The effectiveness of the combined inquiry and experimental learning models on student cognitive learning outcomes about the properties of light

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Abstract. Experimentation Method is one method that is widely used in learning Science because the main purpose of this method is to find the truth of the data/facts that can be observed or obtained. The inquiry learning model is a widely recommended method because it encourages students to solve problems independently. The research is research and development. The data is study include qualitative and quantitative data. The research instrument used was a validation sheet, a teacher's evaluation sheet, a student's evaluation sheet, an observation sheet for the implementation of learning, a test of learning outcomes, and a questionnaire for student learning independence. The implementation of the learning process on material changes in the form of objects observed by the observer, namely the class teacher using the observation sheet of the implementation of the learning process and student responses in using the inquiry learning model combined with experiment using a questionnaire sheet. Student learning outcomes or evaluations use the test method with the One Group Pre-test Post-test Design model to determine the extent to which student learning outcomes before and after being given a joint inquiry learning model and then use the average value formula (M), the calculated value (t-test), and table values. The results of the inquiry learning model combined with the experiment were shown by evaluating an average score of validity of 85.05% (very valid), an average of practicality of 94.4% (very practical), and effective in improving student learning outcomes. So, the inquiry learning model combined with science learning experiments is very feasible in terms of valid, practical, and effective.

1. Introduction
Inquiry learning model is a method that is widely recommended because it has several advantages. In this case Kunandar states the superiority of inquiry learning models, namely: 1) Spurring students' curiosity about problems, 2) Motivating students to find answers to teacher questions, 3) Encouraging students to solve problems independently, 4) improving learning outcomes students in analyzing information [4].
The experimental method is one of the learning methods that focuses on student activities in the teaching and learning process. The experimental method is very suitable because some of the concepts, principles, laws and theories of Science are abstract, so learning is not enough with the lecture method. In the teaching and learning process with the experimental method students are given the opportunity to experience themselves or do it themselves, follow a process, observe an object, analyze, prove and draw their own conclusions about an object, state, or process of something. Thus, students are required to experience it themselves, look for the truth, or try to find a law or proposition, and draw conclusions from the process they went through.

Piaget stated that direct experience plays the most important role as a driver of children's rapid cognitive development. The efficiency of direct experience as a factor driving the speed of cognitive development depends on the consistent relationship between methods and materials with the child's level of cognitive development. The Experiment Method is one method that is widely used in learning Science because the main purpose of this method is to find the truth of the data / facts that can be observed or obtained [12]. In addition, Bruner argues that: "Concrete" [3]

Thinking Methods will lead students towards conceptual thinking in an easier way. This means that through direct experience and real objects to prepare students to think to a higher stage, namely the symbol / fictional stage.

Rousseau believes that children instead learn directly from their own experiences rather than just rely on explanations from books. Rousseau states "My first teacher": "My feet, my hands and my eyes", because my senses can teach me Thinking with reasonable reasons to explain a problem [1]. For this reason researchers feel the need to conduct research to improve science/science learning in elementary schools.

Based on this description, the researchers formulated the effectiveness of the combined inquiry and experimental learning model of students' cognitive learning outcomes about the properties of light. The formulation of the problem in this study are:

a. How to develop a combined inquiry and experiment learning model with valid learning of light material science?

b. How to develop a combined inquiry and experiment learning model with practical learning of light material?

c. How is the development of a combined inquiry and experiment learning model on effective learning of light material?

The purpose of this study are:

a. To analyze the development of a combined inquiry and experiment learning model in science learning in light material validly.

b. To describe the development of a combined inquiry and experiment learning model on practical learning of light material.

c. To describe the development of a combined inquiry and experiment learning model on effective learning of light material

2. Literature Review

2.1 Inquiry Learning Model

Inquiry-based learning is one component of contextual learning. Inquiry-based learning was developed to return to the idea that students learn better if the environment is created naturally. Learning will be more meaningful if students experience what they learn, know the meaning of students’ learning activities, it's not a transfer of knowledge from teacher to student. Students’ Practical activities will motivate students to learn and provide memories and a stronger understanding of the learning methods that are oriented to memorization. Inquiry-based learning requires students to be active because learning activities take the form of practice and discussion. Learning strategies are expected to be more important than learning outcomes. Learning outcomes are expected to be more meaningful for students to solve problems in long-term life.
The relationship between inquiry and contextual learning is that inquiry is a core part of contextual learning activities which is a refinement of the 2013 curriculum (Ministry of National Education, 2002: 12). The inquiry is to find out for yourself the answers to the questions because of the students’ desire by conducting an inquiry. This encourages students to learn a number of concepts and facts and they also learn the process that is passed to find the concepts and facts.

