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Table of contents

View all abstracts

Issue 2

Papers

A Wiratman, M Mustaji and W Widodo
View abstract View article PDF

022008
THE FOLLOWING ARTICLE ISOPEN ACCESS
The effect of STAD learning model and science comics on cognitive students achievement
I Damopolii and S R Rahman
View abstract View article PDF

022009
THE FOLLOWING ARTICLE ISOPEN ACCESS
The aesthetics display, program and learning features: A validation toward STEM based e-module for learning integrated science
D Rochintaniawati, R R Agustin and L Rusyati
View abstract View article PDF

022010
THE FOLLOWING ARTICLE ISOPEN ACCESS
Profile of elementary student's argument ability on the energy topic
R P Pertiwi and A R Sinensis
View abstract View article PDF

022011
THE FOLLOWING ARTICLE ISOPEN ACCESS
The effectiveness of OrDeP2E learning model to train the natural science problem-solving skills of primary school students
M I Mashluhah, B K Prahani, S Suryanti and B Jatmiko
View abstract View article PDF

022012
THE FOLLOWING ARTICLE ISOPEN ACCESS
Teachers, pre-service teachers, and students understanding about the heat conduction
R S Anam, A Widodo and W Sopandi
View abstract View article PDF

022013
THE FOLLOWING ARTICLE ISOPEN ACCESS
Assessing pre-service science teachers' technological pedagogical content knowledge (TPACK) on kinematics, plant tissue and daily life material
R R Agustin, S liliasari, P Sinaga and D Rochintaniawati
View abstract View article PDF

022014
THE FOLLOWING ARTICLE ISOPEN ACCESS
Effectiveness of local wisdom integrated (LWI) learning model to improve scientific communication skills of junior high school students in science learning
I N Dewi, M Ibrahim, S Poedjiastoeti, B K Prahani, D Setiawan and S Sumarjan
View abstract View article PDF

022015
THE FOLLOWING ARTICLE ISOPEN ACCESS
Profile of pedagogical content knowledge ability of science teacher in learning
S Nurmatin
View abstract View article PDF

022016
THE FOLLOWING ARTICLE ISOPEN ACCESS

[Gender difference and scientific literacy level of secondary student: a study on global warming theme](#)

A Hardinata, R E Putri and A Permanasari

[View abstract](#) [View article](#) [PDF](#)

022017

THE FOLLOWING ARTICLE ISOPEN ACCESS

[How do kindergarten teachers grow children science process skill to construct float and sink concept?](#)

Q Qonita, E Syaodih, A Suhandi, B Maftuh, N Hermita, A Samsudin and H Handayani

[View abstract](#) [View article](#) [PDF](#)

022018

THE FOLLOWING ARTICLE ISOPEN ACCESS

[Description of meta-analysis of inquiry-based learning of science in improving students' inquiry skills](#)

M A Firman, C Ertikanto and A Abdurrahman

[View abstract](#) [View article](#) [PDF](#)

022019

THE FOLLOWING ARTICLE ISOPEN ACCESS

[Succeed or failed: diagnostic of student's ability to passed basic learning material on liquid pressure, respiratory system and its application based on integrated sciences test in school](#)

K Kasmanah, I B Rangka, F Fijriani, E Fitriyanti, S Utami, H Stevani, B Ruth, R Andriani, H Riansyah and M Irawan

[View abstract](#) [View article](#) [PDF](#)

022020

THE FOLLOWING ARTICLE ISOPEN ACCESS

[The ability of elementary teacher candidate in developing material learning oriented to the scientific approach](#)

N Nurlaila, F S Tapilouw, S Redjeki, P Siahaan and S Sukarno

[View abstract](#) [View article](#) [PDF](#)

022021

THE FOLLOWING ARTICLE ISOPEN ACCESS

[Smart city design in learning science to grow 21st century skills of elementary school student](#)

R H Zulkarnaen, W Setiawan, D Rusdiana and M Muslim

[View abstract](#) [View article](#) [PDF](#)

022022

THE FOLLOWING ARTICLE ISOPEN ACCESS

[The effect of integrated learning model to the students competency on the natural science](#)

U Usmeldi and R Amini

[View abstract](#) [View article](#) [PDF](#)

022023

THE FOLLOWING ARTICLE ISOPEN ACCESS

[Comparison of argumentation skill in science and non-science undergraduate students](#)

M S Hayat, D Djuniadi, A P B Prasetyo, F Roshayanti, A G C Wicaksono, I B Minarti and S Sumarno

