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IMPLEMENTATION OF DISCOVERY LEARNING MODEL BASED ON CALOR CHARACTERISTIC BRICKS MIXED BY *(DURIO ZIBETHINUS)* AND COCONUT *(COCOS NUCIFERA)* SKIN TO IMPROVE TUDENTS'COGNITIVE LEARNING OUTCOMES

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ABSTRACT

This study aims to determine the cognitive learning outcomes of students through learning the Discovery Learning model that uses a practicum material bricks mixed by durian and coconut skin. The briquettes were implemented as practicum materials on temperature and calor learning in the Discovery Learning model to improve learning outcomes of KIR students in SMP N 15 Kota Bengkulu. Calorific value of briquette variations in the mixture of durian and coconut shell skin was determined by a Bomb Calorimeter in Chemical Laboratory Basic Science UNIB. Briquettes characteristics carried out in Science Laboratory. The instrument that used in learning implementation was a multiple-choice test form that has been validated. Result showed that Learning research implementation showed that after Discovery Learning model was implementated, cognitive learning outcomes of students increased and the N-gain value for the high group have score in 0.78 for high category, medium group have score in 0.57 and the low group have score in 0.53.

Keywords: calorific value, characteristics of briquettes, Discovery Learning.

INTRODUCTION

Durian is a tropical plant from Southeast Asia that has a taste many people like (Nuriana et al., 2013; Hasbullah et al., 2018). Indonesian people, especially in Bengkulu only consume durian meat but their skin is wasted and become a waste that gives a problem in the environment. Durian skin waste can be used as an alternative energy source by making briquettes. Durian skin briquette calorific value is 3,786.95 cal / gram (Hatta, 2007). Durian skin calorific value is still below the SNI standard of 5,000 cal / gram, but can be increased if it mixed with high biomass calorific values. Biomass with a high calorific value is usually used as a mixing base in the manufacture of briquettes (Nurhilal & Suryaningsih, 2018). Biomass used as a briquette mixer in this study used coconut shell.

Briquettes mixture of durian skin and coconut shell were technologies for developing alternative fuels. Briquettes can be used by the community as a alternative fuel and wood for cooking, and as a science learning medium, be a source of fuel in practicum.

So that learning science in schools can utilize natural materials around that are not utilized, then learning science Discovery Learning model that utilizes a briquette mixture of durian skin waste an d coconut shell as a means of holding practical science

The research aimed to describe the cognitive learning outcomes of students after using briquettes on temperature and calor learning using the Discovery Learning model in SMP N 15 Kota Bengkulu.

METHODS

The research type consists of scientific research and educational research. The scientific research was a direct experimental research that aimed to describe briquettes calorific value that mixed with durian skin and coconut shell. After scientific research, then continued with educational research. Briquettes were used as practicum materials in temperature and calor learning to improve student learning outcomes.

The study located in Science Laboratory SMPN 15 Bengkulu and determination of

variations briquette calorific value that mixture of durian skin and coconut shell was carried out in Chemistry Basic Science Laboratory, University of Bengkulu did from December to March 2019.

Materials and tools

The raw materials that used in making briquettes consist of durian skin charcoal, coconut shell charcoal and tapioca flour solution. Research equipments were drums, briquettes, filters, digital scales, rock collisions and earthen stoves.

Research Steps

Durian skin and coconut shell waste was dried under the sun. After drying, durian skin and coconut shell will be a charcoal. Durian skin and coconut shell will be burned down separatedly that using clean drums. This step will be done by burning the ingredients in the drum, then the drum was closed for 1 night until the material becomes charcoal.

After becoming charcoal, the ingredients were mashed by using rock collisions and sifted with sieves to get the same size. Furthermore, the mixture of durian skin and coconut shell charcoal with a composition of 20%: 80%; 50%: 50% and 80%: 20%. The next process was mixing with the adhesive material of tapioca flour solution then ready to mold. Briquettes were dried under the sun for 4 days. From the mixing variations, the calorific value and the characteristics of the briquette were tested including the lost water content, briquette density, burning speed.

