level of cognitive flexibility of teachers about SPPLH, namely the understanding, perspectives, components and aspects of SPPLH before and after reading SPPLH teaching materials. The test instrument measures cognitive teacher flexibility regarding SPPLH at SLBN 7 East Jakarta.

The test instrument was carried out using a rating scale consisting of 2 scores, namely 0 and 1, provided that the correct answer got a score of 1, while the wrong answer got a score of 0. The trial was conducted to determine the effectiveness of SPPLH teaching materials using the experimental method with the research design before the test – after test control treatment groups. Cognitive instrument item validity test teacher flexibility about SPPLH is done with the help of Microsoft Excel. Based on the results of the calculation of the validity of the cognitive instrument, teacher flexibility regarding teacher SPPLH is known from 48 statement items. 6 items are not valid. Thus, the number of useful items used as a data collection and research tool is 42 items. Calculation of the reliability of cognitive instrument items teacher flexibility regarding valid SPPLH was analyzed using the KR 20 technique. Calculation of the reliability of the cognitive variable instrument teacher flexibility regarding teacher SPPLH as many as 42 items obtained results $r_{ii}$ = 0.8884. Analysis of research data was carried out quantitatively to test the instrument's validity and reliability and test SPPLH teaching materials' effectiveness.

## 3. RESULT AND DISCUSSION

### Result

Product study this packed in form SPPLH teaching materials as ingredient references that are special in science _ with notice characteristics of SLBN 7 Jakarta teachers. Testing the effectiveness of teaching materials is carried out through the Google platform form with the experimental method. The effectiveness test was carried out on SLBN 7 teachers in East Jakarta, each of which was divided into a treatment group and a control group. The treatment group consisted of 27 SLBN 7 Jakarta teachers who studied using SPPLH teaching materials, and the control group consisted of 27 East Jakarta SLBN 7 teachers who did not use SPPLH teaching materials. Each group was given a pre-test to determine the teacher's initial knowledge, and in subsequent activities, each group was given time to study SPPLH teaching materials for six weeks. Both groups were given a final test (post-test) to find out the improvement in cognitive teacher flexibility about SPPLH.

Based on the effectiveness test results, the post-test and gain score in the group of teachers who learn to use SPPLH teaching materials is higher than the group of teachers who do not use SPPLH teaching materials. Statistical analysis was carried out to see the difference between the two groups, as described in the following discussion. In detail, the results of the effectiveness test can be seen in Table 1.

**Table 1.** Description of Pre-Score Data Test and Post-Test of the Control and Treatment Group

| Cognitive Flexibility of SPPLH | | Group | |
|---|---|---|---|
| | | Control | Treatment |
| Pretest Score | N | 27 | 27 |
| | Amount | 735 | 731 |
| | Average | 27.22 | 27.07 |
| | mode | 25 | 26 |
| | median | 28 | 26 |
| | Score range | 21 – 31 | 18 – 39 |
| | St. Deviation | 2.56 | 4.88 |
| | variance | 6.56 | 23.84 |
| Postes Score | N | 27 | 27 |
| | Amount | 941 | 1017 |
| | Average | 34.85 | 37.67 |
| | mode | 34 | 39 |
| | median | 34 | 39 |
| | Score range | 31 – 40 | 29 – 42 |
| | St. Deviation | 2.34 | 4.21 |
| | variance | 5.51 | 17.76 |
| Gain Score | N | 27 | 27 |
| | Amount | 150 | 196 |

| Cognitive Flexibility of SPPLH | Group | |
|---|---|---|
| | Control | Treatment |
| Average | 5.56 | 7.26 |
| mode | 3 | 5 |
| median | 5 | 7 |
| Score range | 4 – 14 | 1 – 19 |
| St. Deviation | 4.91 | 4.44 |
| variance | 24.10 | 19.74 |

Base on Table 1, analysis statistics used to see different results pre-test and post-test on both groups use the t-test. As a precondition t-test, each data obtained normality test was performed. Normality test performed with criteria testing Kolmogorov-Smirnov Test on the pre-test, post-test, and pre-post-test gain scores from the treatment and control groups. Criteria testing is based on Kolmogorov-Smirnov Test, meaning that the data scores of pre-test, post-test, and gain scores from all samples are normally distributed. The results of the normality test can be seen in Table 2.