[View abstract](#) [View article](#) [PDF](#)

022024

THE FOLLOWING ARTICLE ISOPEN ACCESS

[The effectiveness of mobile-based interactive learning multimedia in science process skills](#)

T A T Nugroho and H D Surjono

View abstract View article PDF

022026

THE FOLLOWING ARTICLE ISOPEN ACCESS

Applying of teaching strategy based on cognitive load theory to develop pre-service teacher teaching skills of waves: Cognitive load analysis

I Permana, H Firman, S Redjeki and I Hamidah
View abstract View article PDF

022027

THE FOLLOWING ARTICLE ISOPEN ACCESS

Analysis on senior high school's reasoning skill

A R Pratami, T Widhiyanti and A Widodo
View abstract View article PDF

022028

THE FOLLOWING ARTICLE ISOPEN ACCESS

Student's ecological intelligence ability on the environmental knowledge course

A Putra, A Rahmat, S Redjeki and T Hidayat
View abstract View article PDF

022029

THE FOLLOWING ARTICLE ISOPEN ACCESS

Promoting coupled-inquiry cycle through shared curricular integration models to enhance students argumentation

D Diniya, D Rusdiana and H Hernani
View abstract View article PDF

022030

THE FOLLOWING ARTICLE ISOPEN ACCESS

Implementation of science learning with local wisdom approach toward environmental literacy

A Ilhami, R Riandi and S Sriyati
View abstract View article PDF

022031

THE FOLLOWING ARTICLE ISOPEN ACCESS

The use of video laboratory report to develop presentation skills in science teacher education students

I Nugraha and E Eliyawati
View abstract View article PDF

022032

THE FOLLOWING ARTICLE ISOPEN ACCESS

Profile of students' scientific literacy in application integrated science on the theme of air pollution

Y Yamin, A Permanasari, S Redjeki and W Sopandi
View abstract View article PDF

022033

THE FOLLOWING ARTICLE ISOPEN ACCESS

Preconception analysis of evolution on pre-service biology teachers using certainty of response index

H Helmi, N Y Rustaman, F S Tapilow and T Hidayat
View abstract View article PDF

022034

THE FOLLOWING ARTICLE ISOPEN ACCESS

[Identification of junior high school students' misconceptions on solid matter and pressure liquid substances with four tier test](#)
A Ammase, P Siahaan and A Fitriani
[View abstract](#) [View article](#) [PDF](#)

022035

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Advisability of integrated science teaching material on the topic of environmental pollution to increase environmental literacy and critical thinking of junior high school students](#)
P D Sartika, A Fitriani and P Sinaga
[View abstract](#) [View article](#) [PDF](#)

022036

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Mapping the reasoning skill of the students on pressure concept](#)
R Rosdiana, P Siahaan and T Rahman
[View abstract](#) [View article](#) [PDF](#)

022037

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Integrated science teaching materials oriented on critical thinking skills and information literacy](#)
T Fairuz, I Kaniawati and P Sinaga
[View abstract](#) [View article](#) [PDF](#)

022038

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Investigating scientific literacy of students on the topic of water pollution through STEM based *6E learning by design*](#)
D Sulistiowati, H K Surtikanti and I R Suwarma
[View abstract](#) [View article](#) [PDF](#)

022039

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Exploring the effect of reflection to inquiry teaching through lesson study for learning community](#)
S Rahmawan, S Hendayana, H Hernani and D S Rahayu
[View abstract](#) [View article](#) [PDF](#)

022040

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Types and the role of teacher's questions in science classroom practice](#)
D S Rahayu, S Hendayana, A Mudzakir and S Rahmawan
[View abstract](#) [View article](#) [PDF](#)

022041

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Profile of problem solving ability of junior high school students in science](#)
T Koswara, M Muslim and Y Sanjaya
[View abstract](#) [View article](#) [PDF](#)

022042

THE FOLLOWING ARTICLE IS**OPEN ACCESS**

[Implementation analysis of formative self and peer assessment towards critical thinking skill in junior high school](#)
A Sarasvati and S Sriyati
[View abstract](#) [View article](#) [PDF](#)

022043

THE FOLLOWING ARTICLE IS **OPEN ACCESS**

[Predict Observe Explain (POE) strategy toward mental model of primary students](#)

L Jasdilla, Y Fitria and W Sopandi

View abstract View article PDF

022044

THE FOLLOWING ARTICLE IS **OPEN ACCESS**

[Junior high school students' scientific literacy on earth science concept](#)