Inquiry-based learning is a series of learning activities that maximally involve all students' abilities to search and investigate systematically, critically, logically, and analytically so that they can formulate their own findings with confidence [11]. Whereas inquiry is an important component in a constructivist approach that has a long history of innovation or educational renewal that encourages students to learn actively with concepts and principles to find their own learning experiences [7,8]. In inquiry-based learning the knowledge and skills acquired by students are expected not to be the result of remembering a set of facts but the results of finding themselves [2]. So inquiry-based learning is learning that uses inquiry or research by students with teacher guidance to solve problems where students are required to be active and able to think critically, logically, and analytically so that they can find experiences from themselves.

Inquiry is not only a learning phase to arrive at learning objectives, but also a series of stages in the form of a cycle Nurhadi, et al [7] describe the cycle as follows:

1) Formulate the problem.
2) Gather data through observation.
3) Analyse and present results in writing, pictures, reports, charts, tables and other works.
4) Communicate or present the work to readers, classmates or other audiences.

The inquiry learning planning framework in science learning can be explained as follows:

| No | Steps in the inquiry learning | Activity |
|----|-------------------------------|----------|
| 1. | Observation                   | Give a problem | Hold a simple investigation then students play the role |
| 2. | Question                      | Ask students to compile a list of questions about unclear material. | Make questions verbally and in writing |
| 3. | Hypothesis                    | Ask students to answer questions based on observations | Mention the types of money that are known based on observations |
| 4. | Data collection               | Ask students to name some of their findings based on other learning resources | Mention the properties of light that are known based on observations |
| 5. | Conclusion                    | Provide input and criticism or responses that build student knowledge | Record the results of the conclusions that have been written on the board by students from other groups. Conclusions are written systematically so that students are easier to learn and easy to recall |

Source: Nurhadi, et al, (2012: 44) developed

The formation of groups in inquiry-based learning is done if it can support the teaching and learning process. The formation of this group is based on or adapted to the material to be taught. According to Pambudi Formation of a group is a model that is oriented towards learning together in a small group to discuss problems together with group members so that difficult problems can be solved [5].

Table 1. Steps in the inquiry learning model in learning science
2.2 **Experiment Method**

The method is the ways taken by the teacher to create a learning situation that makes fun and supports the smooth learning process and achievement of children's learning achievements that satisfy Mulyani Sumantri and Johar Permana (1999. 134) according to Syaiful Bahari Djamarah and Aswan Zain (20120. 46), the method is one way that is used to achieve the goals that have been set, according to Hamzah B Uno (2010: 2), the learning method is defined as the way used by the teacher, which in carrying out its function is a tool to achieve learning objectives. The learning method is more procedural, which means a certain stage. The experimental method or experiment according to Mulyani Sumantri and Johar Permana (1999: 157), is interpreted as a way of teaching and learning that involves students by experiencing and proving themselves the process and results of the experiment. Syaiful Bahri Djamarah and Azwan Zain (2010: 84), said that the experimental method is a way of presenting where students can experiment by experiencing and proving themselves something they learn. In the teaching and learning process with this method students are given the opportunity to experience themselves or do it themselves, follow the process, observe objects, analyse, draw proof and draw their own conclusions about the process they experienced. The experimental method is one way of teaching, where students do an experiment about something, observe the process and write the results of the experiment, then the observations are delivered in front of the class and evaluated by the teacher Roestiyah (2012:80). According to Moedjiono and Moh. Dimyati (1993: 78-79), the procedure for using the experimental method, the steps are as follows:

1) Prepare for the use of the experimental method, which includes activities:
   a) Establish the suitability of the experimental method for the objectives to be achieved.
   b) Determine the need for equipment, materials, and other facilities needed in the experiment as well as checking its availability in school,
   c) Conduct an experimental test (the teacher conducts his own experiment to test the accuracy of the process and the results) before assigning it to students, so that certain possibilities are likely to occur,
   d) Provide equipment, materials, and other facilities needed for the experiments to be carried out, and
   e) Provide work sheets.