**Table 2.** Results of Normality Test Analysis by One-Sample Kolmogorov-Smirnov Test

| Model | | Pretestcontrol | Posttestcontrol | Pre-test treatment | Posttest Treatment |
|---|---|---|---|---|---|
| N | | 27 | 27 | 27 | 27 |
| Normal Parameters [a,b] | mean | 27.22 | 34.85 | 27.07 | 37.67 |
| | Std. Deviation | 2.562 | 2.349 | 4.883 | 4.215 |
| Most Extreme Differences | Absolute | 0.138 | 0.160 | 0.143 | 0.235 |
| | Positive | 0.103 | 0.160 | 0.143 | 0.152 |
| | negative | -0.138 | -0.104 | -0.079 | -0.235 |
| Test Statistics | | 0.138 | 0.160 | 0.143 | 0.235 |
| asymp . Sig. (2-tailed) | | 0.200 | 0.074 | 0.168 | 0.001 |

Based on the Table 2, it can be seen that the asymp value. Sig. (2-tailed) is more significant than 0.05; in accordance with the test criteria, then $H_0$ , meaning that the data is normally distributed and can be used to meet the requirements of the t-test (difference test). The results of the different test analysis (t-test) were carried out to distinguish the mean of the variables criterion two groups. To test hypothesis parameter difference between two groups could use t-test statistics. With condition analysis of the test must be fulfilled, that is placement subject in tested groups must be chosen by random, data must be standard. Based on results different test analysis independent (Independent sample t-test) on the score post-test group control and group treatment, obtained $t_{arithmetic} = 6.903 > t_{table} = 2.042$ at = 0.05. With thus, $H_0$ was rejected, which means that there is a real difference _ Between the score post-test in the group control and the score post-test in the group treatment. This means that cognitive flexibility about SPPLH in the reading group SPPLH teaching materials learning 1, 2, 3 and materials learning 4 (treatment) and group who not read it (control) show the real difference. While based on results different test analysis dependent (dependent sample t-test) on the score pre-test and post-test group control , obtained $t_{arithmetic} = 13.874 > t_{table} = 1.98$ at = 0.05. With thus $H_0$ rejected, there is a real difference among scores pre-test and post-test in the group control. It means cognitive flexibility about SPPLH on reading group SPPLH teaching materials learning 1, 2, 3 and materials learning four based on score pre-test and post-test control show the real difference.

Based on results different test analysis dependent ( dependent sample t-test ) on the score pre-test and post-test group treatment , obtained $t_{arithmetic} = 12.278 > t_{table} = 1.98$ at = 0.05. With thus $H_0$ rejected. There is a real difference, between the score pre-test and post-test in the group treatment. It means cognitive flexibility about SPPLH on reading group SPPLH teaching materials learning 1, 2, 3 and materials learning 4 shows real difference if compared to with before read it. H result different test analysis independent (Independent sample t-test) on the gain score Among group control and group treatment, obtained $t_{arithmetic} = 4.42 > t_{table} = 1.98$ at = 0.05. With thus, $H_0$ was rejected, which means that there is real difference in gain score Among group control with group treatment. This means that in the group of teachers who use SPPLH teaching materials learning 1, 2, 3 and materials learning 4 shows enhancement more cognitive flexibility tall compared to with a group of teachers who do not use SPPLH teaching materials learning 1, 2, 3 and materials learning 4. In detail, the results of the different tests can be seen in Table 3.

**Table 3.** Cognitive of Flexibility about SPPLH in the Treatment and Control Groups

| Test Group | dk | N | Test Statistics | | |
|---|---|---|---|---|---|
| | | | $t_{count}$ | $t_{table}$ (0.05) | $t_{table}$ (0.01) |
| Postes Treatment - Control | 52 | 54 | 6.903 | 2.042 | 2.75 |
| Pretest-Post Control | 52 | 54 | 13.874 | 2.042 | 2.75 |
| Pretest-Post Treatment | 52 | 54 | 12.278 | 2.042 | 2.75 |
| Gain Score | | | | | |
| Group Treatment - Control | 52 | 54 | 4.42 | 2.042 | 2.75 |

Based on Table 3 show the calculation of that h test results, t-test cognitive flexibility about SPPLH between the treatment group's post - t-test scores and the control group (gain score) obtained $t_{count}$ 4.42 > $t_{table}$ 2.042. Thus, H0 is rejected, meaning there is a difference between the treatment and control groups. This means that there is a very significant difference between cognitive flexibility scores who were given SPPLH teaching materials. Then the score of post t - pre-test t treatment is show in Figure 1.

