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Research and Scientific Publication Unit (URPI), Faculty of Islamic Education and Teacher Training
Universitas Islam Negeri Raden Intan Lampung, Indonesia

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ABOUT THE JOURNAL

Overview

Tadris: Jurnal Keguruan dan Ilmu Tarbiyah (Tadris: Journal of Education and Teacher Training) is a peer-reviewed journal on education and teacher training. Tadris Journal is intended to communicate researchers with current issues and present developments on the subject through the publication of articles and research reports. This journal provides readers with a better understanding of education and teacher training, especially in the Muslim world. All articles will be reviewed by experts before accepted for publication. Each author is solely responsible for the content of the published articles.

Tadris Journal is published by Research and Scientific Publication Unit (URPI), Faculty of Education and Teacher Training, Universitas Islam Negeri Raden Intan Lampung, Indonesia. This Journal collaborates with Perkumpulan Pendidik IPA Indonesia (PPII) / Indonesian Society for Science Educators and Perkumpulan Sarjana Pendidikan Islam Indonesia (PSPII) / Indonesian Society for Scholar of Islamic Education. Tadris Journal is accredited by the Ministry of Research, Technology and Higher Education Republic of Indonesia Number 21/E/KPT/2018 (Grade 3).

Tadris Journal is published twice a year in the months of June and December. The journal publishes in English and it is open to authors around the world regardless of the nationality.

Focus and Scope

Tadris Journal is a peer-reviewed journal on education and teacher training. This journal encompasses original research articles and reviews articles, including Studies in Social Education, Studies in Science Education, Mathematics Education, Management Education, Teaching and Learning, Quality Education, Education Development and Society, Educational Technology, Language Education, Philosophy of Education, Religious Education, Teacher Education, and Early Childhood Education.

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Every submitted paper will be reviewed by at least two peer-reviewers. Reviewers are unaware of the identity of the authors, and authors are also unaware of the identity of reviewers (a double-blind peer-review). Reviewing process will consider novelty, objectivity, method, scientific impact, conclusion, and references.

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FOREWORD

Welcome to the Tadris: Jurnal Keguruan dan Ilmu Tarbiyah (Tadris: Journal of Education and Teacher Training) Volume 3 (2), December 2018. Tadris Journal is an open-access journal on education and teacher training. Tadris Journal is published by Research and Scientific Publication Unit (URPI), Faculty of Islamic Education and Teacher Training Universitas Islam Negeri Raden Intan Lampung. Tadris Journal is intended to communicate researchers with current issues and present developments on the subject through the publication of articles and research reports. This journal provides readers with a better understanding of education and teacher training, especially in the Muslim world.

This issue contains 10 articles. All articles will be reviewed by experts before accepted for publication. Some issues talk about the gender profile of students' Pro-Environmental Behavior (PEB) based on green consumerism, the effect of Professional Education and Training for Teachers, a paradigm development of community learning management, and some talk about efforts in overcoming classroom learning problems.

Hopefully, the contents of this journal can add insight, made reference, and provide a meaningful contribution to the advancement of education in Indonesia in particular, and the world at large. Suggestions and constructive criticism we hope to improve Tadris Journal in the future.

Editor-in-Chief

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Learning Environment: Gender Profile of Students' Pro-Environmental Behavior (PEB) based on Green Consumerism

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Abstract: The damage to nature and the changing situation of the surrounding environment certainly make you anxious. The role of students in safeguarding nature is certainly one of the important points in determining the sustainability of green consumerism. The purpose of this study is to see the influence of gender in the students' Pro-Environmental Behavior (PEB) in understanding the concept of green consumerism. The research was conducted in July-August 2018. The research was located at State Junior High School (SMPN) 1 of South Tambun, Bekasi, West Java, Indonesia. The method used was a survey with simple random sampling to obtain 214 samples consisted of 107 male students and 107 female students. PEB score of male students was 63.86 and 64.34 for female students. Data analysis used was t-test with a confidence level of 95%. The results of the t-test showed that there were no differences in green consumerism in terms Pro-Environmental Behavior between male and female. This shows that there needs to be an effort in evaluation by the teachers to improve the male and female students Pro-Environmental Behavior.

INTRODUCTION

Recent environmental changes have led many to express their opinions about environmental issues. Starting from the problem of forest damage that occurs due to illegal logging (Margono, Potapov, Turubanova, Stolle, & Hansen, 2014). Damage to forests certainly has a bad impact on survival in the coming years. Factors that cause damage to the forest are due to poorly controlled mining and extraction of natural resources (Abood, Lee, Burivalova, Garcia-Ulloa, & Koh, 2015). This causes the energy source to run out quickly. Besides that, it can also cause more severe global warming which has now occurred. In principle, it is increasingly worsening the current environmental conditions.

Many of the analyzes lead to one answer which is green consumerism. A good environment will be maintained if the community care for and protect the environment from pollution. Green consumerism is one of the important things in maintaining the sustainability of human consumption so that the environment is maintained (Han & Yoon, 2015; Lekakos, Vlachos, & Koritos, 2014). Green consumerism is a society's understanding of consumer goods that are more environmentally friendly. The purchase of environmentally friendly products is greatly influenced by many factors, the only advertisement (Matthes & Wonneberger, 2014). Meanwhile, education plays an important role as well so that people can be smart in choosing

and understanding the importance of green consumerism.

A person's understanding of green consumerism can be attributed to someone's Pro-Environmental Behavior (PEB) in living their daily lives, in this case, junior high school students. A good PEB from junior high school students certainly affects the surrounding environment (Ting & Cheng, 2017). Students as one of the actors in protecting the environment have many roles. Student behavior in maintaining the environment is reflected through PEB. Students who have high PEB usually have a high tendency to maintaining the environment. PEB can be reflected if a student can master and understand the concept of green consumerism. This makes green consumerism very important to be understood by students at various levels to have an impact on PEB (Steinhorst & Klöckner, 2017; Yu, Yu, & Chao, 2017). One of them are students at the junior high school. Students in junior high school are not majored in science and social studies. This causes environmental learning to be very effective at this level because all students will get the same material. Students at this level are students who are quite ready to accept science learning at school, including learning the environmental material. The learning must, of course, be delivered interestingly so that students do not get bored (Hidayati & Wuryandari, 2012; Seechaliao, 2017).

Middle school students are students who have characteristics in which they are building their knowledge. One that relates to a student's success in learning Science is gender (Vincent-Ruz & Schunn, 2017). It plays a role because gender determines how one must behave. Gender is thought to be closely related to green consumerism. Science learning on the environmental material is important to learn. This is because, in this modern era, there has been a shift in trends in environmental learning, for this reason, gender factors of the junior high school students must be examined (Sax et al., 2017). Based on the existing problems, it was found that many environmental problems have not been resolved, while the role of students has not been too visible in maintaining their environment, so it is necessary to measure the PEB of the students. So that the emergence of the urgency and purpose of this study is to see the influence of gender on the PEB score of the junior high school students.

METHOD

The method used in the research was surveys techniques. The survey was conducted with instruments directly to the students in the class. Instruments that have been given to the students are then collected to obtain the PEB scores. The samples were 214 students of State Junior High School (SMPN) 1 of South Tambun, Bekasi, West Java, Indonesia.This school was chosen because it has students with good academic skills in Bekasi. This school also has a program based on students' environmental concepts in their learning activities. The research was conducted in July-August 2018. Samples were randomized through simple random sampling technique in order to obtain a sample of 107 male students and 107 female students. The data was tested for its normality and homogeneity then the analysis continued with independent t-test with a 95% confidence level.

The instrument used in this study was a standardized instrument that was modified slightly. The goal was to match the characteristics of the sample taken. the instruments used was the one proposed by Kaiser and Wilson (Kaiser & Wilson, 2004). The details can be seen in Table 1.

Table 1. PEB Aspects for Junior High School Students

Number	Aspects	Items
1	Energy Conservation	1,2
2	Transportation	3,4*
3	Waste Avoidance	5,6
4	Consumerism	7,8,9*,10*

Number	Aspects	Items
5	Recycling	11,12
6	Vicarious, Social Behavior	13,14,15

Note: *negative items

The hypothesis in this study was based on various previous studies so that a guess can be obtained. The hypothesis can be seen below. More clearly can be formulated as follows:

H_0: There is no difference in the PEB score between male and female student of junior high school.
H_1: There is a difference in the PEB score between male and female student of junior high school.

RESULT AND DISCUSSION

Based on the data collected, the average PEB score of male students was 63.86 while 64.34 for female students (score range 0-100). Data is presented in graphic to see a comparison of the average PEB score of male and female students. More details can be seen in Figure 1.

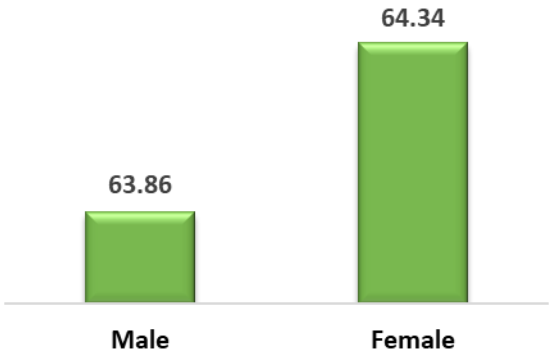

Figure 1. The Average PEB Score of Male and Female Students

It was seen that the PEB score of female students was slightly higher than the PEB score of male students. However, the difference in score is not too significant. The further analysis should be carried out to identify the difference of PEB score between male and female students. The results of the tests for normality and homogeneity showed that the data was normally distributed and homogeneous so that the t-test could be carried out. T-test results were obtained and can be seen in Table 2.

Table 2. Results of t-Test of the PEB Scores of the Male and Female Students

Sig.	t	df	Sig.(2-tailed)
.613	-.320	212	.750

The clearer results related to the PEB of students are described in the details. Based on the results of the t-test, it can be concluded that H_0 is accepted, which means there is no difference in PEB score between male and female students. This is done to analyze further which points are superior between Male (M) and Female (F). More details can be seen in Table 3.

Table 3. Student PEB Scores on Each Item

No	Item	M	F
1	I turn off the light when I going to sleep	3.89	4.12
2	To dry clothes, I use sunlight	4.61	4.71
3	I go to school using public transportation, bicycle, or on foot	3.34	3.64
4	I use a private car or rent more during an excursion than using public transportation*	2.45	2.51
5	I am reusing used paper	2.78	2.82
6	I use a personal tote bag to shop	2.64	2.66
7	I buy products that are environmentally friendly	3.51	3.33
8	I consume organic food products because they are more environmentally friendly	3.53	3.47
9	I like to buy food in Styrofoam because it is practical and light*	2.83	3.07
10	I use insect repellent spray*	2.74	2.97

No	Item	M	F
11	I separate organic waste and plastic waste	3.21	3.00
12	I bought recycled items because it supports go green	2.92	2.83
13	I contribute financially to environmental organizations	3.21	2.96
14	I take part in the community to clean the environment	3.46	3.53
15	I invite people through social media to be more concerned about the environment	2.78	2.63

Note: M (Male), F (Female)

Score range 1-5
a) positive item, apply: always = 5, often = 4, sometimes = 3, rarely = 2, never = 1

b) *negative item, apply: always = 1, often = 2, sometimes = 3, rarely = 4, never = 5

The score contained in Table 3 for each item has a range of 1-5. It is seen that in some aspects of PEB, male students are higher and in some other points, female students are higher. This shows that students' PEB based on gender have variations in every point. This is because every gender has its own characteristics in aspect of PEB (Meyer, 2016).

In items 1-6 it appears that the PEB scores of female students are superior to that of men. This indicates that the female students' PEB in this aspect is better than the male student's PEB. This can happen because female students are indeed more economical in using energy. One example is when they sleep, they usually turn off their light. Even if they use light, they usually use dimmer. Unlike male students who are very wasteful in using energy. Male students tend to be more wasteful in using energy because they are not used to doing things faster, and sometimes they don't think too much about their surroundings. This discovery further proves that gender turns out to have a role in PEB and student knowledge, for that the teacher must begin to pay attention to gender factors in learning (Gullberg, Andersson, Danielsson, Scantlebury, & Hussénius, 2018; Price, Kares, Segovia, & Loyd, 2018; Sax et al., 2017).

Another aspect that is superior for female students is the aspect of transportation. This is due to the fact that more female students use public transport and rental vehicles that can fit many people. The rent car can fit 5-8 people. Meanwhile, male students tend to be reluctant to use this rental vehicle. They prefer to use private vehicles. Psychologically, men want to stand out compared to other men. This gender difference also influences classroom learning (Chander & Muthukrishnan, 2015; Lekakos et al., 2014; Price et al., 2018).

The next discussion is about recycling aspects in points 5 and 6. In this aspect also the PEB score of female students is higher than the PEB score of male students. The reason is that female students often use durable items, for example in using paper. The female students more often use small paper for them to take notes. This habit is certainly very good in the concept of protecting the environment, it would be better if the learning did not use paper at all then it would be better so that the paper will not be wasted (Meishar-Tal & Shonfeld, 2018). In addition, paper producers have also begun to think about innovations so that paper production becomes more environmentally friendly (Silva, Pavan, Oliveira, & Ometto, 2015).