2) Carry out the use of experimental methods, with activities:
   a) Discuss with all students about the procedures, equipment, and material for the experiment and the things that need to be observed and recorded during the experiment.
   b) Assist, guide, and supervise experiments conducted by students, where students observe and record the things that are experimented on, and students make conclusions and reports about their experiments.

3) Follow up on the use of the experimental method, through activities
   a) Discussing obstacles and experimental results,
   b) Clean and store equipment, materials or other advice,
   c) Final evaluation of the experiment by the teacher
3. Data Analysis Techniques
This research uses qualitative and quantitative data types, therefore the data are analysed statistically descriptive. Qualitative data is presented in the form of descriptions obtained based on various inputs from the supervisor, expert advisor, students and teachers regarding the learning tools. Quantitative data is presented in the form of numerical symbols or numbers which are then carried out a calculation to obtain a generally accepted conclusion. Before testing the hypothesis, the normality test and homogeneity test are first performed.

4. Research Result
The results of the research of the development of the learning method of the combined inquiry learning model with the experiment based on the research method used are as follows.

4.1 Validity in developing a learning model that combines inquiry with experiments on learning science material properties of light.
Analysis and revision I conducted in this study is observation in SD Negeri 7 Patokan. Observations were carried out by direct observation and interviews with grade 4 teachers and some students. Observation aims to recognize and obtain a real picture of the learning process that applies in SD Negeri 7 Patokan making it easier to choose appropriate learning methods and learning models. The things observed include the learning process, learning methods, tools, learning tools, and student...
behaviour. Based on the results of interviews and observations obtained information about the curriculum used in grade 4 SD Negeri 7 Patokan is the 2013 revised curriculum. The preparation of a reference test is the first step to find out the student's initial ability. Reference tests are prepared based on the specifications of learning objectives and student analysis. Based on the results of field observations, student test results in odd semester have an average value of the same to each other so that it is easier to determine the type of questions because the measured ability is almost the same. Furthermore, compile the test results of the study lattice as attached to the appendix. The developed test is adapted to the level of cognitive ability. Question items are made with low, medium, and high difficulty levels. Scoring the test results using an evaluation guide containing answer keys and scoring guidelines for each item used as an evaluation tool after the implementation of the activities as attached in the appendix. At this stage, the researcher chooses the method that is appropriate to the student's karate. Researchers choose the form of learning methods and PPT. The method was chosen because it contains pictures that can help students understand the material. Meanwhile, PPT was chosen as a method for conducting confirmation activities and supporting the delivery made by the teacher. At this stage, researchers choose the form of presentation or format that is attractive to students. The learning method is made interesting by presenting pictures, choosing colours, and the shape and size of the writing. The size of the tape is made as efficient as possible so that it is easily used by students.

At this stage, the researcher designs the initial draft of the inquiry learning model combined with experiments and data collection instruments.

1) Learning devices Learning tools that are arranged include syllabi, lesson plans, and learning methods.
   d) Syllabus The syllabus used in this study is a syllabus that is in accordance with Permendikbud Number 21 of 2016 concerning Basic and Secondary Education Content Standards. This syllabus contains core competencies, basic competencies, indicators of competency achievement, subject matter, learning, assessment, time allocation, and learning resources
e) Learning Implementation Plan (RPP) of inquiry and experimental learning model combined with the implementation of learning plan of inquiry and combined learning model based on syllabus and adapted to the rules of the Ministry of Education and Culture Regulation No. 22 of 2016 Concerning Basic and Secondary Education Process Standards