Briquettes calorific value was determined by Bomb Calorimeter at ChemistryBasic Science Laboratory University of Bengkulu.The Bomb Calorimeter can be seen as in Figure 1

Figure 1 *Bomb Calorimeter*

Characteristics of briquettes include:

a) Water Content Lost

The water content lost is the percentage of the difference in mass of the briquette before it is heated (m_1) with the mass of the briquette after burning (m_2) to the mass of the briquette before it is heated (m_1) According to Yuliah et al (2017) the lost water content can be calculated using the equation:

$$content\ of\ water\ lost = \frac{m_1 - m_2}{m_1} x100\% \quad (3.1)$$

b) Density (ρ)

The density is the mass of briquettes after being heated (m) to the briquette volume (V). The density is calculated using the equation:

$$\rho = \frac{m}{V} \quad (3.2)$$

(Yuliah et al., 2017).

c) Used of Briquettes (Fcd)

Is the amount of biobriquette used during cooking water to boil until 100%, calculated by subtracting the initial biobriquets that are burned (F_{ci}) with the weight of the remaining biobriquette (F_{cf}) (Fajari, 2012)

$$F_{cd} = F_{ci} - F_{cf} \quad (3.3)$$

d) Cooking Time (Td)

The length of time to heat the water starts when laying the pan until the boiling water is perfect in 100°C (Fajari, 2012).

e) Biobriquette burning speed (Rcb)

It is a lot of biobriquets used (Rcb) when boiling water (td) with units of g/ minute (Fajari, 2012)

$$R\ cb = \frac{Fcd}{td} \quad (3.4)$$

f) Total of briquette calorific used (Q_{total})

Total of briquettes calorific was determined by multiplying the total briquettes used with the calorific value contained in the briquettes.

g. Implementation in educational research Implementation in educational research, mixed briquettes of durian skin and coconut shell were used as material for temperature and calorific material practicum. Educational research design using one group design in a homogeneous class. The research design was presented in Table 1.

Table 1. Research Design

Pre-test	Implementation	*Post-test*
O_1	X	O_2

Notes:

X: Learning with Discovery Learning models

O1: Pre-test

O2: Post-test

The research subjects used KIR 7th Class students in SMP Negeri 15 Kota Bengkulu as

much as 25 student, which were divided into three groups, namely the high group, the medium group and the low group.

Data collection

To find out the cognitive learning outcomes of students obtained by using the questions given to the sample. This study uses 16 objective items with a minimum-maximum total score range of 0 to 100.

Data analysis

Cognitive learning outcomes of students are said to increase when the results of the post-test (X_2) students are greater than the results of the pre-test (X_1) or ($X_2 > X_1$) and the number of students who are worth ≥70 ≥80%. Whereas to determine the level of students' cognitive learning outcomes the *N-gain* formula is used which is the comparison between the difference between Posttest and pretest with the difference between the maximum value and the pretest which is formulatedas follows

$$N_{gain} = \frac{(X_2 - X_1)}{(X_3 - X_1)}$$

Table 1. G_{ain}Index Criteria

No	Quality	N_{gain}	Category
1	greatly increased	≥ 0,70	High
2	increased	0,30 - 0,70	medium
3	quite increased	0,30	Laow

RESULT AND DISCUSSION

Durian skin and coconut shell briquettes in this study consisted of three types namely K1, K2 and K3 with different composition comparisons. K1 briquettes consist of 20% durian skin charcoal and 80% coconut shell. K1 briquettes have a dry mass after an average drying of 31.67 grams, a briquette height of 2.1 cm and a briquette diameter of 5 cm. K2 briquettes consist of 50% durian skin charcoal and 50% coconut shell. K2 briquettes have a dry mass after an average drying of 29.67 grams, a briquette height of 2.43 cm and a briquette diameter of 5 cm. K3 briquettes consist of 80% durian skin charcoal and 20% coconut shell. K3 briquettes have a dry mass after an average drying of 26.67 grams, a briquette height of 3.13 cm and a briquette diameter of 5 cm. The calorific value and characteristics of mixed briquettes of durian and coconut shell skin can be seen in Table 2.