In addition, the problem of shopping using a tote bag is a habit of female students in shopping at the market. This can be seen with the many tote bags with many motifs that are often bought by female students. While men sometimes give priority to prestige rather than having to use a tote bag, because this is not a normal habit. The use of this tote bag is a form to support the use of

environmentally friendly green products (Dangelico, Pujari, & Pontrandolfo, 2017; Sangroya & Nayak, 2017). More and more of its use also affects the industrial sector to design products favored by young people who love the environment (Gu, Chhajed, Petruzzi, & Yalabik, 2015).

Next is the aspect of green consumerism which is reflected in points 7 to 10. In points 7 and 8 it can be illustrated that PEB male students are higher than PEB female students. This result is different from the results in points 1 to 6, where the PEB score is higher for women. In this case, male students have a higher PEB score because they are better able to maintain their food. In men, they tend to be able to regulate food intake. They can manage various foods they consume. This habit is very good because someone's economy can be better maintained so as not to waste food (Arnold, Kibbe, Hartig, & Kaiser, 2018; Kanchanabhandhu & Woraphong, 2016; McCarthy & Liu, 2017). Unlike female students, in this case, it tends to be easier to be tempted or vice versa to do a diet that is too tight. A diet that is too tight is also not good for health (Iwata, Tsuzuki, Iwata, & Terasawa, 2017).

In points 9 and 10, the PEB score of female students is superior to the PEB score of male students. This is because female students are usually more selective in buying food in the canteen. This is certainly very positive. Also, female students do not like using insect repellent because it makes them feel uncomfortable. Usually, they prefer to use mosquito repellents that do not cause odor. This activity is a form of keeping the air from being contaminated with harmful chemicals so that the environment is maintained (Lavelle, Rau, & Fahy, 2015). The next aspect is recycling which is reflected in points 11 and 12. The PEB score of male students, in this case, is far superior to the PEB score of female students most likely because male students are more daring in sorting trash. Psychologically, this environmental safeguard behavior is not that easy to do, especially for students who have low PEB (Freed, 2018).

Final discussion about social contributions. Male students prefer to contribute socially to the environment using the money by contributing to environmental organizations and participating in campaigns on social media. While female students prefer to take part directly in community service to clean up the damaged environment, both of these things prove that precisely female students prefer to interact directly with their environment compared to male students. However, we also have to realize that campaigning for the invitation to protect the environment through social media is also a positive thing. Social media has the benefit of disseminating information related to learning (Blaschke, 2014; Boholano, 2017; Yusop & Sumari, 2013). In addition, social media can also be used as a learning medium (Yusop & Sumari, 2013).

Overall male and female students have their respective advantages in PEB. The teacher actually also has a role in educating his students to have a high PEB, both male students and female students. A high student PEB is certainly very useful for future environmental sustainability. The solution that can be offered is a lot to be able to intervene to students so that their PEB score becomes higher (Truelove & Gillis, 2018). The older the student should also be more aware of how important PEB is for the sustainability of the future environment (Jonell, Crona, Brown, Rönnbäck, & Troell, 2016; Krettenauer, 2017; Yu et al., 2017).

The possible intervention is by the teacher. A teacher is also known as a facilitator in learning. The facilitator essentially directs students to do things as freely as possible but continues toward

the same learning goals. Teachers cannot govern students, because now student center based learning (Tyabaev, Sedelnikova, & Voytovich, 2015). Our common goal is certainly towards a better understanding of students about green consumerism. This understanding of green consumerism can be invested since students take the junior high school. This is because, at the junior high school level, students have begun to have sufficient reason to understand that the environment must be maintained. Unfortunately, the environmental issue that discusses green consumerism in this school is still very little discussed, even though it is very good learning based on the issue (Kamaludin, Surtikanti, & Surakusumah, 2018; Paço & Gouveia Rodrigues, 2016; Yavich & Starichenko, 2017).

The discussion of green consumerism in schools regarding learning tools such as syllabus, learning plans, learning media, teaching materials, and student worksheets is still very limited. This causes teachers to have difficulty teaching the concept of green consumerism in schools. We recommend that teachers also do a learning innovation to solve this. Students are invited to search for sources of information related to green consumerism on the internet (Geçer, 2014; Jiang et al., 2017; Reyna, Hanham, & Meier, 2018). In addition, teachers can actually develop their own devices that contain the concept of green consumerism as a whole. Development of learning tools can help break the deadlock (Ichsan, Dewi, Hermawati, & Iriani, 2018; Ito & Kawazoe, 2015). This is certainly very helpful in delivering material in the classroom.

Another alternative that the teacher can do is to build a student center learning atmosphere. This can be done by conducting various activities aimed at preserving the environment. This activity can be designed by the teacher in various ways. The most important thing is that learning must make students active because it will motivate students (Owens, Sadler, Barlow, & Smith-Walters, 2017). One of them is by doing the processing of plastic waste into a handicraft (Ichsan & Mulyani, 2018). This activity proved to be effective in improving students' motoric abilities. In addition, many activities such as discussion with problems based. This learning is also good for stimulating students' critical thinking (Said & Syarif, 2016). In addition, problem-based learning can also improve student learning outcomes (Gündüz, Alemdağ, Yaşar, & Erdem, 2016; Ichsan, Iriani, & Hermawati, 2018; Khoiriyah & Husamah, 2018; van der Veen & van Oers, 2017). Eco-friendly games can also be applied as a form of innovation (Morganti et al., 2017).

In the end, all parties must be involved in improving PEB students not only teachers who are required. If viewed from the point of view of the leadership of a school principal, for example, he can make rules that require students to bring their own gadgets, so they do not use paper to record (Ferguson, 2017). Students can also be invited to bring their own place to eat. This is very good because there are still many school canteens that are not paying attention to this green consumer. In addition, sanctions given to students who throw trash out of place can be applied. Sanctions given must certainly be a punishment that educates, such as giving sanctions to create a project on green consumerism learning. In addition to punishment, doing a project is very good in studying science lessons (Amaral & Santos, 2018; Jewpanich & Piriyasurawong, 2015; Lou, Chou, Shih, & Chung, 2017). Overall in principle, all parties, including teachers, principals, and parents must be involved in building an understanding of green consumerism of junior high school students so that the PEB students will be better in the future.

CONCLUSION

The understanding of students' green consumerism as a whole is still considered lacking, as evidenced by the PEB score of male and female students that are still relatively not too high. Specifically, male and female students have their respective advantages in every aspect measured by the PEB instrument. Teachers, parents, and principals have a strategic role in instilling this green consumerism concept to junior high school students. Teachers have a role in improving students' PEB with environmental learning innovations, by developing learning tools.

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Development of Interactive E-book on Energy Resources to Enhance Student's Critical Thinking Ability

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Abstract: This research aimed to develop a valid interactive e-book using Learning Content Development System (LCDS) with scientific approach on energy resources to enhance student's critical thinking ability, to know readability and the ease of operating the developed e-book. The method used is research and development. The implementation of procedures adopted from Sugiyono's design which consisted of 7 adjusted steps that were potency and problem assessment, data collecting, developing preliminary form of product, expert validation, design revision, one-on-one test, and product revision. Developed e-book contains pictures, animations, simulations, learning video, essay question, and interactive test. The e-book has been validated in content and design with results "very appropriate" in quality and "proper to use" as the recommendation for students in learning energy resource topic with scientific approach to foster critical thinking ability. One-on-one test's results show that e-book is very easy to operate with score 3,68 and has very good readability with score 3,60.

INTRODUCTION

The development of education system in Indonesia requires students to adapt to the conditions that they will face in the future such as globalization, environmental problems, the advancement of information, and the convergence of science and technology. One of many things developed by the government in the field of education in Indonesia is the 2013 curriculum. Kemendikbud states that the 2013 curriculum is a development product of curriculum that requires students to fulfill several future competencies such as communication skills and critical thinking skills that will be very useful to encounter global problems in the future (Kemendikbud, 2014).

One of the environmental issues that Indonesia and other countries encounter is the use of electricity. The use of electricity in Indonesia, which continues to increase every year, is still largely sourced from non-renewable energy resources such as coal, petroleum, and natural gas. The non-renewable energy is in critical condition which will be exhausted in the next decades (National Geographic, 2015). This requires the Indonesian people to save on using electricity and change the use of non-renewable energy sources into renewable energy as primary energy that will be converted into electricity.

Teenagers also contribute to the rise of using electricity in everyday life such as the use of laptops, cell phones, televisions, and other entertainment

devices. However, behavior towards the use of electricity in teenagers is still relatively low (Agung, 2012). This has a bad impact on the availability of electricity sourced from non-renewable energy. This is also in line with the Indonesian government that put the Energy Resources topic in the 2013 curriculum for grade XII in even semester so that students (teenagers) can analyze the impact of electricity use.

Learning physics in the 2013 curriculum requires the use of scientific approach in the learning process with steps such as observing, questioning, experimenting, reasoning /analyzing, and communicating. Based on those steps, students are asked to think critically, creatively, and innovatively. Critical thinking is applied to students to solve problems systematically, innovatively, and to design fundamental solutions. Through critical thinking, students analyze what they think, synthesize information, and conclude (Rehena & Tumbel, 2010).

Krathwohl stated that the indicators used to measure critical thinking in taxonomy bloom are analyzing (C4), evaluating (C5), and creating (C6) (Krathwohl, 2002). Based on the explanation above, it is said that critical thinking skills which also includes in High Order Thinking Skills for both direct learning and online are the skills in which students need to answer global challenges and environmental problems because the indicators used to require students to analyze, evaluate, and create.

In its application, students use learning media to foster critical thinking. Along with the development of technology, learning media especially, books have been electronically accessible or better known as electronic school book (e-book) which can be downloaded by all students as a source of learning support in addition to printed books. However, the existence of e-book in Indonesia regarding content is not too different from printed books, or in other words, it is static, and its only different is the form of the book itself which from traditional book to electronic book so that it is easy to carry (Darlen, Sjarkawi, & Lukman, 2015).

Based on the rapid technological development, e-book should contain a compilation of learning videos, animation, audio, and images. So that the contents of e-book are not monotonous, interesting, interactive, and can foster students' critical thinking skills through the interaction obtained from the use of the e-book, especially in the topic of energy resources that require many representations of images or videos in learning. This is supported by research conducted by Husein et al. showing that using interactive multimedia in learning physics for high school students can enhance students' critical thinking (Husein, Herayanti, & Gunawan, 2015).

The questionnaire was given to 24 students and one physics teacher in class XII related to physics learning in even semester of grade XII. The results of needs analysis show much as 96% of students used student worksheet from one publisher, 33% of students used printed books from the school, the existence of e-book in the form of pdf files is only used by 17% of students, and 4% uses interactive e-book. It concluded that students are not very familiar with a variety of learning resources, especially interactive e-book for physics subject.

The development of this interactive e-book is also strongly supported by the conditions faced by students based on the results of needs analysis questionnaire, such as, the amount of time that students have to learn physics material in grade XII in even semester is very limited and the material of energy resources, in basic competency of 3.13, is a new material added by the Indonesian government in the 2013 curriculum syllabus. It results in a learning process that did not run maximally regarding time availability, the

learning process that is lack of opportunity for students to think critically, the teacher who only explain the material that matters and about to come out on the exam, and even some material are passed by students.

Also, research by Suyatna concluded that interactive e-book on the topic of relativity theory using LCDS improved strudents' critical thinking ability even better compare to static books and could overcome the problem of limited time in learning physics (Ayuningtias, Suyatna, Suyanto, & Nwineh, 2018; Suyatna, Distrik, Herlina, Suyanto, & Haryaningtias, 2018). Physics, as a subject, represents content not only by words and equations but also through a graph, pictures, videos, simulations, and analogies. All those representations are in line with the advancement of technology for learning physics and can be accessed through integrated multimedia which one of them is the Learning Content Development System (LCDS).

The use of multimedia such as pictures, animations, videos, and simulation in learning physics also can improve to understand concepts (Kiboss, 2002). E-book, designed with the scientific approach on a topic of wave, which contains videos, animations, and simulations can improve sciences process skills and learning outcomes (Yurika, Suyatna, & Viyanti, 2014). Based on the description, it is very important to develop a valid interactive e-book development with an LCDS-based scientific approach to the material of energy resources that aims to foster students' ability to think critically, have good readability, and are easy to operate.

METHOD

The research method used in this study is research and development. Research and development method is a research method used to produce products and test the effectiveness of these products (Sugiyono, 2015). In this study, the developed product was an LCDS-based interactive e-book with scientific approach on energy resources to enhance critical thinking for high school students of grade XII in even semester. In the interactive e-book product development, not all stages of Sugiyono's R & D methodology were used, but only seven stages were used and adapted to the needs of researchers.