A Nuryanti, I Kaniawati and I R Suwarma

View abstract View article PDF

022045

THE FOLLOWING ARTICLE IS **OPEN ACCESS**

[Interaction of students motivation and ecological phenomena toward learning outcomes using problem-based ecopedagogy](#)

N D Napitupulu, A Munandar, S Redjeki and B Tjahyono

View abstract View article PDF

022046

THE FOLLOWING ARTICLE IS **OPEN ACCESS**

[Students' conceptual understanding in modified flipped classroom approach: An experimental study in junior high school science learning](#)

M D Putri, D Rusdiana and D Rochintaniawati

View abstract View article PDF

022047

THE FOLLOWING ARTICLE IS **OPEN ACCESS**

[Profile of science communication competence of junior high school students on science lesson](#)

T Hermawansyah, T Rahman and S Anwar

View abstract View article PDF

022048

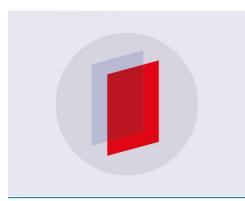**THE FOLLOWING ARTICLE IS** **OPEN ACCESS**

[The use of argument based science inquiry learning model by using science writing heuristic approach to build students argument ability in environmental pollution theme](#)

A N Taufik, T Rahman and H Solihin

View abstract View article PDF

Comparative study of learning models example-non-example and picture-and-picture on natural science subjects

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Comparative study of learning models example-non-example and picture-and-picture on natural science subjects

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Abstract. The research aims to investigate the difference of natural science learning outcomes between sixth graders in primary school taught using the models example non example and picture and picture. This experimental research employed a test as the data collection technique. Furthermore, data analysis techniques were the homogeneity test and the independent sample t-test. The criterion for hypothesis acceptance is that if $t_{count} > t_{table}$, therefore H_0 is accepted and H_a is rejected. Based on the results and data analysis, it is evident that the example non example and picture and picture learning models have improved the learning outcomes of Grade VI students. It is demonstrated from the pretest and posttest average scores of Grades VIA and VIB that experienced an increase from 53.06 to 78.56 and from 17.47 to 66.09 respectively. The independent sample t-test shows the significance value of t_{count} is 0.005<0.05, therefore H_0 is rejected and H_a is accepted. In conclusion, there are some differences in natural science learning outcomes using the picture and picture method in Grade VIA and the example non example method in Grade VIB and natural science learning outcomes using the picture and picture learning model is better than the example non example one.

1. Introduction

As stated by the Ministry of Education in the curriculum that the learning objectives of Natural Science in primary schools are to develop knowledge and understanding of the concepts of science that are useful and can be applied in everyday life, and to develop curiosity, positive attitude and awareness of the existence of mutual relationship among science, environment, technology and society [1].

In the integrated Natural Science subject instructional guidelines, it is described that the trend of Natural Science subject instructional today is that students only learn Natural Science as a product, concepts, theories, and laws through memorizing. This situation is exacerbated by learning orientation on tests/exams. As a result, science as a process, an attitude, and the application is not touched in the teaching learning activities [2]. In fact, students' understanding at primary school levels in natural science's subject is still lacking as discovered from the results of the final examination. In studying natural science, students need a fairly high understanding. Generally speaking, natural science learning at school is often theoretical than practical because it is taught in a textual lesson and rarely uses the

examples of cases or images. One of the topics in natural science that is considered merely theoritical is the solar system.

Consequently, it is likely that learning natural science becomes more interesting by employing images as a learning instrument. Students that learn visual or audio lessons may stimulate their psychomotoric ability. Therefore, teacher's creativity is required to foster student's understanding in relation to natural science learning. There are numerous learning methods, strategies and models consisting of creative and effective elements used in a lesson so as to develop natural science learning outcomes. An instance of learning model that may foster students' creativity and activity is cooperative learning.

The cooperative learning model has positive benefits when applied in the classroom because it is believed to be an effective learning for students, a learning as part of the school's paradigm change currently, and a learning that encourages the interaction and cooperation among teachers who are used to working separately from others. Cooperative learning is an especially effective method to use with any problem-solving task because it encourages people to express divergent points of view [3]. Cooperative learning environment involves students' sense of responsibility, job division, interaction and communication, and mutual connection which are beneficial for each team member [4]. The use of cooperative learning also builds cooperative skills, such as communication, interaction, cooperative planning, sharing of ideas, listening, and taking turns [5]. It is in line with the statement proposed by Mergendollar and Packer [6] that teaching using cooperative learning promotes active learning in which students learn more when they talk and work together than when they listen passively.