Table 2. Characteristics and calorific value of briquettes in various compositions

Briquettes Composition	K1	K2	K3
Briquette calorific value (cal/gram)	7.306,81	6.847,31	6.284,99
Lost Water Content (%)	20,80	25,80	33,30
Briquette Density (Kg/m3)	0,77	0,62	0,43
Briquettes Used (gram)	152,00	155,33	173,67
Time to boil water (minutes)	13,37	12,5	12,02
Briquette burning speed (g/minute)	11,38	12,45	14,46
The total heat of briquettes used (Kcal	1.110,63	1.063,60	1.091,50

Notes:

Briquette composition

K1 = 20% durian skin charcoal, 80% coconut shell charcoal

K2 = 50% durian skin charcoal, 50% coconut shell charcoal

K3 = 80% durian skin charcoal, 20% coconut shell charcoal

Based on Table 2, the lowest calorific value obtained as 6,284.99 kal / gram, found in mixed briquettes of 80% durian skin charcoal, 20% coconut shell charcoal and the highest calorific value was found in mixed briquettes of 20% durian skin charcoal, 80% coconut shell charcoal. The calorific value of this briquette showed that more content of the coconut shell, the calorific value will be higher. The reason was because the coconut shell has more calorific value than durian skin. The calorific value of durian skin in this study increased after being mixed with coconut shell. It because of coconut shell had a carbon binder for durian skin charcoal. The calorific value of briquettes charcoal will be high if the value of carbon content bound to briquettes was high (Triono, 2006).The calorific value that produced by three charcoal briquettes with a mixture of durian skin and coconut shell in this study has fulfill the National Briquette Standard, in a minimum of 5,000 cal/gram (Nurhilal & Suryaningsih, 2017).

Table 2 shown that the water content lost during the smallest briquette drying process was found in the composition as 20% durian skin charcoal, 80% coconut shell charcoal as 20.8% and the highest composition as 80% durian leather charcoal, 20% coconut shell charcoal as 33.3%. The data showed that water content is higher if the amount of durian skin charcoal increase and the coconut shell charcoal is decrease. Water content will increase because durian skin charcoal particles were hygroscopic towards water and air. Water content closely related to the density of briquettes charcoal. If the density was increase, the hygroscopic characteristic of briquettes charcoal will

decrease, so that the absorption of water will getting smaller. If the density is higher, so that the cavities between charcoal particles will be more tight because the particles's density be tighter so that there is no blemish or empty space (Bahri, 2007).

Smallest briquette density was found in the composition of 80% durian skin charcoal, 20% coconut shell charcoal as much as 0.43 gr / cm3 and the highest density was in the composition of 20% durian skin charcoal, 80% coconut shell charcoal as much as 0.77 gr/cm^3 (Table 2). The difference in the types of raw materials was very influential on the density value of charcoal briquettes produced (Hendra, 2000). High density of raw materials produce high density of charcoal briquettes, while low density of raw materials produce low density of charcoal briquettes. Density affects the calorific value. If the density value was higher, so that the calorific value will be higher too (Patandung & Silaban, 2017). Table 2 shown that, the smallest briquette value that used for boiling water as much as 152 grams was in the composition of 20% durian skin charcoal and 80% coconut shell. The highest one in the composition of 80% durian skin charcoal and 20% coconut shell charcoal as much as 173.67 grams. If the calorific value was higher, so that the heat produced will also be higher, and time for combusting will be longer (Fajari, 2012). Accordance with this study, that the if briquette calorific was higher, so that the burning speed value will be slower and the used of briquettes will be less.

Table 2 was found that briquettes with composition of 80% durian skin charcoal and 20% coconut shell charcoal had the fastest time as much as 12.02 minutes and maximum boiling time as much as 13.37 minutes in briquettes composition of 20% durian leather charcoal and 80% shell charcoal coconut.Burning speed of briquettes was briquettes's amount that burns in the unity of time. If the value was high, so that the briquettes will be burn faster and more flammable. The composition of 80% durian skin charcoal briquettes and 20% coconut shell charcoal has fastest burning speed as much as 14.46 gram/minute and the lower one as much as 11.38 grams/minute in the composition of 20% durian skin charcoal and 80% coconut shell charcoal.From the briquette calorific value, can be seen that if calorific value was higher, so that the burning speed will be slower. Burning speed was influenced by material structure, bound carbon content and material hardness (Patandung & Silaban, 2017). The burning rate of briquettes affects the burning time of fuel briquettes. If burning speed value is higher, so that the briquettes will burn out faster. And if burning speed value is lower, so that the briquettes will burn out slower.