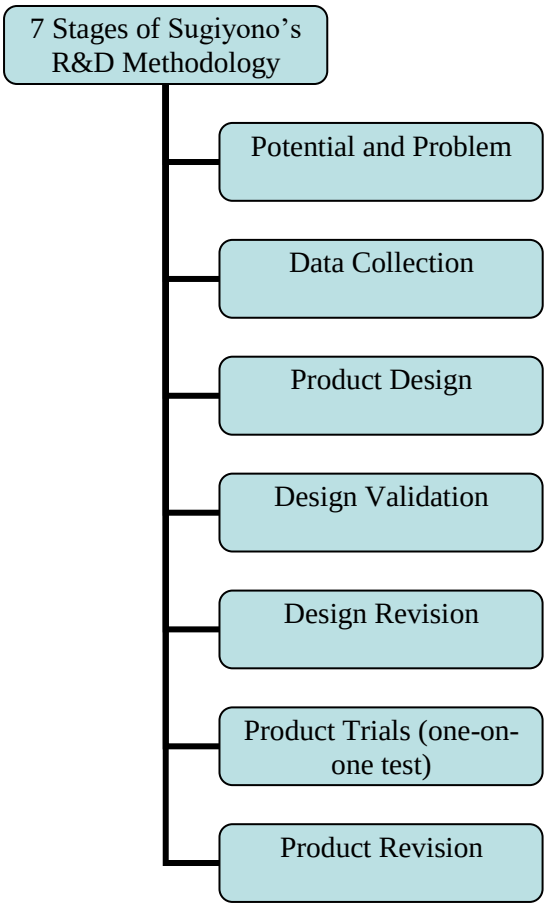

Figure 1. Seven Stages of R&D Methodology

A validation test was done by two tests, namely the design expert test and material expert test. Design and material expert tests were given to two lecturers of Physics Education and three teachers who were certified educators. In the questionnaire assessment of instrument expert validation test, there are four answer choices with a score of 1 to 4 as a

response to the questions given. The assessment score of the validation test can be seen in Table 1 (Suyanto & Sartinem, 2009).

Table 1. Expert Validation Score for Design and Material Test

Score	Quality
4	Very Appropriate
3	Appropriate
2	Less Appropriate
1	Not Appropriate

Product trials are conducted by one on one test. One on one test is conducted to determine the level of readability and ease of operation of the developed interactive e-book on energy resources. This one-on-one test was conducted on six students consisting of three male students and three female students. Each male and female student has different learning achievement under categories of the low, medium, and high. Scoring assessment can be seen in Table 2 (Suyanto & Sartinem, 2009).

Table 2. One on One Test Scoring Assessment

Score	Readability Assessment Criteria	The Ease of Operation Assessment Criteria
4	Very good	Very easy
3	Good	Easy
2	Low	Less easy
1	Not good	Not easy

RESULT AND DISCUSSION

Potential and Problems

The potential and problem assessment stage was done to explore information on learning in schools. At this stage, data is collected by field study and questionnaire. The results obtained from observation and questionnaires indicate that there is a gap between the real and ideal conditions that urged to develop an alternative instructional material in the form of interactive e-book, especially on energy resources.

Based on the results of needs analysis from teachers and students, it is known that the material of energy resources is classified as material that is often not taught by a teacher in the classroom due to lack of time and less of variations in learning media used that are interactive. Both of time and media issues contribute to the lack of critical thinking skills during the learning process. The above problems should not exist regarding the existence of technological developments that happens rapidly in Indonesia, not to mention some facilities provided by the school are many and supportive to have technology-based learning using Interactive e-book, such as computers, LCD projectors, internet (wifi), and students already have their laptops.

Data Collection

The data collection stage was carried out through literature study and questionnaire distribution which aimed to find information that supported the development of interactive e-book on energy resources. Literature studies include reading and reviewing articles of learning resources, cognitive learning theory, e-book criteria, interactive multimedia, LCDS, scientific approaches, critical thinking and material of basic competency number 3.11 namely energy resources.

The next step is testing the material component to experts. The test of e-book component was carried out to obtain a mapping in developing the product. Based on the results of the analysis of component test which conducted on 3 lecturers of Physics Education. It can be concluded that the e-book of energy resources should contain the use of interactive multimedia such as images, graphics, animation and simulation, a summary of the material, assignments, and forms of tests that are tailored to the material presented in the e-book in the form of multiple responses and short essays.

Product Design

The stage of developing preliminary product (product design), in order to fulfill the criteria of interactive e-book, used several supporting program. The program used to develop the product are LCDS 2.8, Microsoft Powerpoint 2013, Macromedia Flash 8, Pinnacle Studio 12, and Ispring Quiz Maker.

LCDS 2.8 is used as a base application in making interactive e-book energy resources. This application serves as a place to compile material in the form of text, images, audio, video, animation, simulation, or even interactive questions. LCDS 2.8 is an application that can accept various forms of file extensions so that in developing the interactive e-book that requires interactive media such as video, animation, or experimental simulations to foster critical thinking abilities can be achieved.

Microsoft Powerpoint 2013 in developing interactive e-book is used to produce compiler material in the form of images that can also contain text or writing and it also provides variations of writing and customed themes so that the presentation in interactive e-book energy resources becomes more attractive.

Macromedia Flash 8 is used to create mobile animation as in the developed interactive e-book, there are dams, solar cells, windmills, and several sub-menus that aim to make e-book become interactive. Pinnacle Studio 12 is used to create or edit a video. In the interactive e-book developed, several videos for energy resources topic are produced such as on the Electric Energy menu and the Source of Electrical Energy, Energy Resources, and Power Plants. Ispring QuizMaker is used in making interactive questions in the form of multiple responses and consists of five questions derived from learning indicators on e-book.

The interactive LCDS-based e-book of energy resources for initial product can be seen in Figure 2. The developed interactive e-book contained introduction, main content, and references. In the introduction section, the interactive e-book contains instructions, core competencies, basic competencies, indicators, and learning objectives. There are two instructions on interactive e-book, namely usage instructions and learning instructions that serve to facilitate students in operating interactive e-book individually.

Figure 2. Product 1 of Interactive E-book

Validation Test

Product 1 which developed in the form of HTML is still hypothetical so that expert validation tests are carried out namely design test and material test. Design expert tests are carried out to determine whether the design used is appropriate such as selection in color combinations, fonts, clarity of simulation, and clarity of images as outlined in interactive e-book to foster critical thinking skills. The tool used for the validation expert test is a questionnaire.

Based on the results of the average score obtained in the design expert test, it can be concluded that the developed interactive e-book is feasible and very well designed. It shows that the components in the energy resources interactive e-book design test are clear, can be understood, has no ambiguous meaning, can be explored independently, foster critical thinking in learning, and have clear instructions.

Table 3. Results of Design Expert Test

Indicator	Average Score	Quality
Layout design in interactive e-book	3,67	Very appropriate
Typography in interactive e-book	3,60	Very appropriate
Illustration in interactive e-book	3,60	Very appropriate
Interactive e-book for fostering critical thinking ability	3,84	Very appropriate
Instruction for using interactive e-book	3,90	Very appropriate
Average	**3,72**	**Very appropriate**

In the design validation test indicator, the developed energy resources e-book is made by using images, videos, animations, color combinations, language that is easy to understand, and interactively designed using buttons such as back, next, launch, and special buttons on Biomass Power Plant simulations so that students can operate e-book independently. According to Darlen's statement that in developing of interactive e-book, the design of displays must be interesting, languages used must be arranged well, and have efficient navigation buttons (Darlen et al., 2015).

Interactive multimedia used in e-book is to facilitate students to learn abstract material to be more contextual so that students can understand the topic as a whole such as the use of interactive animations and videos which display how renewable and non-renewable energy resources turn into electricity in coal power plants, dams, solar cells, and windmills. The use of interactive animations on e-book is also used to explain more sophisticated points such as process or steps for example in biomass power plant, rotten fruits that turn to electrical energy so that students are easy to understand the whole concept independently, and in comparison, there are no such multimedia interactive in conventional or printed books.

The use of interactive multimedia in the form of animation provided in e-book of energy resources also aims to make the learning process created in e-book even more interesting because it does use not only text but also uses images, animation, videos, and audio. This statement is supported by Mayer that human beings process information based on two channels, which are auditory (sound) and visual (picture) not just text (Mayer, 2003). In research conducted by Agustina also said that in learning dynamic fluid topic, using dynamic images (animation) can improve student learning outcomes (Agustina, Suyatna, & Suyanto, 2017). Student learning outcomes with the same learning method on the material of rotational dynamics, dynamic fluids, and impulse-momentum show differences that using dynamic image is better than using static images (Suyatna, Anggraini,

Agustina, & Widyastuti, 2017). Based on the results of the design validation test, it shows that the quality of illustrations used in the developed interactive e-book is very appropriate in representing physical material of energy resources through interactive video or animation.

The interactive e-book of energy resources developed with the goal of enhancing students' critical thinking ability. It is designed with learning indicators which are indexed in High Order Thinking Skills C4, C5, and C6 so that students can analyze, evaluate, and create. It is supported by the statements of Ritdamaya and Suhandi which states that both the process and assessment of physics learning must be oriented to develop students' critical thinking skills as stated in Permendikbud number 64 of 2013 (Ritdayama & Suhandi, 2016). In interactive e-book students are asked to be able to analyze the needs of electricity use in Indonesia, to identify differences in electricity resources in Indonesia, to analyze the problem of electricity that is generated from non-renewable and renewable energy, to deduce the impact of electricity use, to consider the types of electricity that are effective in Indonesia, and to make essays about wise energy sources for Indonesia and how to use electricity positively.

The interactive e-book developed also contains interactive questions which designed to foster critical thinking for students. Interactive questions are divided into two parts, essay questions and multiple responses, which use indicators ranging from C4, C5, and C6 and are made using supporting media such as pictures and videos as stimulus. This is done for the purpose of after students learn the material in e-book students can do given test regarding the understanding of the material that they have learned. The statement is in line with research from Damayanti which said that interactive tests using multimedia and scientific approaches could foster critical thinking in students (Damayanti, Suyatna, Warsono, & Rosidin, 2017).

Expert test in material examines several indicators listed on interactive e-book which are completeness, immensity, and depth of material, accuracy of material, accuracy of interactive tests, material updates, and suitability of the material with the scientific approach. The expert test was also carried out by the same validator in the product design validation test. Based on the results of the material expert test in Table 3, it gets an average score of 3.72, so it can be concluded that the material contained in this interactive e-book is feasible and highly accurate with the existing provisions that are adjusted to the competencies in the 2013 curriculum.

Table 4. Results of Material Expert Test

Indicator	Average Score	Quality
Completeness, immensity, and depth of material	3.65	Very appropriate
Accuracy of material	3,77	Very appropriate
Accuracy of interactive test	3,80	Very appropriate
Material update	3,70	Very appropriate
Suitability of the material with scientific approach	3,70	Very appropriate
Average	**3,72**	**Very appropriate**

Learning materials on interactive e-book of energy resources are also presented by the steps of the scientific approach namely observing, questioning, trying/experimenting, reasoning, and communicating in the learning scheme created in an interactive e-book on energy resources. The statement was supported by Kemendikbud which stated that the 2013 curriculum requires learning physics

in high schools carried out with scientific approach (Kemendikbud, 2016).

The use of scientific approach in interactive e-book of energy resources is developed with the help of several interactive multimedia to foster students' critical thinking skills. At the five-step scientific approach, students can foster critical thinking in every step after the process of observing the material in developed e-book as in some critical thinking abilities according to Ennis'.

First, in the skill of focusing questions and analyzing arguments, students can identify conclusions from the information presented through videos, pictures, and texts and consider the possible answers to essay questions given in e-book. Second, the skills to consider whether sources can be trusted or not and to observe and to consider observation reports are presented with questions that the answer can also be found in other sources through given links. Students also can operate animation and simulation from the process of renewable energy resources (raw material) change into electricity interactively and report the results. Third, the deduction and consideration of deduction skills and also determining the results of consideration are presented by some graphs, a news snippet is presented and given questions to students about the prediction of electricity use in Indonesia and the world. Fourth, in the skill of identifying the assumptions presented by material and questions about the impact of the use of electricity. Fifth, the skill to determine an action is presented in the form of a short essay entitled Wise Energy Source for Indonesia and Positive Behavior in Using Electricity. This related to research that teaching science should encourage students to be able to aware of science and to take action in maintaining and preserving the environment wisely (Parmin, Sajidan, Ashadi, & Sutikno, 2015).

Based on the description of the results of the analysis from material and design expert tests, it shows that the development of interactive e-book on LCDS-based on energy resources with a scientific approach is valid and feasible to be used as teaching materials that foster the ability to think critically for students. These results are supported by Ambarwati and Suyatna in their research shows interactive electronic book that contains interactive multimedia can foster critical thinking skills for students (Ambarwati & Suyatna, 2018). Also students in solving a problem or learning new concepts, they use supporting representation.

Study from Wuri and Mulyaningsih said that the application of a scientific approach in physics learning can improve critical thinking skills for students and strengthened (Wuri & Mulyaningsih, 2014) by the research from Suyatna which states that the use of interactive e-book on the material of relativity theory is designed with a scientific approach can foster students' thinking skills (Suyatna et al., 2018). Regarding the explanation above, the developed e-book on energy resources can improve students' critical thinking ability because it's designed with scientific approach in learning scheme which every step is inherently connected to exercise critical thinking skills.

Design Revision

An e-book that has been validated by design and material experts getting an average score of 3.72 with very good quality and are very appropriate even though there are some improvements that are recommended by the experts for the betterment of developed e-book. This stage is designed revision of the product 1, revision of e-book based on the improvement suggestions from the examiner can be seen in Table 5.