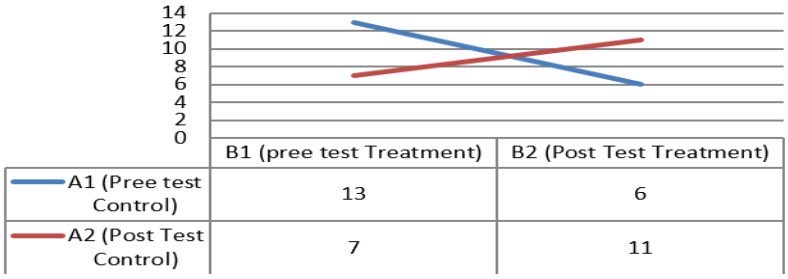


**Figure 1.** Pre test – Post Test Scores of Treatment and Control Group

Base on Figure 1 found that the score of post t -pre-test t treatment is 19.68 higher than teachers who were not given SPPLH teaching materials, namely the post-pre test score control of 9.12. Gain Score of cognitive flexibility about SPPLH is show in Figure 2.

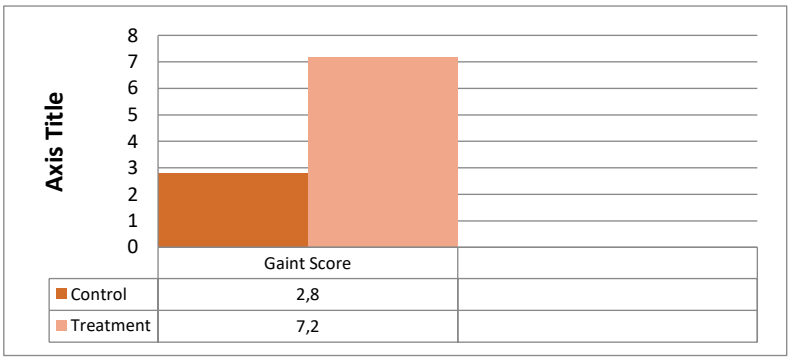


**Figure 2.** Gain Score of Cognitive Flexibility about SPPLH

Base on Figure 2 show the H test results t-test Among group treatment and group control illustrates the knowledge of the group of teachers who learn by using SPPLH teaching materials and the group of teachers who do not use SPPLH teaching materials know about education environment life relatively differently. Knowledge and information about the meaning, types and sources of SPPLH obtained by teachers are sourced from SPPLH teaching materials and can also be obtained from books or other sources. The material contained in the SPPLH teaching materials has a close relationship with the topic of discussion in Environmental Education. This condition will certainly increase the post-test score due to the teacher in the control group. Furthermore, the average score of the improvement in post-test results in the treatment group was higher than the control group. These results illustrate that teachers who learn using SPPLH teaching materials show an increase in knowledge about learning strategies in the

education environment life is higher than the group of teachers who do not use SPPLH teaching materials. SPPLH teaching materials used as learning resources contribute to flexibility in teachers' thinking about learning in an integrated environment.

**Discussion**

Referring to the research results, then SPPLH teaching materials have been motivated teachers to study by active with construct understanding with method do exploration to phenomenon environment and dig information for getting the answer in effort solve problem presented environment. Learning experiences through problem-based learning can foster interest in the material being studied, and the actuality and contextual problems presented can encourage teacher interest in the subject (Dita et al., 2021; Phungsuk et al., 2017; Schettino, 2016). Steps for SPPLH teaching materials presented is the part that doesn't could be separated from something method discovery. Method developed invention from theory learn Bruner, look that study is a discovery process knowledge done by active and systematic. The Discovery process leads the teacher to fulfil the desire to know and encourages for attempted look for information from various sources. Through this process, the teacher can find the answer alone and make a conclusion and communicate it.