Total calorific value that lowest used was in composition of 50% durian skin charcoal and 50% coconut shell as much as 1,063.6 Kcal. The highest one as much as 1,110.63 Kcal in the composition of 20% durian skin charcoal and 80% coconut shell charcoal. The highest calorific value makes burning more efficient so that the amount of briquettes used was more efficient and the amount of calor produced was also more efficient (Patandung & Silaban., 2017).

Implementation in Education

The implementation of this research was held in SMP N 15 Kota Bengkulu in the 2018/2019 academic year. This study aims to determine improvement of student learning outcomes using the Discovery Learning model on the subject of Temperature and Calor. The Discovery Learning model consists of 6 stages: (1) Stimulation (2) Problem Statements (3) Data Collection (4) Data Processing, (5) Verification, and (6) Generalization. Before learning was started, student were given pretest. To find out increase in cognitive learning outcomes, then student were study by Discovery Learning model, then after the learning process the student were given posttest.

Pretest aimed to find out the students' early understanding of the Temperature and Calor's subject material before learning. Posttest aimed to find out the final understanding of students about the subject after learning by Discovery Learning model. Pretest and posttest questions were the same question as much as 16 items. The results of the pretest and posttest can be seen in Figure 2 below.

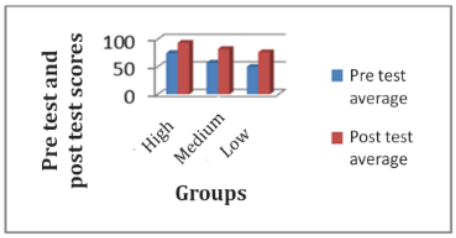

Figure 2. *Pretest and posttest value charts*

From Figure 2 it can be seen that the average value of the pretest and posttest of each group has increased. The high group have an increase average value as much as 18.75. The medium group have an increase average value as much as 25. The low group have an increase average value as much as 26.56.

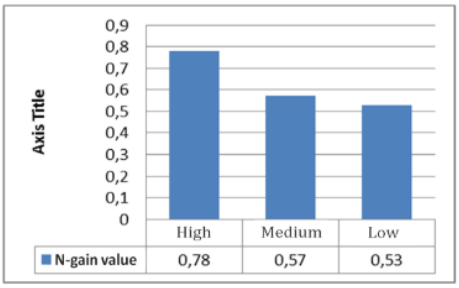

Figure 3. *N-Gain value grafic*

Figure 3 can be seen that the application of the Discovery Learning model based on calorific characteristics research of mixed briquettes of durian skin and coconut shell can improve students' cognitive learning outcomes.This was indicated by the high group that having higher N-gain values than the other groups, which were has 0.78 in the high category. The medium group has as much as 0.57 N-gain value in the medium category. The low group has the lowest N-gain value as much as 0.53 in the medium category.It mean that there were an increase of learning outcomes in the high group that have more increase than the medium and low group, this results were accordance with the results of Sudiro et al (2018) research.

Similar research showed that Discovery Learning Model can improve student learning outcomes on cognitive aspects (Putri et al., 2017). With discovery are student who makes discovery learning is better than student make conventional learning. Teachers who implementating discovery learning can create a high quality learning (Raharjo et al., 2019). The significant improvements indicated that discovery-based speaking assessments were effective to improve the students' speaking skill, critical thinking, and creativity (Wahyudi et al., 2019). The critical thinking ability of students applying discovery learning model is better than students' critical thinking ability with conventional learning (Martaida et al., 2017). This increase is seen from the percentage of completeness in each cycle. Students who were declared complete in the first cycle based on the results of the test there were 7 students (26.92%), the second cycle became 17 students (65.38%) and the third cycle 23 students (88.46%) (Rosarina et al., 2016).