The learning method of inquiry learning model with experiment The learning method of inquiry learning model with material contains the properties of light. The learning method of inquiry combined learning model with experiment is divided into 2 sub materials, namely inquiry combined learning model with experiment 1 discusses material properties of light and inquiry combined learning model with experiment 2 discusses material properties of light. This learning method contains riddles in the form of pictures and questions that must be solved by students. The use of these images is intended to attract students' creative thinking abilities and facilitate students in understanding the material properties of light. Analysis of students is done by interviewing the 4th grade teacher about the level of academic ability, as well as the involvement of students in the learning process. in this study the characteristics of the students analysed were grade 4 students, amounting to 32 people. From the results of the interviews, information was obtained that the students' academic abilities were at the basic level and the ability to think creatively and the involvement of students in the learning process was still low.

4.2 Practicality in developing a learning model that combines inquiry with experiments on science learning material properties of light

Validation sheets are used to find out the quality of learning tools. The validation sheet is filled in by a validator with a range of values 1-5. In addition, the validation sheet also contains suggestions and comments intended as input for improving the instrument. The validation sheet in this study includes the RPP validation sheet, the validation sheet of the learning method of the combined inquiry and learning model, the validation sheet of pre-test post-test questions, the validation sheet of the students'
creative thinking abilities in the beginning of the students, and the validation sheet of the student response questionnaire. Learning tools in the form of lesson plans and learning methods of inquiry learning models combined with experiments are validated by experts and practitioners to get learning tools that are suitable for use in the learning process. Whereas the data collection instruments validated by experts and practitioners were a matter of pre-test post-test and student questionnaire. Validation is carried out by lecturers and validation by expert practitioners is carried out by supervisors, principals and teachers who have the same degree.

Analysis of the validity of the inquiry combined learning model with experiments using ideal standard deviation techniques. Based on the results of the analysis, obtained an average value of 95% with a good category. In detail the results of the analysis of the validity of the inquiry-learning combined learning model can be seen in Appendix 20, while the brief results of the analysis of the validity of the poster learning method are presented in Table 2.

| No | ASPECT                                      | VALIDATOR |
|----|---------------------------------------------|-----------|
|    |                                             | V1  | V2  | V3  | RT  |
| 1. | Conformity of Material and Learning Objectives | 5   | 5   | 5   | 5.00|
| 2. | Attractive appearance: clear letters, legible images and attractive colours | 5   | 5   | 5   | 5.00|
| 3. | The picture contains clear information / concepts | 5   | 5   | 5   | 5.00|
| 4. | Clarity and order of matter                 | 5   | 5   | 5   | 5.00|
| 5. | The accuracy of the material with KD        | 5   | 5   | 5   | 5.00|
| 6. | Material truth                              | 5   | 5   | 5   | 5.00|
| 7. | The suitability / accuracy of the illustrations with the material | 4   | 4   | 4   | 4.00|
| 8. | Present concrete examples from the environment | 4   | 4   | 4   | 4.00|
| 9. | Present text, images accompanied by references / reference sources | 4   | 4   | 4   | 4.00|
| 10. | Academic expediency                         | 5   | 5   | 5   | 5.00|
| 11. | Identity of tables and figures              | 5   | 5   | 5   | 5.00|
| 12. | Non-academic benefits                       | 5   | 5   | 5   | 5.00|
| 13. | The suitability of the sentence with the level of student development | 5   | 5   | 5   | 5.00|
| 14. | The language used is communicative and easy to understand | 5   | 5   | 5   | 5.00|
| 15. | Content truth (facts, concepts, laws, theories and scientific processes) | 4   | 4   | 3   | 3.67|
| 16. | Use good and correct Indonesian             | 4   | 4   | 3   | 3.67|
| 17. | Pay attention when the teacher explains     | 5   | 4   | 3   | 4.00|
| 18. | Asking question                             | 5   | 4   | 3   | 4.00|
| 19. | Take science assignments seriously          | 5   | 4   | 3   | 4.00|
| 20. | Complete science assignments in a timely manner | 5   | 4   | 3   | 4.00|