Tabel 5. Improvement of Validation Test Recommendation

No	Indicator	Recommendation	Improvement
1.	The suitability of the composition of the layout elements (title, author, illustration, logo, etc.), text, and images in the interactive e-book cover has been balanced and in tune with the layout of the contents.	The size of the logo and text must be proportional.	The cover section of the Unila logo has been fixed, and the photoelectric effect title is written down by reducing its size.
2.	The suitability of the illustration is clear that can reveal the meaning of objects, proportional, accurate, and realistic.	The illustration can be in the form of an analogy or flow chart.	An illustration has been added in the form of a flow chart on the menu of renewable energy resources.
3.	Interactive e-book contains indicators indexed by HOTS C4, C5, and C6 in learning activities.	Operational verbs adapted to the level of depth and immensity of material.	The use of operational verbs has been adjusted to the indicators of achievement with the level of depth and breadth of the material.
4.	The suitability of the displayed image can be seen clearly and logically.	The image on the e-book must be proportional.	The images on the e-book have been improved.
5.	Suitability of competency achievement indicators in interactive e-book with Core Competencies (KI) and Basic Competencies (KD).	Use effective sentences on the indicator.	The sentence has been corrected in the indicator section of learning to be an effective sentence.
6.	Accuracy of conceptual explanation of material.	Put the negative impact of using nuclear energy on the environment.	Material has been added regarding the impact of nuclear energy use on the environment.
7.	The accuracy of the updated reference	References must be updated	Recent references have been added to developing interactive e-book.

One on One Test

One on one test was done to find out the readability and the ease of operating interactive e-book. Test is done by giving the questionnaire to three male and three female students who had different learning achievements which are low, medium and high right after they studied using interactive e-book of energy resources. The interactive e-book used is a revised e-book by the recommendations from the results of material and design experts, and also from the six students who are asked for their opinions through questionnaires.

Table 6. One on One Test Score

Indicator	Average Score	Quality
Readability of interactive e-book	3,60	Very good
The ease of operating interactive e-book	3,68	Very easy

Based on the one on one test, according to students, interactive e-book is easy to operate because there are instructions for how to use and learn so that students can use interactive e-book independently. This is by the research of Wulandari et al. who suggested that the instructions for using the interactive e-book should also be facilitated in the

learning process (Wulandari, Suyanto, & Suana, 2016). The range of content such as video, animation, and existing simulations as well as the presentation flow is also very easy for students to learn and to understand the contents of developed interactive e-book.

In the readability of the language used in interactive e-book of energy resources have already been understood independently by students, it is communicative and interactive, do not have multiple meanings, and are arranged using the correct sentence structure. The results of one-on-one questionnaire tested on six students grade XII resulted that five of the six students agreed and recommended using an interactive e-book for energy resource as the main teaching material in studying the topic and one other student agreed to be used as a source backup learning source.

Advantages and Disadvantages of Developed Interactive E-book

Based on the results of validation test and one-on-one test, it concluded that the developed interactive e-book has several advantages, namely the concept of electricity generated from renewable and non-renewable energy resources can be visualized by computers through video illustrations, simulations, and animations not only through text and image so that it can help students understand abstract concepts such as processes or steps in biomass and coal power plants. The interactive e-book of energy resources designed to enhance students' critical thinking with scientific approach can be accessed or opened on a laptop without the need for an internet connection because it is made as HTML file. The results are in line with research from Wagner, et al. which stated that teaching physics using multimedia i.e., video and computer can give students to experience sophisticated content in presentation and also it supports evaluation while learning (Wagner, Altherr, Eckert, & Jodl, 2007).

In addition to having advantages, the interactive e-book also have disadvantages in technical issue, namely e-book cannot always be opened especially in the animation, simulation, and learning video parts because of incompatibility of Microsoft Silverlight applications with Mozilla Firefox version used, so it needs to check software compatibility first to be able to study using the developed interactive e-book. LCDS software that is used in creating interactive e-book of energy resources is also lack of the type of letters to use so that developer still uses Microsoft Office Powerpoint to get the customed font to make it more variety and it should be converted first into extensions of jpeg, jpg, or png.

The final product of the interactive e-book of energy resources can be seen in Figure 2 below. The bold font is the revised section based on suggestions or recommendation from the design and material expert validation test from physics lecturers and teachers as well as one-on-one test.

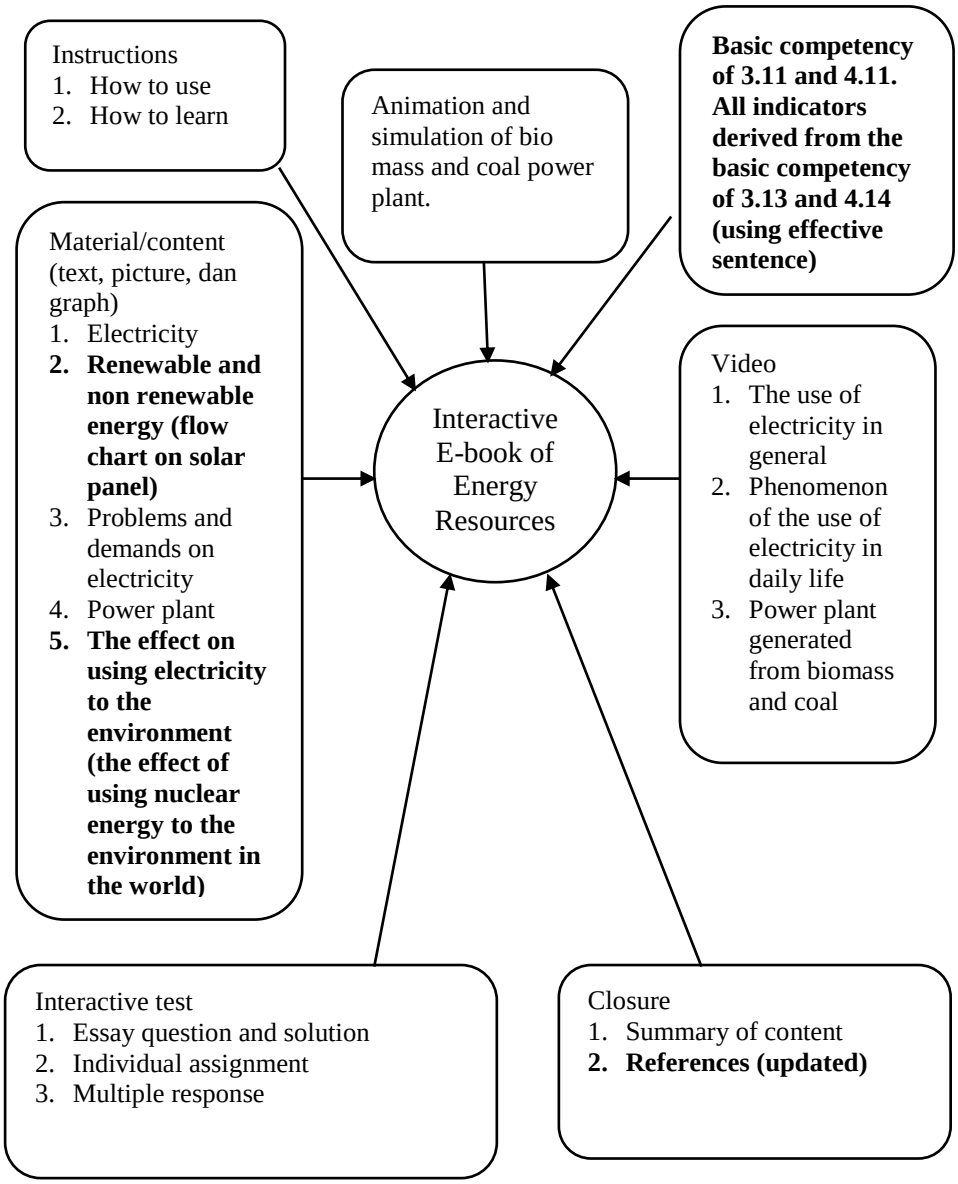

Figure 3. Product 2 (Final Product)

The developed e-book was created for students as a source to learn energy resources material with using scientific approach which also can enhance their critical thinking skill while learning with the developed e-book. The above picture, the final product, shows that there are several aspects that were put into consideration as revision from experts test. Be it the content by bold sections in the flow chart on the solar panel, effect on using nuclear energy, and also references used in e-book itself.

Interactive e-book on energy resources material can also enhance sstudents' critical thinking skills. The multimedia such as video, animation, simulation, and interactive test used in the interactive e-book helps to foster critical thinking skills even more compared to conventional media (Gerven, P. W. M. Van, Paas, Van, Hendriks, & Schmidt, 2003). The use of interactive multimedia which designed using scientific approach will lead students to analyze concepts sophisticatedly by using learning videos, animation, and simulation, evaluate by graphics presentation and essay question. Using electronic book will create interesting, challenging and stimulating

experiences for students, as well as increasing students' interactions with learning content in e-book (Yang, Wang, & Chiu, 2015) and also increasing students' participation by allowing them the to write comments and do observations (Gong, Chen, Wang, Zhang, & Huang, 2013).

CONCLUSION

This research concludes that the development of interactive e-book based on Learning Content Development System (LCDS) has been validated as a teaching material on energy resource topic using scientific approach to enhance students' critical thinking skills. The interactive e-book contain material in the form of texts, images, graphs, animations, simulations, learning videos and interactive test by utilizing several applications then combined into an interactive e-book using LCDS software. Interactive e-book on energy resources is easily operated with a score of 3.68 with very easy quality, and interactive e-books have good readability with a score of 3.60 with very good quality. For further development, it is important to test the developed e-book to massive classes to find the effectiveness of developed e-book. Also in line with technology advancement, it is suggested to always improve on user interface and user experience for students' comfortability.

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The Effect of Professional Education and Training for Teachers (PLPG) in Improving Pedagogic Competence and Teacher Performance

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Abstract: This study is aimed at analyzing the effect of Professional Education and Training for Teachers (PLPG) in improving pedagogic competence and teacher performance. The research used quantitative method through survey approach. The data was taken from 35 respondents using the training exam module and teacher performance instruments. All data were analyzed using software SPSS for Windows release 22.0 through both descriptive and correlation analysis. The result of descriptive analysis of teachers pedagogic competence after taking training test is good (83,74%). Furthermore, Pearson Product Moment Correlation analysis shows that there is a significant negative correlation between these activities and teachers performance obtained (rcount) = -0.590 at 0.000 significance level. The results of the analysis show that teachers need to follow the training to improve their pedagogic competence as well as their performance in teaching and assessing. Since the teachers' knowledge increases, it will definitely have an impact on their performance at school.

INTRODUCTION

Teachers as professionals have the primary duty to educate, teach, guide, direct, train, assess, and evaluate learners in early childhood education, formal education, primary education, and secondary education (Azhary, Handoyo, & Khafid, 2018). In carrying out their duties, teachers apply skills that fulfill quality standards or certain norms obtained through professional education (Vulliamy & Webb, 2018).

If we carefully considered about the task and the responsibility of teachers that stated in the law, then it can be said that the task and the responsibility of teachers are not that easy. Therefore, it is a necessity for all teachers always to improve themselves and their competence, especially the competencies associated with teaching itself.

In general, competence can be defined as a set of knowledge, skills, attitudes, and values as a performance that affects the roles, actions, achievements and work of a person (Frank et al., 2010; Wentzel, 2004). While Kusnandar and Agus states teacher competence is defined as a set of intelligent actions and full of responsibilities owned by someone as a condition to be considered capable by the community in doing tasks in accordance with certain work (Agus, Taha, Said, & Saleh, 2016; Kusnandar, 2007). As

Jennings & Greenberg argues pedagogic competence is the mastery of teachers on how to teach effectively and manage the learning process (Jennings & Greenberg, 2009).

About teacher profession competency that has already explained in the previous paragraph, Indonesian education system has been described in Article 8 of the article 28 of PP RI. 19/2005, the article explains that a teacher besides having academic qualification requirements, a teacher must also have good competences. Those competencies include pedagogic, personality, professional, and social competence. However, the authors only focus on talking about one of the four competencies that are pedagogic. Due to in the context of learning in the classroom, pedagogic competence of a teacher will greatly determine the learning outcomes (Irwantoro & Suryana, 2016). According to Busse, Aboneh & Tefera, pedagogic competence can be defined as the competence of teachers toward learners, design, and implementation of learning, evaluation of learning outcomes, and development of learners to actualize their potentials (Busse, Aboneh, & Tefera, 2014).

Talking about teacher profession in Indonesia today, there are two issues that used to be discussed. It related to teacher education qualification and low pedagogic competence. According to Sani & Jurkiewicz study of 3.9 million teachers in Indonesia today, there are still 25% of teachers who have not accomplished academic qualification requirements, and 52% of teachers have not had professional certificates yet (Jurkiewicz, 2014; Sani, 2013). This is supported by empirical facts that indicate the teachers in Indonesia still do not have good quality based on the national education standardization, from statistic data Human Development Index (HDI) there are 60% of elementary school teachers, 40% junior high school, 43% senior high school, 34% vocational school have not yet eligible to teach in their levels, even 17.2% of teachers or equivalent to 69,477 teachers are not teaching in the field of their study (Murwati, 2013; Sobandi, 2010).

In fact, according to Supriyono, the results of the Teachers Competency Test (UKG) in 2015 nationally obtained an average value of 53.02 under the target of Minimum Competency Standards (SKM) 55 (Supriyono, 2018). This indicates the low quality of teacher competence, especially in pedagogic competence. Mulyasa argues about several indicators that lead to low competence and poor performance of teachers: lack of ability in managing the class, learning strategies, implementing and utilizing classroom action research, lack of achievement motivation, discipline, and professional commitment (Mulyasa, 2008).

