Science-Based Character Building

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Abstract. This study aims to (1) explain the factual cooperative learning model of the jigsaw type in elementary school, (2) explain the design of the character-based cooperative learning model that can improve understanding of science in elementary school, (3) explain the hypothetical model of character-based cooperative learning. understanding of science in elementary school after going through the validation test, (4) Explaining the final cooperative learning model based on character-based jigsaw can improve understanding of science in elementary school after going through a limited test. This study uses a Research & Development (R&D) approach. The research design used is based on the development carried out by Borg and Gall which consists of potential problems, data collection, product design, design validation, design revision, product testing and product revision. The product produced from this research is a character-based cooperative learning model. The limited trial results also showed an increase in learning outcomes in the experimental class, from 52.90 to 80.58. The development of a character-based jigsaw-type cooperative learning model can also improve the character of being friendly and socially caring.

1 Introduction

Education is very important dream of life. Basically education is an interaction that exists between teachers and students in order to achieve educational goals that take place in a certain environment. Education that takes place in schools is provided through guidance, teaching and training in order to develop all the potential of students.[1] Educational success of elementary schools is measured not only by cognitive aspects but also attitudinal aspects. Elementary schools in Indonesia have to serve as the foundation for student personality formation concerning student character. Jakarta as the capital city of Indonesia is very critical related to diminishing student moral quality in the globalization era. Elementary school age is a critical age to shape student personal character. Failure of moral cultivation for elementary school students will cause bigger problems in the future.[2] Student personality is no less important in giving a dynamic impact on learning. This is an equally important concern to consider as things that might support or even hinder students from developing.

Science learning should refer to efforts to build the character of students who are creative, innovative, and inspiring. In the learning process in the classroom, it is necessary to develop the ability to think, work and be scientific and communicate as an important aspect of life skills. Therefore, science learning at every level of education places more emphasis on providing direct experience with the use and development of process skills and scientific attitudes.
The development of the learning model continues to change from time to time. Conventional learning models are now starting to be abandoned and replaced with more modern models. In line with the constructivist approach to learning, the learning model that is currently getting a lot of response is the cooperative learning model.[3] One alternative that can be used to answer these problems is by using jigsaw type cooperative learning. Some research results showed that students’ thinking skills have not shown satisfactory results. In the type of Jigsaw, the teacher must give many opportunities to students to process information and improve communication skills. [4] Cooperative learning is a learning strategy with some students as members of small groups with different levels of ability. In completing the task of the group, each student group member must work together and help each other to understand the subject matter. In cooperative learning, learning is said to be unfinished if one of the friends in the group has not mastered the subject matter.[5] Cooperative learning teaches student to work in team, learn to be a responsible person and respect the opinion in each other. This is in accordance with the statement of Johnson and Holubec that "Cooperative learning yields increased efforts among students, more positive interpersonal relationships, and improved mental health when compared to purely individualistic learning". Cooperative learning increases efforts among student, interpersonal relation which is more positive and mental health improves when compared with individualistic learning. The involvement of students on learning process is expected to improve learning achievement.

[6] Cooperative learning models are developed not solely to achieve academic learning outcomes, but are also effective for developing social skills and collaboration skills. Cooperative learning is not only excellent in helping students understand difficult concepts, but also very useful to foster the ability to think critically, cooperate and help each other to solve a problem.

[7] According to Slavin in Sanjaya, it is stated that (1) the use of cooperative learning can improve learning outcomes as well as improve social relationship skills, foster an attitude of accepting self-deficiencies and others, and can increase self-esteem, (2) cooperative learning can realize students’ needs in thinking, solve problems, and integrate knowledge with skills. The cooperative learning method has several types in its implementation, one of which is the jigsaw type. Jigsaw learning is one type that encourages students to be active and help each other in mastering learning material to achieve optimal learning outcomes.

[8] Jigsaw cooperative learning approach is a learning concept that assumes that children will learn better if the environment is created naturally. Learning becomes more meaningful if students work and experience what they learn. It is not just a transfer of knowledge from educators to students, but how students are able to interpret what is learned. Cooperative learning type jigsaw encourages students more towards learning.

[9] One characteristic of the jigsaw model is the existence of the original group and “expert" group (Benton, 2016; Kagan & Kagan, 2009). There are five essential factors in the implementation of the jigsaw model of cooperative learning. Those factors are: positive interdependence, positive face-to-face interaction, individual accountability, interpersonal and small-group skills and learning reflection (Gillies et al., 2008; Syarifuddin, 2011). Furthermore, the two most essential elements are positive interdependence – ‘We sink or swim together’ and individual. However, in reality in the field there are members who only piggyback on completing tasks and are passive in discussions. Active students will dominate the discussion more and tend to control the course of the discussion.