Based on the results of the analysis using an average of 5 categories in order to obtain a value of 4.4 which indicates a match between expert and practitioner validator ratings. Based on the results of the analysis conducted using ideal standard deviation analysis techniques, the RPP used in this study has an average value of 4.4 with good categories so that it can be said that the lesson plans that have
been prepared are suitable for use in learning. Percentage of Agreement (PA) analysis for the RPP of 96% which shows a match between expert and practitioner validators. In summary, the results of the RPP assessment are presented in Table 3.

| No | Indicator                                                                 | Validator V1 | Validator V2 | Validator V3 | RT    |
|----|---------------------------------------------------------------------------|--------------|--------------|--------------|-------|
| 1. | The suitability of the material with the curriculum                       | 4            | 4            | 4            | 100%  |
| 2. | Cognitive processes are in accordance with the curriculum                 | 4            | 4            | 4            | 100%  |
| 3. | Facts, concepts, principles / laws and theories in accordance with KI and KD | 4            | 4            | 4            | 100%  |
| 4. | Emphasizing process skills                                                | 4            | 4            | 4            | 100%  |
| 5. | The division of chapters and sub-chapters is clear                        | 4            | 3            | 3            | 83%   |
| 6. | The material is arranged by logical arrangement                           | 4            | 3            | 3            | 83%   |
| 7. | Material is accurate / not wrong concept and up-to-date                   | 4            | 3            | 3            | 83%   |
| 8. | Shows clear differences between facts, concepts, principles / laws and theories | 4            | 3            | 3            | 83%   |
| 9. | There are cultural, technological and social arts relations                | 4            | 4            | 3            | 92%   |
| 10.| The contents are relevant to the daily lives of students                  | 4            | 4            | 4            | 100%  |
| 11.| The level of readability is in accordance with the grade level            | 4            | 4            | 4            | 100%  |
| 12.| Technical language is appropriate for the grade level                     | 4            | 4            | 4            | 100%  |
| 13.| Use clear photos                                                          | 4            | 4            | 4            | 100%  |
| 14.| Interesting illustrations and in accordance with the text                 | 4            | 4            | 4            | 100%  |
| 15.| The questions are arranged well and are useful for tests / tests          | 4            | 4            | 4            | 100%  |
| 16.| Activities for students emphasize movements during dance                  | 4            | 4            | 4            | 100%  |
| 17.| Activities motivate students to do it                                     | 4            | 4            | 4            | 100%  |
| 18.| Equipment to carry out activities easily obtained                         | 4            | 4            | 4            | 100%  |
| 19.| Include a teacher guide                                                   | 4            | 4            | 4            | 100%  |
| 20.| The method used is in accordance with the material / supports the concept | 4            | 4            | 4            | 100%  |

The results of the validator's assessment of the participants' questionnaire were further analysed. As for the brief results of the analysis of the validity of the questionnaire the ability to think creatively is presented in table 3.
Table 4. Results of Questionnaire Analysis Students' creative thinking abilities

| No | Question                                                                 | Answers |
|----|--------------------------------------------------------------------------|---------|
| 1. | Do you pray before studying                                             | √       |
| 2. | Are you reading or listening to the magazine?                           | √       |
| 3. | Did you listen to the initial material from the teacher?                | √       |
| 4. | Are you happy with the model that the teacher applied?                  | √       |
| 5. | Do you like to experiment?                                              | √       |
| 6. | Do you use ingredients that are easy to get in doing experiments?       | √       |
| 7. | Did you tidy up the tools and materials after conducting the experiment?| √       |
| 8. | Do you just find it yourself in problem solving?                        | √       |
| 9. | Do you ask the teacher questions if they aren't clear?                  | √       |
| 10.| Are you presenting to the class?                                        | √       |

Table 5. Independent Samples Test

|                      | Levene Test for equality of variance | t-test for equality means |
|----------------------|-------------------------------------|---------------------------|
|                      | F        | Sig. | t     | df | Sig (2-tailed) | Mean difference | Std Error Difference | 95% Confidence interval of Difference |
|                      |          |      |      |    |               |                |                    | upper                  | lower                  |
| Student Achievement  | Equal variance assumed               | 16.37 | .000 | 62 | .018          | -7.500          | 3.078               | -13.65                 | 3                      |
| Test                 |                      | 8     |      |    |               |                 |                     |                        |                        |
|                      | Equal variance not assumed           | -     | 54.8 | 27 | .018          | -7.500          | 3.078               | -13.66                 | 9                      |
|                      |                      | 2.436 |      |    |               |                 |                     |                        |                        |