Meanwhile, according to Umar the low pedagogical competence of teachers can also be seen from the low use of ICT in learning (Umar, 2013). The indications are that there are teachers who have low ability to operate learning tools such as laptops, computers and in focus. When the teacher's operational ability to the learning tool is low, then it is impossible for teachers to integrate ICT into learning. Consequently, less attractive learning atmosphere even could make learners quickly bored while learning.

Based on the data above, there are still many teachers in Indonesia that have no qualifications as a teacher, and even we often found some teachers do not teach the subject related to their field. So, no wonder if the achievement of education in Indonesia does not show great progress from year to year.

To improve education outcomes related to the objectives and targets that have already set, the Ministry of Education made a number of efforts, one of these efforts is to organize a teacher training and education program for teachers in Indonesia. Basically, the program purposed for improving teachers'

competence and teachers professionals to be passed and get a certificate of teacher, in other words, teacher who follows this program will be declared pass the program when he has reached the minimum score of written and performance test. This program is expected to produce professional and competent teachers in their field.

Research results from Yusrizal, Soewarno, & Fitri, shows that professional training has a great influence on teacher performance. Furthermore, the same thing is supported by the research results of Nasutiyon, and Gufran, Mukhadis & Putro said that the program brings a significant influence on the performance of economic teachers (Gufran, Mukhadis, & Putro, 2012; Nasutiyon, 2010; Yusrizal, Soewarno, & Fitri, 2011).

Based on the research results, the writer concludes that the training program which is followed by teachers can affect their performance in school. So, that is a must for teachers to follow the program since it will influence their performance later. Based on the various problems that have been stated above, it is necessary to conduct scientific studies whether Professional Education and Training for Teachers that has been followed by the teachers will have a positive impact on the improvement of the competence and performance of a teacher, so the writer considers this issue to be proven scientifically through research.

METHOD

This research uses quantitative research design. According to Sugiyono and Neuman, quantitative methods used when a researcher wants to analyze more than two variables (Neuman, 2013; Sugiyono, 2012). While Creswell reveals that quantitative methods aim to know clearly, summarizing the conditions and situations toward various variables that want to be investigated (Creswell, 2002). The research data was taken from 35 teachers of History of Senior High School in Pekanbaru, Riau Province. All respondents are teachers who have completed PLPG in 2017. Data collection use questionnaires taken from the module of the training program and teacher performance instruments. All data were analyzed using software SPSS for Windows release 22.0 through descriptive analysis and correlation.

RESULT AND DISCUSSION

In order to be more interesting, the writer will show all the result of research based on the purpose of this research that is analyzing PLPG to increase pedagogic competence and teacher performance. Furthermore, the authors report all data analysis of research results as follows.

Table 1. Description Scores on Teacher Pedagogic Competency After the Training Program

No	Indicator Scores Tested	Ideal Score	Teacher Average Score	Percen-tage (%)	Interpre-tation
1	Development of teachers professionalism	16	13,90	86,87	Good
2	Improvement of relevant knowledge	20	16,30	81,50	Good
3	Improvement of teaching skill	32	25,71	80,34	Good
4	Development of professional attitude	24	20,70	86,25	Good
	Total Score	**92**	**76,61**	**83,74**	**Good**

As shown in Table 1 can be explained that result of the analysis shows the total score on teacher professional development indicators is (86.87%). The interpretation of the total score is **good**. Furthermore, the total score on the

relevant knowledge improvement indicator is (81.5%) the interpretation of the score is **good**. Then the total score on the indicators of improvement of teaching skills is (80.34%). The interpretation of the total score is **good**. While the total score on the indicator of professional attitude development is (86.25%). The interpretation of the total score is also good. It means that the training program can improve the competence of teachers especially on the pedagogic competence aspects, the more often teachers follow the training program, the more knowledge of pedagogic competence they will get.

Furthermore, to see the relation between research result of the training program and teacher performance, the writer uses correlation product moment correlation analysis. The result of the analysis shows that there is a negative significant correlation between PLPG and the teacher's performance with the correlation coefficient of -0.588 at the level of significance 0.000. As shown in Table 2.

Table 2. Correlation Analysis between Relationship and Teacher Performance

Variables	Analysis	PLPG	Teacher Performance
Professional *Education and Training* for *Teachers (PLPG)*	Pearson Correlation	1	-.588 **
	Sig. (2-tailed)		.000
	Sum of Squares and Crossproducts	-63854,597	333543,074
	Covariance	1450.187	-277 629
	N	35	35
Teacher Performance	Pearson Correlation	-.588**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Crossproducts	35308,026	-63854,597
	Covariance	-277 629	153 513
	N	35	35

**. Correlation is significant at the 0:01 level (2-tailed).

Based on the results of the analysis as shown in Table 2, it can be pointed out that there is a significant negative relationship between the training program and teacher performance. In other words, teacher training and education have a significant effect on teacher performance at school. It means that the hypothesis about correlation between this program and teacher performance can be accepted.

In principle, provided by the government is to improve teacher competence. In general, the purpose of the program is to improve the professional skills of teachers such as the ability to plan, implement and evaluate learning in a sustainable manner. Meanwhile, the benefits of the program are protecting the teachers' profession from incompetent practices, protecting the community from unqualified practices and improving teachers' welfare. Therefore, the material obtained in the implementation of the training program includes material on pedagogical skills, professional abilities, personality skills, and social skills.

Teachers are a key element in the education system, especially in schools. All other components, such as the curriculum, facilities, costs, and so forth will not mean much if the essence of learning like the interaction between teachers and learners is bad. All other components, especially the curriculum will be "alive" if it is implemented by the teacher. The teacher's role in transforming educational inputs is really important. In fact, many experts claim that there will be no change or improvement in quality without the changes and improvements in teacher quality (Diana, 2017; Hiebert, Morris, & Glass, 2003; Subroto, 2013).

In the context of classroom learning a teacher must have good pedagogic

competence, pedagogic competence is the ability that the teacher must have related to the characteristics of learners such as moral, emotional, and intellectual (Damri, Engkizar, & Anwar, 2017; Murniyetti & Anwar, 2016; Zafirah et al., 2018). In other words, a teacher must be able to master learning theories and its principles because learners have different characters, attitudes, and interests (Anwar, 2017). Teachers should be able to optimize the potential of learners to actualize their ability in the classroom and should be able to assess learning activities that have been done (Sundayana, 2015). Also, a professional teacher should also be able to gain interest and self-efficacy of learners to learn diligently, hard and not easily give up caused by obstacles in learning (Asari, Fauziyah, & Uchtiawati, 2018).

In the background section of this paper, the writer has already explained that the Ministry of Education has determined that teachers must follow for creating qualified and professional teachers. Not only to increase teacher competence, but this program also being the benchmark for a teacher to get a certification certificate. This means that after attending the training program, teachers will follow the series of tests that have been provided. When they pass the test successfully, then a teacher can get a certification certificate.

The results of this study clearly show that that has been implemented to 35 Senior High School teachers in Pekanbaru can increase the pedagogic competence of teachers on teacher professionalism development indicators (86.87%), improvement of relevant knowledge 81,5%), improvement of teaching skill (80,34%) and professional attitude development (86,25%). The results of this study are supported by Yusrizal, Soewarno, & Fitri, Nasutiyon and Gufran, Mukhadis, & Putro which generally find that the program that has been followed by teachers have a significant effect on the improvement pedagogic competence and teacher performance (Gufran et al., 2012; Nasutiyon, 2010; Yusrizal et al., 2011). So, teachers should follow the training for it will affect the improvement of the competence and performance of teachers in school later.

Based on the results of this study the writer clarify that the training program followed by teachers is good to improve the competence and performance of teachers in schools. Furthermore, related to the pedagogic competence of teacher Syah teacher competence is the ability of a teacher in carrying out his obligations in a responsible (Syah, 2010). In other words, the teacher is the combination of personal, scientific, technological, social, and spiritual competencies that completely form the competence of teacher professional standard, which includes material mastery, understanding on learners, educated learning, personal development and professionalism. So, teachers have to improve themselves to be great and become a model for their learners.

In general, performance can be defined as the work achieved by an individual or group of people within an organization based on the responsibility given. In simply, performance is the result or success rate of a person during a certain period as a whole over a certain period such as standards of work, here the targets or the criteria have been determined first and have been mutually agreed. Surely, in this research context, that is the performance outcome of a teacher in school after joining PLPG. The results of this research have succeeded to reveal that teacher training and education program done by 35 Senior High School History teachers in Pekanbaru has an impact on teacher performance outcomes in working. As a matter of fact, the result of analysis showing a significant relationship between teacher training and

teacher performance by obtaining the correlation coefficient of -0.588 at a significance level of 0.000. Thus, the training program that was followed by the teacher has a positive impact or significantly affects the performance of teachers in schools.

CONCLUSION

This research has succeeded in knowing the effect of the improvement of pedagogic competence and teacher performance at school. Based on the result analysis, it indicates that there is an improvement of teacher competence at good category after following the program. In other words, the program followed by teachers has an impact toward the improvement of teacher competence, especially on the aspect of pedagogic competence. Moreover, correlation analysis results show the influence of teacher performance significantly after they follow the program. In conclusion, both of two result analysis shows that teachers need to follow to improve pedagogic competence. Surely, when the knowledge of the teacher increases it will affect their performance at school.

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Focus, Explore, Reflect and Apply (FERA) Learning Model: Developing Science Process Skills for Pre-Service Science Teachers

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Abstract: The purpose of this study is to describe the application of Focus, Explore, Reflect, and Apply (FERA) learning model in improving science process skills for a pre-service science teacher in primary school. The stages of learning using the FERA learning model consist of four stages, namely focus, explore, reflect, and apply. The sample of this study was the students in the Primary School Teacher Education Study Program at STKIP Sebelas April Sumedang. This research was conducted using Quasy-Experimental method with Non-equivalent Control Group Design. The effectiveness of the treatment was obtained by giving the pretest and posttest to each class one time. The research data was processed by analyzing N-gain, normality test, and average difference using the Wilcoxon and Man Withney U tests. The results showed that the experimental class and the control class had significant mean differences between the science process skills data on pretest and posttest. This shows that learning using the FERA model is more effective in improving science process skills for pre-service primary school science teachers.

INTRODUCTION

Science learning has evolved from year to year from teacher-centered to the student-centered (Basonggo, Tangkas, & Said, 2014; Nurfaidah, 2017; Prawindaswari, 2015). The view of science learning by memorizing a number of terms, concepts, theories, and others is outdated (DepDiknas, 2013; Isdaryanti, Rachman, Sukestiyarno, Florentinus, & Widodo, 2018; Sugianto, Ahied, Hadi, & Wulandari, 2018; Sumaedi, Dantes, & Suma, 2015). This is in line with the principle of learning activities carried out in universities that are student-centered and provide opportunities for students to develop their potential (Kemendikbud, 2012). Learning activities in universities that serve as the educational institution not only provide students with an understanding of teaching materials but must consider students' competency standards in accordance with their education level. At the primary school level, the National Education Standards Agency reveals that science learning in primary schools must emphasize direct learning experiences through the use and development of scientific attitudes and process skills (Badan Standar Nasional Pendidikan, 2006).

The importance of process skills for primary school education has an impact on the educational institutions' efforts through lecture activities in equipping students with a number of qualified

science process skills so that during their service, primary science teachers can apply these skills to their students (Anita, Jalmo, & Yolida, 2015; Muliyani, Kurniawan, & Sandra, 2017; Purwandari, 2015). How is it possible for an educator to develop the science process skills if the educator himself does not master the skills to be trained.

Given the importance of science process skills for pre-service science teachers in elementary school, the science learning activities in universities must use effective learning models in training and developing these skills (Alfarizqi Nizamuddin Ghiffar, Nurisma, Kurniasih, & Bhakti, 2018; Cahye, 2018; Muliyani et al., 2017; Nasution, 2018). One learning model that can be applied in science learning is the FERA learning model which consists of four learning stages, namely Focus, Explore, Reflect, and Apply (National Science Resources Center, 2008). The FERA learning model is a constructivist learning model that provides opportunities for students to build their knowledge with a number of work activities in the form of experiments so that they can train students' understanding and various skills (Sprague, 1995). This model is not in sequential steps but rather a cycle process (Center for Inquiry Science at the Institute for Systems Biology, 2006). This model of learning is student-centered. It is in accordance with the demands of the university principles which requires students to actively develop themselves through learning, mastering, and practicing branches of science to become professional education practitioners. FERA learning was developed in California.

But in Indonesia, FERA learning is still rarely applied, even almost nonexistent, especially at the primary school level. Therefore, the researchers wanted to know the effectiveness of FERA learning in developing science process skills for the pre-service science teachers in elementary school.

THEORETICAL SUPPORT

The FERA learning model is cycled learning developed through constructivist learning. This learning model was developed by the National Science Resources Center in California in 2008 (National Science Resources Center, 2008). The name of the FERA learning model is taken from four important stages carried out during the learning activities; namely, Focus, Explore, Reflect, and Apply.

Implementation of the FERA model in science learning for the pre-service science teachers in elementary school can be carried out by starting the focus stage where students are asked to clarify initial knowledge about a concept. Then in the explore stage, the students will be give given problems to be solved by carrying out activities that involve experiments. In the reflecting stage, the students process data to conclude in answering the problems. In the last stage, apply, the students apply concepts that have been discovered in daily-life situations.