Departing from the weaknesses of using the Jigsaw-type cooperative learning model that occurs in the classroom, the researcher tries to develop a character-based Jigsaw cooperative learning model. This learning model is suitable and can form a friendly and socially caring character in students. This learning model can form the 2 (two) characters above because it is a development of the Jigsaw type cooperative learning model which in its learning activities trains to share with one another is integrated with the delivery of friendly character values and social care in a clear and planned manner. The use of the jigsaw learning model has many influences, one of which is on student science learning outcomes at the elementary school level. These results can be seen from the results of several studies that have been conducted. Many studies have proven that there is an increase in learning outcomes
after using the jigsaw learning model. [10] Several studies investigated the effects of Jigsaw strategy of cooperative learning on students’ achievement and found that Jigsaw method increase students’ performance and learning retention. Sahin (2010) in his study which lasted for six weeks investigated the effects of Jigsaw Strategy. The study used a Pre-test and Post-test design. Results from the t-tests indicated that students in the Jigsaw Group outscored on the achievement test (p < .001) those in the traditional lecture-based learning group (ES = 0.86). The Jigsaw Group also had greater long-term achievement on the delay test (p < .05) than those in the Control Group (ES = 0.69). A similar study was undertaken by Temesgen & Enunuwe (2016). The research was also based on Jigsaw Cooperative Learning teaching style on students’ achievement in organic chemistry. The study used 51 students in the intervention group and 54 students in the Control Group. The results indicated that there was statically significantly difference between intervention and control groups with the two sample t-test at P<0.05 taken on the quiz and post-test achievement scores of students. The intervention group students performed better than those in the Control Groups.

Based on the description that has been described above, it is necessary to take action by the teacher to develop a learning model that can improve student achievement and strengthen student character. [11] Strengthening Character Education (PPK) is a mandate from Nawa Cita which was proclaimed by the President. The Nawa Cita is stated in the eighth point, which is about carrying out a character revolution. KDP also concerns the personality or character of students. The successful achievement of educational goals mainly determined by the teaching and learning process experienced by students. Students in learning expected to be able to experience good changes in cognitive, affective, and psychomotor aspects. The attitudes the teacher must take in the process learning should be appropriate and capable arouse student learning activities as well improve student learning outcomes.

The purpose of this study is to explain the factual cooperative learning model of the jigsaw type in elementary school, to explain the design of the character-based cooperative learning model to improve understanding of science in elementary schools, to explain the hypothetical model of character-based jigsaw type cooperative learning to improve understanding of science in elementary school after going through the validation test. as well as explaining the final model of character-based jigsaw cooperative learning can improve understanding of science in elementary school after going through a limited test.

**2. Research Methods**

This study aims to develop a character-based, character-based cooperative learning model that is valid for teaching material on Theme 5 Ecosystems. [12] The methodology used research and development method by Borg and Gall. Research and development is a method of research development to produce new products or improve existing products and test the effectiveness of these products. Borg and Gall (2003: 589) states "Educational research and development (R & D) is a process used to develop and validate educational products". Sugiyono (2010: 407) states that research and development design is a research design used for produce certain products and test the effectiveness of certain products.

The research design used is based on the development carried out by Borg and Gall which consists of potential problems, data collection, product design, design validation, design revisions, product trials and product revisions. While the instruments used in this study were the validation of educational practitioners, material experts and media experts.

Sources of data in this study include primary data sources obtained through observation, field notes and interviews as well as secondary data sources obtained through literature studies. While the data in this study include data on the validity of learning devices, data on the character of the students 'friendly and social care, data on students' positive results, data on student responses to learning, and data on activities of model teachers and students in learning.

Data collection techniques used in this study include observation, interviews, documentation study, and questionnaires. Observation is used as a data collection technique because the researcher wants to know the overall behavior, attitude and atmosphere in the study. Meanwhile, the type of interview used in this study is a semi-structured interview. The documentation study in this study includes the
results of students’ science work. In this study, the questionnaire was made with a yes-no answer statement because the researcher wanted to get a definite answer. This refers to the Guttman scale which states that the Guttman scale is carried out if you want to get a firm answer to a problem being asked (Sugiyono, 2012: 139).

To analyze the initial data used the normality test and homogeneity test. The normality test was conducted to determine whether the test result data of the two groups were normally distributed or not. Meanwhile, the homogeneity test was carried out to determine whether the control class and the experimental class had the same variance or not (Mairing, 2017: 148).