Revision I was made after the product was validated by expert validators and practitioner validators. The validator stated that the lesson plan, the learning model combined inquiry with experiment, pre-test and post-test questions, students' creative thinking skills questionnaire, and students' questionnaire responses were appropriate to be used in the data collection process. However, this research instrument must be improved by considering the validator's suggestions and comments. Following are the validator's suggestions and comments on the research instruments and the results of the revisions made. The validator's suggestions and comments on the lesson plans and the inquiry learning model combined with the experiments and the results of successive revisions are presented in Table 5.
### Table 6. Revision I RPP

| Validator   | Comments or suggestions                                      | Before revision | After revision |
|-------------|-------------------------------------------------------------|-----------------|----------------|
| Expert      | Value scoring needs to be added                             |                 |                |
|             | There was a typo in the time allocation for closing RPP 1   | 10 minutes      | 10 minutes     |
|             | activities                                                 |                 |                |
| Practitioner| -                                                           | -               | -              |

### Table 7. Revision I RPP

| Validator   | Comments or suggestions                                      | Before revision | After revision |
|-------------|-------------------------------------------------------------|-----------------|----------------|
| Expert      | The size of the poster is enlarged so that it is easy to    | A3 + one poster | Poster size of |
|             | read between one material and another                       | sized page      | two A4 pages   |
|             |                                                             |                 | for easy       |
|             |                                                             |                 | discussion     |
| Practitioner| Use a lighter primary color for poster 1                     | -               | -              |

![Figure 2. Differences in pre-test and post-test learning outcomes](image)

4.3 The effectiveness in developing a learning model that combines inquiry with experiments in learning science about the properties of light

The following is a summary of the results of the validity test that was tested using the help of the Microsoft Excel program
Table 8. Data Questionnaire Validity Test

| Item | \( r_{\text{hitung}} \) | \( r_{\text{table}} \) | Category |
|------|----------------|----------------|----------|
| Item 1 | 0.518 | 0.444 | Valid |
| Item 2 | 0.678 | 0.444 | Valid |
| Item 3 | 0.949 | 0.444 | Valid |
| Item 4 | 0.492 | 0.444 | Valid |
| Item 5 | 0.883 | 0.444 | Valid |
| Item 6 | 0.783 | 0.444 | Valid |
| Item 7 | 0.741 | 0.444 | Valid |
| Item 8 | 0.541 | 0.444 | Valid |
| Item 9 | 0.870 | 0.444 | Valid |
| Item 10 | 0.552 | 0.444 | Valid |

Based on the table above, it can be seen from the 20 items that the questionnaire items were declared all valid because they were greater than \( r_{\text{count}} > r_{\text{table}} \) then all questionnaire items could be used in questionnaires to be distributed to fourth grade students in SDN 7 in Patokan. Test the validity of the questionnaire for items 1 to item 10 has \( r_{\text{count}} > r_{\text{table}} \) where \( r_{\text{table}} = 0.444 \). It can be concluded that the highest count is in item 3, and the lowest count is in item 5.

Table 9. Test Validity Test Data

| Item | \( r_{\text{hitung}} \) | \( r_{\text{table}} \) | Category |
|------|----------------|----------------|----------|
| Item 1 | 0.814 | 0.444 | Valid |
| Item 2 | 0.703 | 0.444 | Valid |
| Item 3 | 0.684 | 0.444 | Valid |
| Item 4 | 0.711 | 0.444 | Valid |
| Item 5 | 0.771 | 0.444 | Valid |
| Item 6 | 0.784 | 0.444 | Valid |
| Item 7 | 0.850 | 0.444 | Valid |
| Item 8 | 0.695 | 0.444 | Valid |
| Item 9 | 0.631 | 0.444 | Valid |
| Item 10 | 0.795 | 0.444 | Valid |