Science process skills is a process of carrying out activities related to science. Rustaman et al. Mentioned that all skills, including intellectual skills, physical skills, and social skills, need to be acquired, developed and applied of its concepts, principles, laws, and theories which referred to as science process skills (Rustaman et al., 2005). Science process skills can be divided into two levels, namely basic science process skills and integrated science process skills. The basic science process skills consist of several skills (Muliyani et al., 2017), the first is observing skills by utilizing all five senses, making qualitative and quantitative observations, and observing changes. Second, communication skills by explaining the results of observations, compiling, and submitting reports systematically, and describing data by

using graphs, tables, or diagrams. Third, classifying skill done by looking for similarities and differences and looking for the basis of grouping. The fourth is the measuring skill which is done using appropriate tools to obtain the right data and to measure the appropriate units. The fifth is the concluding skill to make conclusions based on the results of observations and to determine the pattern of observations. The sixth is predicting skills which are done by predicting something that has not happened based on existing trends or patterns and then uses the patterns for observation.

In this study, the science process skills refer to the six basic skills indicator. Through the FERA learning model, each indicator of the science process skills was then trained in a number of activities to the students directed by the teacher as a facilitator (Koksal & Berberoglu, 2014). For example, communication skills can be trained through a process of clarifying the concepts to be learned (Lin, Chiu, Hsu, Wang, & Chen, 2018; Rauschert, Dauer, Momsen, & Sutton-Grier, 2011) where the students are stimulated to communicate their initial knowledge about the concepts to be learned.

FERA learning has four phases that the students must go through in the learning process; namely, Focus, Explore, Reflect, and Apply. These four phases can bridge students in instilling science process skills. These four phases can be implemented in the form of student activities while carrying out the learning.

Table 1. The Framework of FERA Learning Model in Training the Science Process Skills

Stages	Students	Science Process Skills
Focus	Linking experience with what will be learned Considering the concepts to be explored Gaining interest and motivation of the contextual phenomenon	Observing
Explore	Testing the students' ideas through experiments Comparing the ideas among peers in a group discussion Demonstrating the understanding through discussion Group	Measuring Communicating Classifying Concluding
Reflect	Developing an explanation through the obtained results Using scientific language to represent what is obtained in the experiment	Communicating Concluding
Apply	Applying and transferring acquired knowledge into different contexts Connecting experiences with the concepts obtained Communicating ideas in a different context	Communicating Concluding Predicting

METHOD

This study used a quasi-experimental method with Non-equivalent Control group Design. The pretest and posttest were conducted once to measure the science process skills. The design of the study can be described as follows (Fraenkel & Wallen, 2008).

O_1	X	O_2
O_3		O_4

Figure 1. Non-Equivalent Pretest-Postest Control Group Design

The population in this study were all Primary School Education Study Program students of STKIP Sebelas April Sumedang, West Java Province. The samples in this study were two classes of the entire population selected by Purposive Sampling due to the characteristics of the experimental and control groups are suitable with the research variables.

The instrument used in this study was a test of science process skills. Before it was used, it was tested for its validity

and reliability. The data collected in this study is in the form of science process skills data obtained from the results of the pretest and posttest in both the experimental class and the control class. The data was then tested whether it is normally distributed or not by using the Shapiro-Wilk test. After knowing the data distribution, the next step was to test the difference in the average score of pretest and posttest in both classes using Independent Samples T-Test and Paired Samples T-Test for the normally distributed data. The data that was not normally distributed, the Wilcoxon and Man Withney-U test were used.

The average difference between the data of the pretest and posttest in two classes was tested three times. (1) Test the average difference of the pretest between the experimental class and the control class. This test was intended to describe the initial conditions of both classes before treatment. (2) Test the average differences of the pretest and posttest score between the experimental class and the control class. These steps were done to find out whether there were changes in the condition of each class after treatment. (3) Test the average difference of the posttest between experimental class and control class. This step was done to find out whether there are differences in the final conditions of the two classes. All data processing was carried out using SPSS 16 software. After the average difference test was done, then the normalized gain <g> of the data was calculated to determine the effectiveness of the treatment in both classes manually by using the Microsoft Excel. The formula used was:

$$< g >= \frac{S_{post} - S_{pre}}{S_{ideal} - S_{pre}}$$

Once the score was obtained, the interpretation of the normalized gain was made by comparing the criteria set out in Table 2 (Hake, 1999).

Table 2. Gain Criteria

Gain	Criteria
<g> < 0.3	Low
0.7 > <g> ≥ 0.3	Moderate
<g> ≥ 0.7	High

The FERA learning model is shown in Figure 2 (Center for Inquiry Science at the Institute for Systems Biology, 2006).

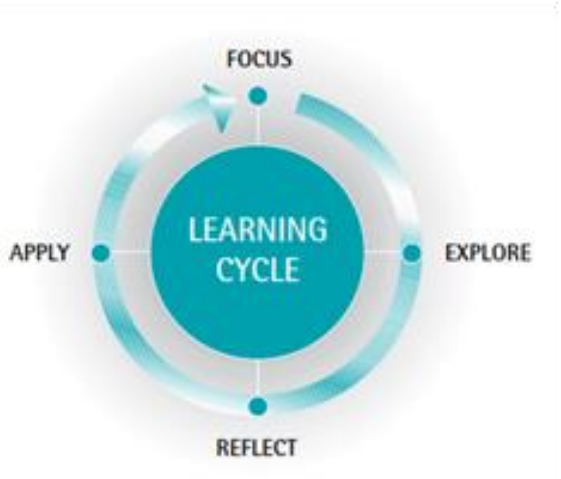

Figure 2. FERA Learning Model

RESULT AND DISCUSSION

The significant differences in the improvement of the science process skills of the primary school pre-service science teacher between the experimental and control classes can be tested statistically using the SPSS 16 software. The steps taken for this statistical test consisted of a normality test using the Shapiro-Wilk test and the mean difference test using Independent Samples T-Test and Paired Samples T-Test for the normally distributed data, while data that was not normally distributed, the Wilcoxon and Man Withney U were used.

The results of the normality test using the Shapiro-Wilk formula in the experimental class and the control class can be seen in the following table. The data is said to be normally distributed if the significance is greater than the confidence level set at 95% (sig > 0.05).

Table 3. Normality Test Results Using Shapiro-Wilk

Group	Shapiro-Wilk	df	Sig
Experiment (pre)	0.898	27	0.012
Experiment (post)	0.901	27	0.014
Control (pre)	0.918	23	0.060
Control (post)	0.891	23	0.017

Based on Table 3, the data of pretest and posttest score has varied distribution. Data on pretest in the control class is normally distributed while other data such as the pretest and posttest in the experimental class and the posttest in the control class have abnormal data distribution. This can be seen from the significance of the pretest score in the control class that is 0.060 (sig > 0.05) while the data of pretest and posttest in the experimental class and the data of posttest in the control class have values smaller than 5%, or precisely 0.012; 0.014; 0.017 (sig < 0.05). To test the average difference in the data of pretest and posttest for both classes was done using non-parametric statistics, namely the Wilcoxon and Man Withney U test because there were no data pairs that were both normally distributed. The results of the test can be seen in Table 4.

Table 4. Average Difference Test Results Using Wilcoxon and Man Withney-U Average

Average Difference Test	Whitney-U		Wilcoxon	
	z	Sig	Z	Sig
Pre-pre *	-0.994	0.32		
Post-post *	-5.046	0.00		
Pre-post **			-4,57	0,00
Pre-post ***			-4,23	0,00

Description:
* = The average score of experimental class and control class
** = Experimental class average score
*** = control class average score

Based on Table 4, it was revealed that the initial condition of both classes before given the treatment was not significantly different. This is known from the results of the average difference test between both classes with a significance value of 0.32 (sig > 0.05). The result of the average difference test of the pretest and posttest in both classes shows that there is a significant difference in the mean for both classes with a significance value of 0.00 (sig < 0.05). This implies that the learning process by implementing the FERA model and without implementing the FERA model can significantly improve the science process skills of the pre-service teachers. However, the result of the average difference test of the posttest between both classes shows a significant difference in mean with a significance value of 0.00 (sig < 0.05). This shows that the final conditions between the two classes have significant differences.

Furthermore, to find out which class is more effective in improving science process skills, the normalized gain <g> test was performed using Microsoft Excel. The results of the comparison of the average normalized gain of science process skills between the experimental class and the control class are shown in the following Figure 3.

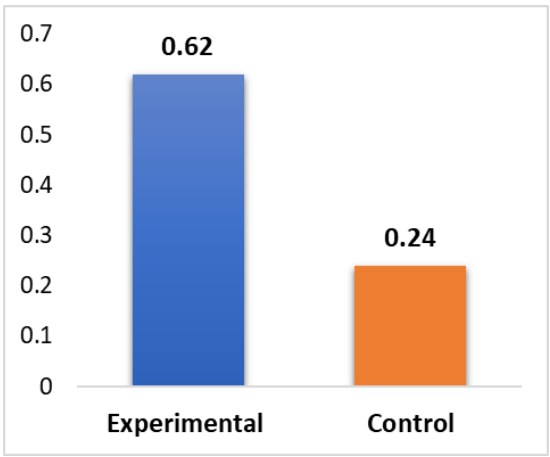

Figure 3. Science Process Skill Improvement

Based on Figure 3, it is known that the average score of normalized gain for the experimental class is 0.62 and for the control class is 0.24. In other words, the difference in the average score of the normalized gain of the two classes is 0.38. The improvement of the science process

skills in both classes is in a different category. The experimental class is in the moderate category while the control class is in a low category. This reinforces the results of previous data calculation which states that the final conditions of the two classes have significant differences. So, it can be concluded that learning using the FERA model is more effective in improving science process skills.

A person will have a skill if someone is training it through activity. Similarly, the science process skills in students will increase if he has the experience to do or practice these skills (Wenning, 2006). If we look at the distribution of science process skills trained in learning, in general, the application of the FERA model more often practice science process skills than without applying the FERA model, so it is very reasonable if in general, the improvement of science process skills in the experimental class is more significant than the control class.

In the **Focus** stage, the science process skills trained are observing, predicting, drawing conclusions, and communicating. The researchers gave a question with the intention to stimulate the students to communicate their ideas. In addition, at this stage, the researchers conducted demonstrations related to the material to be studied. The aim was to stimulate the observing, predicting, and concluding skills. The results of the demonstration activities will ultimately confirm the results in the next stage. The students made predictions after drawing conclusions about the relationship between concepts obtained by observing the phenomena carried out during demonstration activities (Saregar & Sunarno, 2013).

In the **Explore** stage, science process skills trained was observing and measuring skills. They measured the electric current namely the potential difference and the strong electric current. It was carried out in collaboration with each group member, and the results were recorded in the student worksheet. This measurement process was strongly influenced by the functioning of the tools and observation skill. The frequency of training in measuring skills in the control class is less than in the experimental class. As a result, the increase in measuring the skill of the students in the experimental class was higher than the control class.

In the **Reflect** stage, science process skills trained are the skills to draw conclusions and communicate the results of experimental activities. This skill in making conclusions is a preliminary skill that is quite often trained in learning activities in the experimental class. In addition, based on the data of the instruments used for the test, there are similarities in the characteristics of ways to make conclusions. In learning activities and also instruments used. The conclusion made was based on quantitative data to find the relationship between electrical current. The similarity in characteristics enabled them to answer correctly.

In the **Apply** stage, the science process skills trained was communication skill. They were trained to communicate the application of the concepts learned everyday life. Based on the results of the study, there are several causes for the FERA learning model to provide a better improvement for the experimental class compared to the control class related to the science process skills, namely, the learning stages bridge the science process skills indicators. The activities in learning stages instill meaningful learning, and the stages also strengthen the students' motivation during the learning process (Kosasi, 2015; Nor, Noprina, & Zuhdi, 2013).

First, the FERA learning model is the form of learning cycle that can bridge the students to instill science process skills. A number of student activities in exploring the science process skills indicators are facilitated through lecturing activities contained in FERA learning

stages. In other words, the FERA learning model can provide broad opportunities to strengthen science process skills (Muliyani et al., 2017; Özgelen, 2012; Susilawati, Susilawati, & Sridana, 2015). For example, when students practiced observing and measuring skills, they can conduct experimental activities related to the concepts learned.

Second, FERA learning activities contain important components in science, namely hands-on and mind on activities. Every activity is able to encourage students to make hands-on and minds to contribute to meaningful experiences (Koksal & Berberoglu, 2014; Satterthwait, 2010). This is because the students creatively and independently construct knowledge from what they know in the initial process of FERA learning, to be specific, in the focus stage. Constructing new knowledge structures is strengthened through experimental activities and analysis of what has been done (Widayanti, Yuberti, Irwandani, & Hamid, 2018). Indirectly, this meaningful activity will strongly instill the science process skills (Lin et al., 2018; Muliyani et al., 2017; Rauschert et al., 2011; Susilo & Atun, 2017).

Finally, it cannot be denied that every learning activity that emphasizes student-centered learning will encourage students' interest or motivation in conducting the learning process. When these interests and motivations are formed, the students will automatically have the awareness to do the right learning according to the design directed by the lecturer. This process will strengthen the students' science process skills.