Analysis of the data on the effectiveness of the character-based jigsaw-type model of operative learning was obtained through data analysis on the improvement of student learning outcomes. The experimental data analyzed were pre-test and post-test data. Pre-test and post-test data from the control group and the experimental group was analyzed using the n-gain formula:

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N - \text{gain} < g > = \frac{\text{Posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}}
\]

The increase in student learning outcomes calculated by the n-gain formula is divided into 3 (three) categories. First, to improve learning outcomes it is low in the interval from 0.00 to 0.29. Second, the increase in learning outcomes is in the moderate category if it is in the interval 0.30-0.69. And third, the increase in learning outcomes is said to be high if it is in the interval 0.70-1.00.

3. Results and Discussion

Development of character-based jigsaw type cooperative learning model is a product development of a learning model in the form of a learning syntax that integrates and blends the cooperative learning model of the jigsaw type of inserting character values. The character-based jigsaw cooperative learning model also contains Class 5 Theme 5 material on the Ecosystem of the Relationship between Living Things.[13] It is widely considered that an educational policy known as character education can help strengthen and develop character values of learners.

Based on the analysis of the results of interviews with teachers, it can be concluded that the development of a character-based, character-based cooperative learning model is needed. They think that the character-based jigsaw cooperative learning model can help teachers improve understanding students towards the subject matter and be able to improve student character.

Interviews with students were carried out orally to students in grade V SD Negeri Candisari 1, SD Negeri Candisari 2, SD Negeri Karangsono 1, SD Negeri Karangsono 2, SD Negeri Karangsono 3 and SD Negeri Kembangarum 4. Based on the answers obtained from several students, it can be concluded that in learning students do not understand how important the learning model used by the teacher. The results of the interviews also showed that there were still many teachers who taught conventionally, and students were less enthusiastic about learning. The learning carried out by the teacher is not able to stimulate student interest because students only listen to the teacher's explanation and work on the questions contained in the LKPD. In addition, the learning carried out by the teacher has not been able to shape the character of students.[14] Factors that influence character education is the support of the environment when students are in the classroom, the classroom teachers and assistants, because the application of character education requires environmental support and the main support is the family consistent environment. Family is a more important environment to instill character education because if character education is only given to students at school and not in the family then the child will find it difficult to accept the values of character implanted in school.

Based on the analysis of these needs, it is necessary to develop a character-based cooperative learning model. The benefits obtained from using the character-based jigsaw cooperative learning model are increased students' understanding of the concept of science and the strengthening of student character, especially friendly and social care.[15] Schools with higher total character education
implementation tended to have higher academic scores on academic measures for the year prior to their application, the year of their application and the subsequent two years.”

The type of jigsaw cooperative learning model developed is character-based. The product being developed is a character-based cooperative learning model manual. This book contains a jigsaw-type cooperative learning model that has been developed with the insertion of friendly and socially caring character values. This model book is part of a character-based cooperative learning model development product to improve understanding of science in elementary schools on ecosystem themes. The purpose of this manual is to provide direction and focus for the model to create learning objectives, especially aspects of understanding and values of children’s character. Competency in understanding and character building is an inseparable part of the 2013 curriculum.

The development design of the character-based jigsaw type cooperative learning model consists of a syntax and a support system. The support system contained in the character-based Jigsaw cooperative learning model is the Learning Implementation Plan (RPP), syllabus, teaching materials and Student Worksheets (LKPD).

Based on the results obtained at the development stage, namely expert judgment and trials, the resulting learning model product has reached the predetermined product development criteria. This can be seen from the results of the expert's assessment (table 1).

Tabel 1. Results of Expert Assessment of Product Feasibility

| No | Validation Type | Percentage | Appropriateness |
|----|----------------|------------|-----------------|
| 1  | Media          | 71.42 %    | Worthy          |
| 2  | Theory         | 77.50 %    | Worthy          |
| 3  | Learning       | 91.07 %    | Very worthy     |
|    | Average        | 79.97 %    | Worthy          |

From the results of validation carried out by experts on the feasibility of development products, it is known that the character-based jigsaw cooperative learning model product is suitable for use with a percentage score of 79.97%. The results of the expert's assessment are supported by the following limited trial results.

The effectiveness of the learning model plays a role in supporting the success of the learning process. In this study, the character-based jigsaw cooperative learning model was applied to improve elementary students’ understanding of science. The data on the effectiveness of the character-based jigsaw cooperative learning model were obtained through a positive response questionnaire from 6 teachers and 106 students. Practical criteria for the character-based jigsaw cooperative learning model if the percentage of student positive responses is ≥75.01% and the percentage of positive responses from teachers is ≥75.01%.[3] The experimental class value was higher than of the control class, it demonstrated the influence of learning with the application of jigsaw type cooperative learning.

The development of the character-based jigsaw type cooperative learning model is designed through three stages, namely planning, process and evaluation. At the planning stage by determining the material, learning objectives and other learning model components. At this stage of the process carried out in the learning process using a model that has been developed, namely the character-based cooperative learning model of the jigsaw type. The evaluation stage includes the social impact and the accompanying impact of the character-based cooperative learning model.