Based on the above table, it can be seen from the 10 items that the test items are declared to be all valid because they are greater than \( r_{\text{count}} > r_{\text{table}} \), then all item items can be used to be distributed to fourth grade students at SDN 7 Patokan Situbondo. The value of the reliability test calculation results using the Microsoft Excel program. The Cronbach’s Alpha questionnaire was 1.04 with a reliability index greater than 0.6 and the Cronbach’s Alpha test score was 1.07 with a reliability index greater than 0.6. Then the instrument is declared reliable, because the value of Cronbach’s Alpha is categorized with very high normative reliability criteria.

5. Discussion

Validity in developing the combined inquiry learning model with experiments in learning science material properties of light with valid reached 96% with a very valid category. This means that the use of inquiry-based experimental learning methods is more effective in increasing understanding of static fluid concepts than verification experiment learning methods. This indication is in accordance with the opinion of Hofstein & Lunetta (2004) which states that inquiry-based experiments can play an important role in the science of education. This is due to the need to involve students with physical actions and social negotiations in the learning process of science. Thus, students are better trained because they themselves experience scientific activities in the learning process. "Inquiry learning model is a series of learning activities that emphasizes the process of thinking critically and analysing..."
to find and find answers for themselves of a problem in question" (Sanjaya, 2016: 194). According to Piaget (Mulyasa, 2018: 108) that inquiry learning model is a learning model that prepares students in situations to conduct their own experiments widely to see what is happening, want to do something, ask questions, and find their own answers, and connect findings one with the other findings, comparing what he found with those of other students. By looking at the two opinions above, it can be concluded that inquiry learning is a learning model that prepares students in situations to conduct their own experiments so that they can think critically to look for and find answers to a problem in question. Inquiry learning is much influenced by cognitive learning flow, according to this flow learning is essentially a mental process and thought process by utilizing all the potential possessed by each individual optimally. Practicality in developing the inquiry learning model combined with experiments in learning science material properties of light with a practical reach 96% with a very practical category. Based on the results of interviews with some students, it was found that students were happier and more motivated to learn by using the inquiry model with experimental methods. This is consistent with the results of interviews with respondents who stated the inquiry model can train and add to their ability to answer questions while the experimental method can find new knowledge for themselves. Application of the inquiry model with the experimental method students learn in small groups to find new knowledge, besides that students also feel free to move so that they are not ashamed or inferior and also the learning is not monotonous. While the teacher's response to the application of the inquiry model with experimental methods is very good because ongoing learning can motivate students to learn independently. Development of the inquiry learning model combined with experiments on learning science about the properties of light effectively. Implementation of the stages of inquiry learning can only achieve a portion of the learning indicators that must be mastered by students. Therefore, it is necessary to ask questions which constitute the development of subject matter to achieve all learning objectives. Next, the teacher evaluates the process before learning ends. This is done by giving several questions to find out students' understanding of the material that has been obtained. This activity is continued with the assignment of exercises in the form of questions and recording learning outcomes in notebooks to students to do at home. This activity is in line with the opinion of Noer and Khotimah, (2000) that at the end of the discussion a material should be followed by an exercise to determine the level of mastery and the location of students' misconceptions in understanding the material.

6. Conclusion
Based on the results of research and analysis of research data, the following conclusions are obtained.
1. The development of the combined inquiry learning model with experiments in grade 4 science learning in elementary schools can be valid in terms of the observation results of the "Very Good" category, a PA value of 96%.
2. The development of the combined inquiry learning model with experiments in grade 4 science learning in elementary schools with a practical increase of up to 96%.
3. The development of the combined inquiry learning model with experiments on grade 4 science learning in elementary schools can be effective

Suggestions that can be delivered based on the results of this study are as follows:
1. This learning development research can be continued, to develop the combined inquiry learning model with experiments on science learning on different topics as explored in this study.
2. Research into the combined inquiry learning model with experiments on science learning needs to be continually developed, because the inquiry combined learning model with experiments on science learning is a scientific discipline that will be of widespread concern in the future

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