CONCLUSION

Based on the findings and analysis of data in this study, it can be concluded that the application of the FERA learning model in the basic concepts of science can improve science process skills for primary school pre-service science teacher compared to without applying the FERA learning model. The research using different material and even different fields of science need to be conducted. In addition, the explore and reflect stage should be given special attention by researchers when conducting learning using the FERA model. This is based on the findings that most students are still not used to doing both phases of learning.

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Exploring Students' Learning Difficulties Using Scientific Approach in Junior High School

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Abstract: This study was conducted at the Junior High School of West Aceh using scientific approach in the process of teaching and learning. This study aims to determine the types of difficulties and factors that cause student learning problem during the use of the scientific approach. The method in this study is the analysis of miles and Huberman, namely data reduction, data display, and conclusion with the technique of triangulation of sources, techniques, and time. The results of the study showed that the learning difficulties of students' mathematics consisted of five components: Reading Error, Comprehension Error, Transformation Error, Process Skill Error, and Encoding Error. Besides, the factors that cause learning difficulties in mathematics come from internal factors and external factors. Internal factors derived from students include student attitudes in learning mathematics, student learning motivation is still low, body health is not optimal, and students' sensory abilities are lacking. While external factors that come from outside the students, among others, the lack of teacher teaching variation, and the use of learning media that has not been maximized. Efforts should be made to reduce the difficulty of learning mathematics by the difficulties experienced and background factors among others teaches math with fun, using instructional media concrete reproduce exercises, and collaborates with parents.

INTRODUCTION

Scientific approach becomes an approach in the modern teaching and learning process that shapes students to be able to organize their mindset, deepening and expanding material, strengthening processes, content, process and assessment standards (Ellizar, Hardeli, Beltris, & Suharni, 2018; Simbolon, Simanjuntak, & Simarmata, 2018). As well as emphasizing learning in the modern pedagogical dimension, the scientific approach has learning steps such as the process of observing, asking, reasoning, trying and forming networks (Al A'raf, Tahmir, & Rahman, 2015). However, the application of the scientific approach has not been fully able to be implemented in schools. This is due to internal and external factors of students and teachers as actors in the teaching and learning process (Farida, 2015).

Optimization of student learning outcomes is an indicator of teacher success in teaching, teaching competition will be tested when the teacher is required to explain in detail the subject matter that is not easy, and the teacher's ability to manage to learn will be questioned when the teacher fails to embed the concept of learning with students (Nurafifah, Budi, & Siahaan, 2017; Putrawan, Suharta, &

Sariyasa, 2014). This failure is a result of the teacher's unpreparedness in teaching, this condition will only turn off students' enthusiasm for learning, and of course, this is a detrimental impact on student learning outcomes (Tawil, Ismaimuza, & Rochaminah, 2014). The difficulties of teachers and students in carrying out the teaching and learning process with the latest curriculum need to be analyzed further, about the form of problems and what factors actually cause difficulties for teachers and students in class (Azizah, Ariwidodo, & Adriana, 2015; Gumilang, Usodo, & Pramudya, 2017; Mutia, 2017; Perbowo & Anjarwati, 2017), this is expected so that the results of this study are considered and important information to improve problems that occur in the field especially in West Aceh.

The researcher collected data using question tests through mini research and interviews with Mathematics teachers in one of grade VII at junior high School in West Aceh. The researcher took ten samples with the sampling technique was a simple random sampling. Test results obtained as follows.

Table 1. Students' Achievement

No	Trial	Lowest score	Highest score	Average
1	Class A	59	80	80,5
2	Class B	63	81	81,2

The low test results of students are influenced by several factors, including students experiencing difficulties when the process of observing mathematical problems is given, students have difficulty reasoning when given problems, students have difficulty trying to solve problems and students have difficulty concluding when asked to conclude the material obtained. In the end, these obstacles arise as a result of the students themselves or from the teacher who is still lacking in the learning process.

Rusindrayanti and Santoso revealed that teachers must be active in activities organized by a group of expert teachers, following workshops or training organized by the government or Ministry of Education and Culture, teachers must be creative and innovative in carrying out learning with a scientific approach, assistance from the curriculum development team (Rusindrayanti, Santoso, & Rusgianto, 2015). This is an effort to familiarize the teacher in applying scientific approaches in the classroom.

Furthermore, research by Ali shows the result that teachers influence students' understanding of concepts (Ali, 2011). Besides, the study also emphasizes the importance of mathematical knowledge and relates it to the understanding of new concepts. Another thing to note is the coordination between teachers, schools, curriculum, and a conducive environment to support students learn math in depth. Based on the results presented, the teacher becomes a factor that influences students' understanding of the concept and influences the difficulty of learning mathematics.

Therefore, the ideal learning process should involve an educator who has the readiness in running a method for students to get involved and experience the learning process without difficulty (Suryana, 2017). Also, the readiness of teachers in the learning process and the limited facilities and infrastructure that support and the low management of teachers in the learning process also become an obstacle in implementing the Scientific Approach, whereas learning of mathematics should be based on scientific context and student activities (Beckman, 2009). Researchers try to do research in several junior high schools in West Aceh as samples that have applied scientific approaches in their teaching and learning processes, with the aim of exploring students' learning difficulties both internally and externally while using scientific approaches, findings in this research will be input, advice, and improvement for educators to develop this

approach to be better and able to regulate learning situations so that the teaching and learning process becomes more effective.

METHOD

This research uses descriptive qualitative research method to understand the phenomenon of what is experienced by the research subject, such as behavior, perception, motivation, action, etc., the holistic description in the form of words and language, in a special context that is natural with utilizing various scientific methods (Moleong, 2010). Researchers carefully investigate a program, event, activity, process, or group of individuals using various data collection procedures based on the time specified (Creswell, 2013). This research was conducted in Grade VII of Junior High School in West Aceh that is School A, School B, and School C which have implemented the 2013 curriculum in teaching and learning process Data analysis in this research using Miles and Huberman technique which is a qualitative data analysis with effort repeated and continuous (Miles & Huberman, 2007). Activities in data analysis, i.e., data reduction, display data, and conclusion drawing or verification as shown in Figure 1.

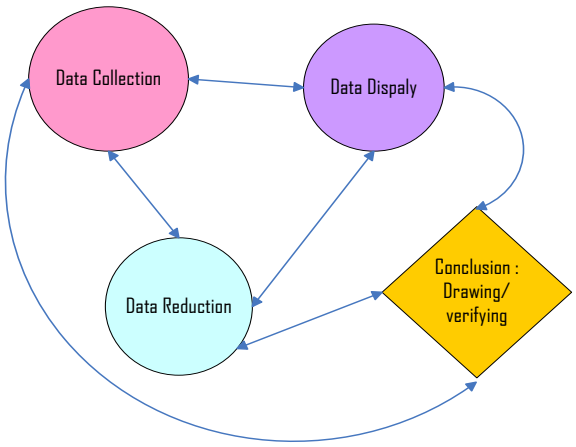

Figure 1. Qualitative Analysis of Data According to Miles and Huberman

This research was conducted with simplification, abstracting and transformation of data that emerges from written notes in the field. In this case, the researcher gives a mathematical test to see the errors in the process of completing the students' answers using Newman analysis, and then students will be interviewed to get more accurate data related to the factors causing student answer errors which will lead to student learning difficulties. The researcher chooses which data to group and which to discard or not used in presenting data. Data obtained through interviews, observation, and the questionnaire will be grouped based on the type of difficulty experienced, the cause difficulties, and efforts to overcome these difficulties. For example from the results of student interviews summarized, then selected answers stating that students do not like math lessons because of difficulties experienced or other answers that refer to problems experienced by students while being taught using the scientific approach. No answer leading to mathematical difficulties will not be used or analyzed further so make it easier for researchers to draw conclusions.

RESULT AND DISCUSSION

The results of this study will be presented in two parts, namely learning outcomes analyzed by using Newman analysis to find the types of learning difficulties and interviews to teachers and students who made the subject of research to see the factors that cause student learning difficulties. Overall, the results of the average analysis of student learning outcomes have been good, because it is able to achieve minimum criteria of mastery learning value ≥ 75, based on the results obtained with the average test that in class VII School A of 31 students, 25 students complete and 6 people unfinished, School B with 28 students, 25 completed and 3 people unfinished, and School C as many as 22 students, 18

completed and 4 people unfinished. The following learning results of students who were taught with the Scientific Approach are presented in the following Table 2.

Table 2. Student's Learning Result

No	Category	Location of Study		
		School A	School B	School C
1	Complete	25 (80,6%)	25 (89,3%)	18 (81,8%)
2	Uncomplete	6 (19,4%)	3 (10,7%)	4 (18,2%)
	Total	31 (100%)	28 (100%)	22 (100 %)

Analysis of learning difficulties is obtained from the way students complete the answer process. Some student mistakes in solving problems can be viewed from Analysis of Reading Errors, Understanding Errors, Transformation Errors, Process Skill Errors, and Encoding Errors. Based on the result of the analysis of the student answer process then obtained some form of errors and difficulties of students in completing tests caused by internal and external self-discipline students are taught with Scientific Approach. The results of Newman's analysis that researchers found in the study.

Reading Error

The error in the reading phase is 4.93 %, meaning that there are four students from the total of 81 students who are mistaken in reading and understanding the problem well and correctly, the difficulties experienced by students is not able to interpret the sentence that they read well. The error at this stage is that the student understands the context of the sentence but unable to write the meaning correctly. The researcher took 1 sample of student's answer in School C that was wrong in interpreting the sentence about.

Form Question 1.
Sarah will cover the floor of her room with carpets; Sarah's room is a rectangle measuring 5 m x 4 m. If the price is Rp. 200,000.00- per m^2, how much the price will Sarah spent on the carpet?

Sample Answer

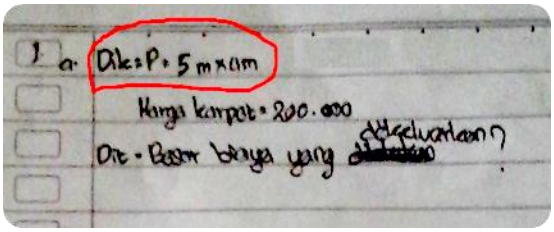

Figure 2. Sample Answer of Reading Error

Sarah's room rectangular with size 5 m x 4 m, it means Sarah room have length 5 m and width 4 m. However, students assume that the length of the room is 5 m x 4 m. This is a condition of reading error or student error in interpreting sentences about, and this happens in because students are less careful in reading the questions given by teachers. The data is obtained through interviews with the students concerned.

Researcher	:	"Do you Know the Purpose of the sentence about the form question 1?"
Student	:	"I know, Sir."
Researcher	:	"So. Why were you wrongly misunderstanding that?"
Student	:	"I'm sorry, Sir. I'm in a hurry to do the problem, so I misinterpret the meaning of the matter after I re-read it, it turns out that I realized I was wrong, Sir."

"The high motivation of the students to solve the problem quickly and want to appear more than his friends cause students to rush into the problem." (Interview with the teacher of School C).

Based on the results of the interview above, it is necessary to be considered by

the educator to give priority to the accuracy in doing the problem from the speed of working on the problem, the positive impact is the emergence of motivation from the student self to get more value, but on the one hand, the students become less concentrated and meticulous because of time hunted because only 5 answerers fastest that gets the best value.

Comprehension Error

At the stage of comprehension the problem, the percentage of students who made a mistake of 39.51 % or 32 students of the total students, the error at this stage is that students can not understand all the meaning of the word, in other words, the students can not mention what is known and what is asked by form question 2. Here is a sample of students' answers indicated by comprehension Error.

Form Question 2.
Aisha had a square-shaped handkerchief with a side of 30 cm, she wanted to put the lace around her handkerchief. How much are you willing to spend to buy lace? If the cost of the lace is Rp.500.00/Cm

Sample Answer

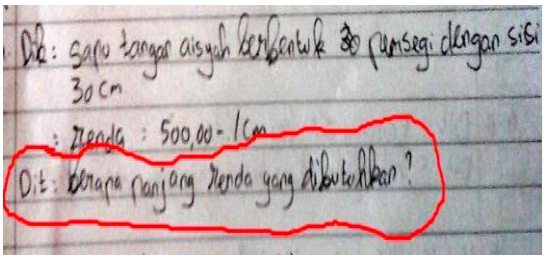

Figure 3. Sample Answer of Comprehension Error

Aisha will put the lace around her handkerchief, while the side size of her handkerchief is 30 cm and what is the money that Aisha must spend on the lace fitting around her handkerchief. However, students assume that what is asked is the required length and how many handkerchiefs are around, the data is very clear, but the students are wrong to provide information about the problem in the section asked. The researcher tried to interview the students' school A who did Comprehension Error in the form of question 2.

Researcher	:	"Why do you provide information that is not in line with question 2?"
Student	:	"Yes, Sir. I think we have to calculate around first."

"... students are always actively working on the given problem, either on the blackboard or as homework, but they are used to not writing what is known and what is being asked." (Interview with school teacher A).

The conclusion that the students know the purpose of the problem but not complete in providing information, this happens because students are not accustomed to being trained to provide information of the given problem, students are more likely to answer directly the questions given by the teacher, so that the creative ideas of students cannot be poured in the form of writing.