The results of the study showed that using the discovery learning model of learning completeness of students before the action and after the action, namely; cycle I (60.00%), and cycle II (90.00%) (Salmi, 2019).The results of student learning with models Discovery Learning higher than direct instruction learning with the acquisition t-test is t count 3,291 > t table 1,99, with details of the average value of the experimental class 80,176 and the average value of the control class 76,083 (Mubarok & Sulistio, 2014). Based on the results of the study concluded that the application of discovery learning model increases the activity, scientific attitude and student cognitive learning outcomes (Malinda et al., 2019). There is a positive and significant linear influence between the mathematical representation of skills and the learning outcomes of science, through a problem-based learning model of discovery (Ertikanto et al., 2018). So it is concluded that there is an influence of using discovery learningmodel with LKS based on discovery of learning outcomes, science process skills, andstudent learning interest (Inka et al., 2017). Based on the results of research can be concluded that the application of problem-based learning model can boost the activity and student learning outcomes and problem-solving skills(Baksir et al., 2017).

Based on the data, it was also found that students' skills in problem solving, critical thinking, and finding knowledge can be improved through research-based learning (Srikoon et al., 2014; Alshehry, 2014). Increasing physics concepts and generic abilities's students can be done effectively through research-based learning (Usmeldi, 2015b). Students' physics and process skills can be improved through research based learning (Usmeldi, 2015a). Research based physics learning with a scientific approach can improve students' scientific literacy effectively (Usmeldi, 2016b). Student curiosity about the subject matter can be improved through research-based learning (Lui, 2011; Walkington, 2011). Cognitive skills, critical thinking skills, scientific work skills, and students' scientific attitudes can be improved through research methods in research-based learning (Cahyani, 2014; Sulistijo, 2017; Hairida, 2016). According to Trisnasih (2013) in the research said that activities, skills and knowledge of students in

science lessons can be improved through research-based learning.

CONCLUSION

Based on the research, the following conclusions can be drawn, the calorific value of the mixture durian briquettes was 20% and 80% coconut shell as much as 7306.81 cal/gram; durian briquette mixture value of 50% durian skin and 50% coconut shell as much as 6487.31 cal/gram, mixture of durian skin briquettes 80% and 20% coconut shell as much as 6284.99 cal/gram, and implementation in learning showed that there were increase in cognitive learning outcomes students in the high, medium and low groups after learning by Discovery Learning model. The N-gain value for the high group was 0.78 in the high category, the medium group was 0.57 in the medium category, and the low group was 0.53 in the medium category.

REFERENCES

Alshehry, Amel Thafer. (2014). Teaching Research Writing to Female Undergraduates In Saudi Arabia. *International Journal of Education Learning and Development* 2(4) 15-25.

Bahri, S. (2007). Pemanfaatan Limbah Industri Pengolahan Kayu untuk Pembuatan Briket Arang dalam Mengurangi Pencemaran di Nangroe Aceh Darusalam. *Universitas Sumatera Utara.*

Baksir, Elda Lestari.,Mayub, Afrizal., & Putri, Desy Hanisa. (2017). Peningkatan Aktifitas dan Hasil Belajar Siswa Serta Kemampuan Pemecahan Masalah Melal uji Model Problem Based Learning PadaKonsepCahaya di Kls VIII.E SMP N 6 Bengkulu, *Jurnal Pembelajaran Fisika,* Vol.1 (1).

Ertikanto, C., U. Rosidin, I. W. Distrik, Yuberti, T. Rahayu (2018). Comparison of Mathematical Representation Skill and Science Learning Result In Classes With Problem-Based And Discovery Learning Model, *Jurnal Pendidikan IPA Indonesia*, Vol7 (1) 106-113.

Cahyani, R.., Rustaman, N.Y., Arifin, M., & Hendriani, Y. (2014). Kemampuan Kognisi, Kerja Ilmiah dan Sikap Mahasiswa non IPA melalui Pembelajaran Inkuiri Berbantuan Multimedia. *Jurnal Pendidikan IPA Indonesia*, Vol3(1), 1-4.