Analysis of the needs of the cooperative learning model of the jigsaw type is not optimal. The analysis comes from the observation of the implementation of the Jigsaw cooperative learning model in the field and seeing the needs of teachers and students in the use of the Jigsaw type cooperative learning model. There are still some obstacles so that the expected learning objectives have not been fully achieved.
There are still many students who do not have self-confidence so that it is difficult to convey material to their friends. Students who are more active dominate the course of the discussion so that they feel less concern for their friends to be given the opportunity to express their opinions. Some students also have not been fully responsible for the group so that the implementation of the Jigsaw type of cooperative learning model is not optimal.

In group work, success will be achieved if there is cooperation between its members. Regarding learning, teachers must be good at creating effective working groups. The teacher must also be able to arrange assignments in such a way that each student in the group can complete their respective assignments so that group goals can be achieved. Based on this, the development and research of a character-based type of jigsaw cooperative learning model in learning theme 5 sub-theme 2 class V elementary school according to the needs of teachers and students.

In the control class, when learning took place some students talked to their friends and some were daydreaming. When the teacher provides learning, some students listen to the teacher's learning diligently and with full concentration. However, some students pay less attention to the teacher. Students talk with friends and play alone. During the learning activities, some students look serious, but there are still some students who are not serious. This is evident when the teacher gives questions on the sidelines of learning the student cannot answer the teacher's questions correctly.

In the experimental class, it was found that students were enthusiastic in participating in learning theme 5 sub theme 2 from the beginning to the end of the lesson. Student enthusiasm has been seen when the teacher provides motivation to arouse student interest in learning. Followed by apperception activities, the teacher conveyed the learning objectives, the enthusiasm of the students had emerged. Moreover, after the teacher explained the character-based jigsaw cooperative learning model, the students' enthusiasm seemed to increase. The enthusiasm continues when students complete assignments given by the teacher, both group assignments and personal assignments. At its peak, when students were asked to read the results of their work, students competed to want a presentation in front of the class. Although there were still some students who were less enthusiastic during the learning process. However, students' enthusiasm during the learning process in theme 5, sub theme 2, was categorized as good.

The effectiveness of learning is measured by the increase in student learning outcomes and student activity in learning. The improvement of student learning outcomes was analyzed using pretest and posttest data in a broad trial. The mean of the pretest learning outcomes in the control class was 53.56 while the experimental class was 52.90. After testing for 6 meetings, the posttest mean scores in the control and experimental groups increased to 67.69 and 80.58. Thus the increase in the average student learning outcomes in the control and experimental classes were 14.13 and 27.68. Thus the increase in the average learning outcomes is greater in the experimental group.

4. Conclusion

Based on the results and discussion of research regarding the development of a jigsaw-based cooperative learning model, the following conclusions can be drawn:

1. The factual model found in the field states that the implementation of the jigsaw cooperative learning model is not optimal. The results of the analysis show that teachers and students need a character-based cooperative learning model development.

2. The learning model design developed was a character-based cooperative learning model guide. The development of this model has an impact or influence on the pedagogical competence of teachers.

3. The hypothetical model developed is a character-based jigsaw cooperative learning model. The development of this model is used in learning theme 5, sub-theme 2, grade 5 with the aim of building students' caring attitudes towards the environment by instilling character values, namely cooperation, independence, caring for others and religion. The material is taught using a character-based jigsaw-type cooperative learning model. The media used is character-based snakes and ladders. The way to play is like playing a game of snakes and ladders in general. However, this game is slightly modified by adding question cards and penalty cards. The question card contains questions about class 5 theme
5 sub-theme 2, especially the content of science lessons. The punishment card contains the punishment that students must run if they cannot answer the question on the question card. The learning method uses the cooperative learning model syntax. The character-based jigsaw cooperative learning model is proven valid because the number of scores obtained from 3 validators respectively 20, 31 and 43 with valid score criteria.

4. The results of the final model effectiveness test show that the development of a character-based cooperative learning model is effective in learning. The use of effective learning to build friendly attitudes and social care is evident from the increase in learning outcomes and changes in student attitudes. The average posttest percentage in the control and experimental groups was almost the same, namely 53.56 in the control class and 52.90 for the experimental class. After being given the intervention, the posttest mean of the control and experimental classes increased to 67.69 and 80.58. The results of the t test obtained tcount = 2.538 with a significance level of 0.012 <α = 0.05. The percentage of positive responses given by teachers and students were 95.2% and 98.7%, respectively, from the minimum criteria of 75.01%. The learning activity of the control class students reached an average of 63% and the experimental class was 77%. Thus, the increase in student learning outcomes was higher in the experimental group.

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