The learning process based on the problem could develop an attitude positive somebody to learn science, increasing results study. Besides that, results analysis also explains that students who study through solving problems will get knowledge practical ( applicable ) for application in life every day (Anazifa & Djukri, 2017; Baran & Sozbilir, 2018; Rapp & Cena, 2016). Several results study supports the effectiveness of test results SPPLH teaching materials. Based on the description above, SPPLH teaching materials could give the teacher time to assimilate and accommodate information obtained. With the teaching materials, the teacher does not only read, take notes, and repeat what he learned but pushes on activities and thought processes. Thinking could help teachers get constructed knowledge alone, which becomes more meaningful. According to the results previous research, the learning model based on the problem could push them for think by critical and creative in solving the problem he faces (Boa et al., 2018; Hsu et al., 2022; Ulger, 2018). This opinion is in line with the results previous study, which states that learning based on problems could increase the ability to solve problems environment (Chen & Chang, 2014; Tseng et al., 2013). Effectiveness test results describe that prepared teaching materials based on knowledge about learning strategies for education environment life could help teachers assimilate and accommodate information based on his findings. Approach concepts environment life could increase the teacher's ability to manage and overcome obstacles to reach the goal.

Effectiveness test results describe that prepared teaching materials based on knowledge about learning strategies of education environment life could help teachers to assimilate and accommodate information based on his findings. Approach concepts environment life could increase the teacher's ability to manage and overcome obstacles to reach the goal. The most outstanding Competence is improved ability to analyze, power reason, and think logically (Hendriana, 2014; Tangney, 2014). This is in line with research about the effectiveness of teaching by previous study which discusses how educator post-school medium could increase the effectiveness of teaching and results in studying students through evaluation of students (Pappas et al., 2018). Moreover other study state that highlight will include practice based on proof, style of teaching, methodology, and assessment data for university instructors (Fitriyani et al., 2021). The study results showed that the learning package prepared with a constructivist approach effectively improved learning outcomes. Focus main is the data obtained from holder interest main for increase practice teach for more fulfil needs, expectations, and goals they students, programs and institutions, including consideration implication for assessment of institutional programs on a larger scale broad. The SPPLH teaching material model's effectiveness was also supported by serving contextual material with approach constructivism. That thing encourages teachers to build their knowledge based on experience learning gained from the environment. Condition the help the teacher understand knowledge about SPPLH for then made reference as an alternative in solving problems, especially problems that occur in the teaching environment. Develops applications for android-based teaching materials, which have valid, practical and effective qualities that can help increase the quality results study students and motivate students to study (Ahmar & Rahman, 2017; Mudiartana et al., 2021). The development process ingredient uses the development model Plomp, which consists of preliminary phase investigation, phase design, phase realization/construction, stage testing, evaluation and revision, and phases implementation. The implication of this study is providing overview about teaching materials model effectively boosts the teacher's cognitive flexibility in the innovative learning integrated environment. Presenting the problems presented in the teaching materials encourages teachers to actively think, recognize a problem, investigate for answers to issues faced, and come to the preparation conclusion. Through SPPLH teaching materials, teachers vigorously find a solution to the problem presented. Referring to the research process

of development of SPPLH teaching materials, so for study more, it is necessary to conduct the step of developing the SPPLH teaching material model. It should be carried out on a broader scale by involving all SLB teachers throughout DKI Jakarta, so the target subject population involved is larger and heterogeneous. Apart from that, it is necessary to conduct a study about the use of SPPLH teaching materials by controlling other variables that can determine the effectiveness and efficiency of textbooks in the learning process at the teacher level

## 4. CONCLUSION

From the result of the study to innovation model development learning integrated environment in jack-up teacher's cognitive flexibility can be concluded that the model Innovative learning integrated environment in the form of SPPLH teaching materials are worth it for jack-up teacher's cognitive flexibility and model Innovative learning integrated environment in the form of effective SPPLH teaching materials for jack-up teacher's cognitive flexibility. The effectiveness test results describe teaching materials based on knowledge about learning strategies. Education environment life could help teachers assimilate and accommodate information found in the findings.

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