Mubarok, Chusni., & Edy Sulistyo. (2014). Penerapan Model Pembelajaran Discovery Learning Terhadap hasilbelajar siswa Kls X Tav Pada Standar Kompetensi melakukan instalasi sound system di SMK N 2 Surabaya, *Jurnal Pendidikan Teknik Elektro*, Vol. 03 (01) 215 – 221.

Fajari, I. (2012). Karakteristik Pembakaran Briket Arang Campuran Sekam Padi dan Serbuk Kayu Serta Implementasinya sebagai Model Pembelajaran Dengan LKS Kimia Berbasis Keterampilan Proses di SMA N 3 Lubuk Linggau. *Tesis Pascasarjana,* Universitas Bengkulu.

Gina Rosarina, Ali Sudin, AtepSujana (2016). Penerapan Model Discovery Learning untuk meningkatkan Hasil Belajar siswapa da materi Perubahan Wujud benda *Jurnal Pena Ilmiah:* Vol. 1 (1).

Hairida, H. (2016). The Effectiveness Using Inquiry Based Natural Science Module with Authentic Assessment to Improve The Critical Thinking and Inquiry Skills of Junior High School Students. *JurnalPendidikan IPA Indonesia*, Vol.*5*(2), 209-215.

Hasbullah, Iskandar, T., Yuniningsih, S.(2018). Identifikasi Nilai Kalor pada Briket Biochar Berbahan Baku Kulit Durian. *eUREKA. Jurnal Penelitian Mahasiswa Teknik Sipil dan Tehnik Kimia*,Vol.2(1) 1-8.

Hatta, V.(2007).Manfaat Kulit Durian Selezat Buahnya.*Universitas Lampung*. Lampung

Hendra, D., Darmawan, S. (2000). Pembuatan Briket Arang Serbuk Gergajian Kayu dengan Penambahan Tempurung Kelapa. *Buletin Penelitian Hasil Hutan*. Bogor.

Inka Nofita, Afrizal, M.,Eko, S. (2017). Pengaruh Model *Discovery Learning* Dengan Lks Berbasis Penemuan Terhadap Hasil Belajar, Keterampilan Proses Sains, Serta Minat Belajar Pada Konsep Getaran Dan Gelombang Di SMPN 1 Kota Bengkulu, *Jurnal Pembelajaran Fisika,* Vol. 1 (1).

Patandung, Petrus & Silaban, Doly Prima. (2017). Karakteristik Penyalaan Briket

Limbah Serbuk Arang Tempurung Kelapa Dengan Bahan Pemantik Abu Kelapa (Cocodust), *Jurnal Riset Teknologi Industri*, Vol.11 (1), 50-58

Liu, X., & Li, Q. (2011). Combination of The Research-Based Learning Method with The Modern Physics Experiment Course Teaching. *International Education Studies*, Vol4(1), 101-109.

Nurhilal, O., & Suryaningsih, S. (2017). Karakterisasi Biobriket Campuran Serbuk Kayudan Tempurung Kelapa, *Jurnal Material Dan Energi Indonesia,* 07(02) 13 – 16.

Nurhilal, O., &Suryaningsih, S. (2018). Pengaruh Komposisi Campuran Sabut dan Tempurung Kelapa Terhadap Nilai Kalor Biobriket dengan Perekat Molase. Bandung: *Jurnal Ilmudan Inovasi Fisika* Vol. 2 (01) 8-14

Nuriana, W., Anisa, N., &Martana(2013). Karakteristik Biobriket Kulit Durian Sebagai Bahan Bakar Alternatif Terbarukan, *Jurnal Teknologi Industri Pertanian*23(1), 70-76.

Putri, I., Juliani, R., Lestari, N. (2017). Pengaruh Model Pembelajaran Discovery Learning terhadap Hasil Belajar Siswa dan Aktivitas Siswa. Medan. *Jurnal Pendidikan Fisika* Vol 6.