Cooperative learning models, which are similar but not the same, are 'example non example' and 'picture and picture'. These learning models are considered suitable for pictorial materials in natural science lessons. The topic of solar system is therefore opted to apply this learning model.

Astronomers who study the Solar System, known as planetary scientists, make use of robotic orbiters and landers that are sent directly to other worlds for more detailed measurements of these objects to supplement what we can learn about them from Earth-based or space-based (but still Earth-orbiting) telescopes. Planetary scientists are also able to investigate questions about the Solar System directly by analyzing meteorites, including lunar and Martian meteorites, which can be studied in great detail in Earth-based laboratories [7].

The learning model 'example non example' is a learning model that employs pictures as a learning medium in which students are provided by the teacher with a pictorial sample related to the topic. Students then analyze the picture in groups. After that, based on students' analysis, the teacher begins to direct the students to the concept of the topic delivered.

The use of the pictorial media is structured and designed so that students are able to analyze the picture into a brief description of what is in the picture with more emphasis on the context of student analysis. This model aims to encourage students to think critically by solving the problems contained in the prepared image examples.

The stages of learning model 'example non example' include: (1) the teacher prepares the pictures in accordance with the topic and learning objectives having been outlined; (2) the teacher attaches a picture on the board or presented through an LCD projector or OHP; (3) the teacher provides a guideline, time, and opportunity for students to observe, analyze and study the existing pictures; (4) through a group discussion consisting of two or three students, the discussion results from the analysis of the picture are written on a paper; (5) each group present their discussion results.

On the other hand, the learning model 'picture and picture' utilizes images as a learning medium since the beginning of a lesson. The stages of 'picture and picture' learning model are as follows: (1) the teacher states the competence to be achieved; (2) the teacher presents the topic as an introduction; (3) the teacher demonstrate pictures related to the topic; (4) the teacher invites the students one by one to place pictures into a logical sequence; (5) the teacher inquires the rationale of the pictures' sequence; (6) the teacher explains the concept of the topic in accordance with the competence to be achieved; (7) the students conclude the topic. Students are expected activein the class individually, actively discussed, dared to express and accept ideas from others, creative to find problem solutions [8].

As regards previous study about the effect of numbered heads together (NHT) cooperative learning model on the cognitive achievement of students with different academic ability achieved the results of ana Cova test confirmed the difference in the students' cognitive achievement based on learning models and general academic ability [9]. Similar research had also been conducted by other researchers about comparative study, the result is the students' achievements with NHT learning model by Concept Maps were better than students' achievements with TGT model by Concept Maps and Direct Learning model [10]. However, those research are not similar to the researchers' study because this particular research was conducted among VI graders of primary school by using picture and picture learning model and example non example learning model on the natural science subject about solar system.

Furthermore, this study aims to investigate the difference of 'example non example' and 'picture and picture' learning models on the solar system topic in State Primary School No. 42 of Palembang and to discover natural science learning outcomes on the solar system topic, whether 'example non example' learning model is more preferable than 'picture and picture' one, or vice versa.

2. Method

The research method is the means used by researchers to collect data in their study. Specifically, this research employed the experimental method, especially comparative approach. Comparative research is defined as a study that compares the existence of one variable or more in two or more diversed samples at different times. Comparative research or analysis is a broad term that includes both quantitative and qualitative comparison of social entities [11]. Comparative analysis is carried out by comparing a theory and another one, or study result and other study's. Through this comparative analysis, the researchers are able to synthesize one theory with another, to limit it when viewed too extensively [12]. Grounded on this consideration, this experimental research aims to examine the effect of treatment or action on a particular group compared to another group by using distinct treatment.

The technique of probability sampling is a sampling technique that provides equal opportunity for each element (member) of the population to be selected as a sample. The sampling technique of this research is conducted by cluster random sampling. Cluster random sampling is taking sampling unit (individual) in a cluster. The sample of this study is showed in table 1. It is describes the research sample, that is, State Primary School No. 42 of Palembang, which consists of two classes (i.e. VIA comprising 32 pupils and VIB comprising 36 pupils). So, the total number of sample is 68 students.

Table 1. Research Sample.

Learning model	Class	Number of students	Additional information
Picture and Picture	VIA	32	Experimental class I
Example non Example	VIB	36	Experimental class II

In this study, the researchers experimented on two groups comprising two different classes (i.e. Classes VIA and VIB). Class VIA implemented the 'picture and picture' learning model whereas class VIB applied the 'example non example'one. Both these experimental classes carried out an evaluation at the end of the teaching - learning process. The evaluation was in the form of a written test so that the learning results of the students would be obtained.