RoniWahyudi, Dwi Rukmini, Dwi Anggani Linggar Bharati. (2019). Developing Discovery Learning-Based Assessment Module to Stimulate Critical Thinking and Creativity of Students' Speaking Performance, *English Education Journal,* Vol. 9 (2) 172 – 180

Salmi (2019). Penerapan Model Pembelajaran Discovery Learning dalam meningkatkan hasil belajar Ekonomi peserta didik Kls XII IPS.2 SMA N 13 Palembang, *JURNAL PROFIT VOLUME 6 (1)*

Malinda, Sherli., Rohadi, N., & Medriati, R. (2017). Penerapan Model Pembelajaran Discovery Learning Untuk Meningkatkan Sikaplmiah dan Hasil Belajar Kognitif Siswa Pada Konsep Usaha dan EnergiKls X MIPA.3 SMAN 10 Bengkulu, *Jurnal Pembelajaran Fisika*, 1(1), 56-63

Srikoon, S., Bunterm, T., Samranjai, J., & Wattanathorn, J. (2014). Research Synthesis of Research-based Learning for Education in Thailand. *Procedia-Social and Behavioral Sciences*, 116, 913-917.

Sudiro, S., Farid, M., Swistoro, E. (2018). Hubungan antara kedalaman Permukaan Air Tanah dengan Salinitas di Pesisir Pantai Kungkai Baru serta Penggunaan Model Discovery Learning. *PENDIPA Journal of Scince Education*, Vol 2 (3).

Sulistijo, S.H., Sukarmin, W. Sunarno (2017). Physics Learning Using Inquiry-Student Team Achievement Division and Guided Inquiry Models Viewed by Students Achievement Motivation. *Jurnal Pendidikan IPA Indonesia,* Vol.6(1),130-137.

Martaida, Tota., Bukit, Nurdin., &Ginting, Eva Marlina. (2017). The Effect of Discovery Learning Model on Student's Critical Thinking and Cognitive Ability in Junior High School, *IOSR Journal of Research & Method in Education (IOSR-JRME),*Vol.7 (6), 01-08.

Raharjo, Tri Joko., Kisworo, Bagus., & Harianingsih (2019). The Implementation Effect of Discovery Learning Model for Non-Formal Education Student. *International Journal of Academic Research in Business and Social Sciences,*Vol. 9 (9).

Triono, A. (2006). Karakteristik Briket arang dari campuran serbuk gergaji kayu Afrika (Aesopsis emini) dan Sengon (Paraserianthes falcarita) dengan Penambahan Tempurung Kelapa, *Institut Pertanian Bogor,* Bogor.

Trisnasih, Anjuntia Bella. (2013). Peningkatan Keterampilan Proses dan Hasil Belajar IPA melalui Model Research-based Learning SiswaKelas VSD. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha,* Vol.4 (1), 23-28

Usmeldi (2016a). The Development of Research-based Physics Learning Model with Scientific Approach to Develop Students'Scientific Processing Skill. *JurnalPendidikan IPA Indonesia*, Vol.*5* (1),134-139.

Usmeldi (2016b). Pengembangan Modul Pembelajaran Fisika Berbasis Risetdengan Pendekatan Scientific untuk Meningkatkan Literasi Sains Peserta Didik. *Jurnal Penelitian & Pengembangan PendidikanFisika*, Vol. 2(1), 1-8.

Usmeldi, R. Amini, S. Trisna (2017*)*. The Development of Research-Based Learning Model with Science, Environment, Technology, and Society Approaches to Improve Critical Thinking of Students. *JurnalPendidikan IPA Indonesia*, Vol.*6* (2),134-139

Walkington, H., Griffin, A. L., Keys-Mathews, L., Metoyer, S. K., Miller, W. E., Baker, R., & France, D. (2011). Embedding Research-based Learning Early in The Undergraduate Geography Curriculum. *Journal of Geography in HigherEducation*, Vol*35*(3), 315-330

Yuliah, Y., Hakim, L., &Hadiyan, Y. (2018). Nagasari (Mesuaferrea): Budidayadan Potensinya sebagai Tanaman Obat Nagasari, *Proceeding Biology Education Conference* Vol.15 (1), 808-812

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