Moreover, the data collection techniques of this study were interviews, observations, and tests. The interviews were conducted with the teachers of classes VIA and VIB by providing a number of questions to them. The observations were conducted using the observation sheets written by the researchers in the form of class observations. The test is a series of questions or exercises as well as other tools used to measure skills, intelligence, abilities or talents possessed by individuals or groups [8]. The questions provided had firstly been tested their validity and reliability. Data analysis technique used in this research is homogeneity test and statistical test of parameter t (t test). The t test employed independent sample t-test using SPSS 19.

3. Result and Discussion

Data collection employed observation and test sheets. Interviews were conducted to investigate what learning models teachers practise frequently in learning. The tests included written pretest and posttest consisting of 10 questions about the solar system. The question has been tested their validity and reliability. Validity and reliability are important concepts to consider when designing a research instrument. Validity refers to appropriateness, meaningfulness, correctness, and usefulness of an instrument or a procedure that it measures what it is supposed to measure. Reliability refers to the consistency of scores or answers from respondents over time. Reliability is a necessary but not sufficient condition for validity. It means that an instrument must be reliable for it to be valid, but a reliable instrument does not necessarily guarantee that it is a valid one [12,13,14]. The questions had been tested their validity, as shown in table 2.

Table 2. Validity Test.

Items Number	r_{xy}	r_{tabel}	Notes
1	0.704	0.239	High validity
2	0.059	0.239	Invalid
3	0.324	0.239	Low validity
4	0.448	0.239	Moderate validity
5	0.639	0.239	Moderate validity
6	0.869	0.239	High validity
7	0.852	0.239	High validity
8	0.909	0.239	Very high validity
9	0.920	0.239	Very high validity
10	0.843	0.239	High validity

Table 2 describes the result of validity test, by using the r_{table} value with N = 68 and df = 66 at significance of 5% showing r_{table} = 0.239. Based on the analysis table of the validity test of the 10 items, there were several categories: invalid (item 2), low validity (item 3), moderate validity (item 4 and 5), high validity (item 1, 6, 7, 10), very high validity (item 8, 9). Thus, the results of validity analysis included valid categories, that is, item 1,3, 4, 5, 6, 7, 8, 9, and 10. So, the questions used in this study accounted for 9 questions.

Apart from the validity test, the researchers also carried out the reliability test in order to find out whether or not the questions given were reliable. Based on Cronbach's Alpha test, the alpha is 0.761, meaning that the tested questions are reliable because the value of Cronbach's Alpha is greater than 0.60.

This study employed data analysis techniques in the form of homogeneity test to find out whether the questions given were homogeneous and independent sample t test test to discover the difference of learning result of 'picture and picture' learning model and of 'example non example' one.

Based on homogeneity by using Levene test α = 0,05 the significance value of learning outcomes for learning model groups p-value is 0.777. It can be concluded, therefore, that the data of learning outcomes based on learning models is homogeneous.

Meanwhile, the data analysis technique used in this study is t test (i.e. independent sample t-test). Independent sample t-test describes the average scores of the 'picture and picture' model is 78.56, which is higher than the 'example non example' learning model is 66.09. Thus, the students who used the learning model 'picture and picture' were better than those using the learning model 'example non example'.

Referring to the study results, it can be underlined that the learning model 'picture and picture' is preferable because it is able to improve the reasoning and thinking power of the students in analysing the existing picture. The learning is also memorable because students can observe directly the image that has been prepared by teachers and understand the concept of solar system thoroughly. On the other hand, the learning model 'example non example' provides students with a limited understanding

of the concept because the model is less able to explore the students' ability systematically and thoroughly.

The result of Sig. (2-tailed) by using Independent Sample T-Test is 0.005 <0.05. It can be concluded that H_0 is rejected and H_a is accepted. This means there is a difference on the average scores when employing the 'example non example' learning model and the 'picture and picture' one.

4. Conclusion
Based on the results and discussion, the conclusions of this study are as follows: (1) learning using the 'picture and picture' learning model is better than the 'example non example' one; (2) using hypothesis test (i.e. independent sample t test), it is obtained the Sig value (2-tailed) of 0.005 <0.05; consequently, it can be concluded that H_0 is rejected and H_a is accepted, which means there is a difference on the average scores when using the 'example non example' learning model and the 'picture and picture' one.

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