Transformation Error

In the Transformation Error stage, the percentage of students who make mistakes is 20.99 % or 17 out of 81 students. The error at this stage is when the student can not write the formula or calculation according to the question form 2. Most students write formulas incorrectly, and some students do not write the formula.

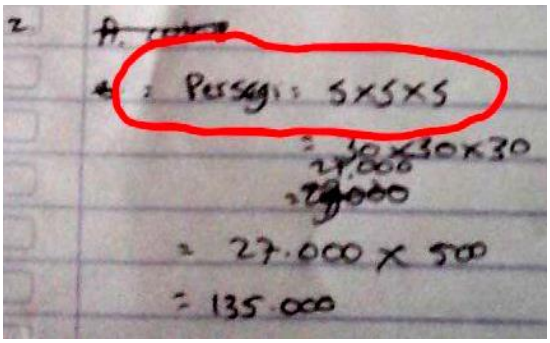

Figure 4. Sample Answer of Transformation Error

Students wrongly use the square circumference formula, and this error causes the students to find the final result of the form question 2 incorrectly. The researcher tries to interview the students of School A who perform the Transformation Error.

Researcher	:	"Did you forget the formula finding around the square?"
Student	:	"Yes, Sir. I forgot."
Researcher	:	"Why forget? not studying at home, huh?"
Student	:	"Yes, Sir. I rarely study at home, when there are tasks from teachers just learning."

Based on the results of the interview above, this happens because students rarely face problem-solving problems, the teacher gives more questions in the form of short, students can not plan solutions to do the problem, the students forget the material and formula, less practice doing the story form problems with different variations, wrong in determining the mathematical operations used, as well as students' difficulties in constructing mathematical connections between mathematical concepts and real problems. The problems that occur above need to be corrected in terms of the strengthened concept of students with exercises with different levels of questions by relating questions related to daily life.

Process Skill Error

Percentage of students who made a mistake of 51.85 % or 42 of 81 students. The error at this stage is when the student cannot perform the calculation operation or calculation steps appropriately. However, errors in process skills can also occur because the error determines the formulas in the transformation phase of the form of questions 1. This can occur because students are rarely given problems in the form of problem-solving, in addition, because students are less thorough in understanding the purpose of the problem and in solving it. Most students make mistakes in solving problems, especially on the writing part of the unit.

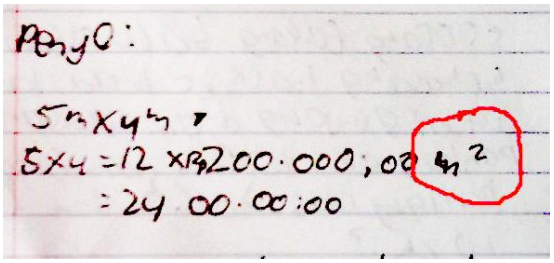

Figure 5. Sample Answer of Process Skill Error

Students make mistakes in putting units and errors in the process of multiplication. Student puts unit m2 in unit Price (Rp) while student makes a mistake in multiplication product and does not make the unit for the price (Rp).

Researcher	:	"How can the price Rp. 200.000,00 - you use m^2 as the unit? And you are also wrong in the product multiplication?"
Student	:	"Yes, Sir. I'm wrong, Sir."
Researcher	:	"What exactly do you already know about units and multiplication?"
Student	:	"But sometimes forget, if the results of that time I was wrong, Sir."

This should be noted by the educators to more often train students in the problems that hone the analysis and problem-solving skills, and students must also be familiarized to solve the problem carefully and sequence by paying attention to each sequence with the units by the demand question.

Encoding Error

In the final answer writing stage, the percentage of students making mistakes is 8.64 % or 7 of the total students. This error occurs when the student is wrong or does not write the conclusion as the final answer to the question, this is because the student is not careful and does not evaluate the final answer before it is collected like the following sample answers from students of School B.

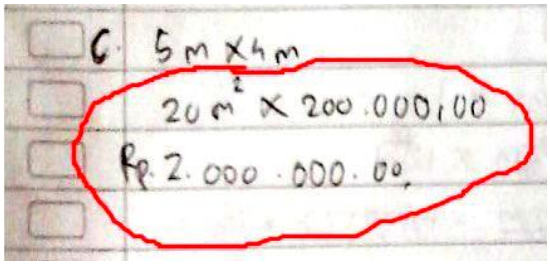

Figure 6. Sample Answer of Encoding Error

Student Error in processing multiplication, students perform the process correctly but wrong in obtaining the results of multiplication. There are so many cases in the field that we consider today as a common but very influential for learning outcomes and student achievement. It is necessary to be considered by educators to pay more attention to the factors that affect the process and learning outcomes, both internally and externally. So that the learning process can run optimally.

Internal Factors

Based on the observation of the students' activity in class VII of School A, School B, and School C, it is found that there are some factors of learning difficulties of mathematics students taught with Scientific Approach. That is:

a. Student attitudes in the learning process

Attitude is a tendency to act in a certain way. A positive attitude toward a subject is a good start for the learning process (Mutodi & Ngirande, 2014). Conversely, negative attitudes toward subjects will potentially lead to learning difficulties or make learning outcomes that are less than the maximum. Researchers found that students' attitudes toward math subjects are diverse, some prefer mathematics, and some do not like mathematics, for them mathematics is a difficult subject, so they do not like math lessons. This was stated in the interview as follows.

Researcher	:	"How do you think the math's are?"
Student	:	"I do not like math. The lesson is difficult because it must count."
Researcher	:	"The teacher explains well, through pictures and real-life examples, are you not interested in math after class?"
Student	:	"I am so glad, Sir. I have a passion for learning because many of our activities, so far only record and solve the problems, but because I often forget the formulas that have been studied, so be afraid to learn math. I not confident, Sir."

Negative attitudes of students in learning mathematics affect students in following the learning process (D. ; M. ; Indarti & Pramudya, 2017). Students who have negative attitudes toward learning mathematics tend not to follow mathematics learning well. Students do not pay attention to the explanation that the teacher submits and perform other activities during the lesson such as silence or chatting with his friend. The statement is justified by the classroom teacher at School C in the following interview.

"If these children are eager to learn math if there are only games with prizes. Some are passive because they are afraid to learn mathematics first, are asked to be afraid that they cannot answer, but not yet tried ".

Excerpts of the results of the above interviews show that attitudes in learning mathematics affect students in following the process of learning mathematics (Ramdhani, Usodo, & Subanti, 2017).

b. Motivation to learn

Strong motivation is needed so that students can achieve success (D. Indarti, Mardiyana, & Pramudya, 2018). Giving motivation from the teacher becomes an important thing so that students are encouraged to learn well (Putra, Widyawati, Asyhari, Wahyu, & Putra,

2018). In addition to motivation by teachers, student motivation is also influenced by the provision of support from parents. Students who get the attention and support from parents will have a strong motivation.

Student motivation during math lessons tends to be low, seen when student observations do not prepare their textbooks. Students do not pay attention properly, whereas at the beginning of learning teachers have motivated to learn. Also, student motivation can be known from the preparation of students in learning mathematics. Students with strong motivation will enjoy learning math even if there is no homework or repetition the next day. However, students who indicated the difficulty of learning mathematics has low motivation. They do not repeat the material that has been submitted or studied in advance the content to be delivered. The lack of learning motivation is justified by students in School C in the following interview quotes.

Researcher	:	".... until home, are you reading back a record of what you learned in school?"
Student	:	"(Shook his head)."
Researcher	:	"Usually if there is no repetition, do you learn math?"
Student	:	"No."

In general, teachers motivate students orally through words and real examples of students who succeed in the lesson so that students who are still challenging to imitate his friend. In addition to providing oral motivation, teachers also motivate by giving rewards or awards to students who can not be encouraged to be in learning. But the motivation of teachers without parental support will not have a meaningful impact on students.

"These kids have the will to study at school, but all still have to be balanced from the family. Although schools are motivated to let the spirit of learning at home there is no attention from parents is the same, so children do not learn at home pack." (Interview with teacher's School C).

Family plays an essential role in motivating students. Parents who do not give the maximum attention will have an impact on the low motivation of student learning in school. Little motivation to learn to make students not pay attention to the lesson and tend to be noisy in the class.

c. Body health

Health is one of the important factors to run the learning activities of mathematics. Students who are less healthy will have difficulty learning. Students who are sleepy and not concentrated during the lesson can be a sign that the students' physical condition is not in an optimal state. The circumstances resulted in students not able to absorb well the material delivered during the lesson. Some students who are experiencing difficulty learning confess to feeling dizzy during the lesson, as stated by students in School A in the following interview passage.

Researcher	:	"During math class, have you ever felt the pain that interferes with math?"
Student	:	"Yes, I have. Dizzy."
Researcher	:	"Are you feverish or sick?"
Student	:	"Yes, Sir. I have a fever, but I want to go to school to study, but to school so I do not concentrate because of dizziness."

Unhealthy student body condition can disrupt the student's learning concentration. Also, poor health to make students often do not go to school resulting in students lag behind the subject matter. The condition is also a cause of students having difficulty in math lessons, as yes is told by teachers of School A.

”There is because it does not come in, so it is automatically left behind the lesson. Students who have health problems need special attention and get appropriate treatment from an expert or doctor”.

“There are if children often do not enter the reason sick, dizzy, hot, and his son seems weak usually I call his parents.” (Interview with Teacher’s School B).

Based on the results of these interviews teachers have given attention to the health of their students. Furthermore, it is necessary to coordinate between teachers and parents to maintain student health.

d. Sensing ability

Eye disorders will disrupt the students in receiving information, especially in learning mathematics. From the results of data collection, not many students who have eye disorders. Researchers found two students who have eye disorders. They can not see far or eye minus. Students who are less in the view need to get special handling, it is of particular concern to teachers of School B. Knowing his students there are eye disorders that is the eye minus, he puts the student on the front bench in the middle to still be able to see the board clearly, as delivered in the following interview quotes.

”There, the students whose eyes minus I sit in front of the middle let me focus on the blackboard.”

Ear disorders can also affect students in absorbing the information conveyed by the teacher. There are some students who do not listen to the teacher's explanation well when sitting behind. The researchers found the questionnaire with the statement.

”I can not hear the teacher's explanation well when explaining the lessons of mathematics.”

But the researchers found no more in-depth explanation because the students' interviews were less able to provide detailed information about their lack of listening.

External Factors

a. Teaching variation

The use of varied learning methods and models is needed to attract students 'attention and reduce the students' boredom in learning mathematics (Apriandi & Krisdiana, 2016; Rusnilawati, 2016). Based on the observations and interviews of researchers in School A found that teachers use Scientific Approach in learning based on the curriculum of 2013. At the beginning of learning teachers use lecture model to open the lesson and then combined with Scientific Approach so that students are more active and more critical in understanding the material provided.

Appropriate learning methods and models will make it easier for students to understand the material and reduce students' saturation. But in School C, researchers have not found the use of Scientific Approach that has not been maximized due to inadequate school facilities and understanding of Scientific Approach is also lacking. In observations made during math lessons, teachers use more lecture methods. The teacher explains the material in front of the class, and the students are not enthusiastic about listening to the material presented, the students tend to talk to their onboard friends. After explaining the material, the teacher gives the students to ask questions, but no students ask questions. Students are then asked to work on the exercises that are in the packaged book with the specified time and then collected.

The proper use of the Scientific Approach and support of students to be active will make learning meaningful. Meaningful learning will make the subject matter interesting and well understood by

the students. Conversely, conventional learning does not attract students' attention and affects the lack of understanding of the material presented. This is justified by an interview quote with students in School C below.

Researcher	:	"Do you understand the teacher's explanation?"
Student	:	"Do not understand, Sir."
Researcher	:	"Keep if you do not understand, why not ask?"
Student	:	"I do not know what I want to ask, Sir."

This indicates that the teacher has tried to use a varied Scientific Approach. But there are also teachers who still do not understand the application of Scientific Approach so that students are less interested in learning mathematics (Nursalam & Rasyid, 2016).

b. Using media

Students can not think abstractly, the use of instructional media becomes an important factor that needs to be considered in mathematics learning so that students can understand the concept of mathematics well (Maharani, Supriadi, & Widyastuti, 2018; Rahman, 2017). The importance of using media to help students' understanding has been realized by teachers (Irawan & Suryo, 2017). Therefore teachers try to use the media in learning mathematics. This is stated in the interview quotes with teachers as follows.

"... children should not be verbal. Sometimes children make their props." (Interview with teacher's School A).

"Yes, that's sure, but the media does not have to be beautiful, but the media that I use is simple, suppose that if the math is the medium, as multiplication can use more than five fingers ...." (Interview with teacher's School C).

The teacher realizes the importance of using media in mathematics learning, but sometimes teachers experience difficulties in choosing the right media according to the material presented. As with the delivery of integer material, teachers do not understand the right media to teach the material. Submission of integer matter is conveyed by giving an analogy to the student such as a negative integer of debt, and a positive integer is given the liability of paying the debt. This is justified by the statement of teacher C School in the following interview quotes.

"It should be used by the media because it teaches mathematics there is a concrete way, semi-concrete, semi-abstract, and abstract like that right. But not all materials can use the media, as the material says round there is a negative and positive, the child was confused when it entered the integer operation. Negative minus negative again why the result so much more, that kind of child is still confused."

Teachers also choose to use the environment around the school as a medium rather than to create learning media that can attract students' attention and interest, as presented in an interview quote with teacher School A as follows.

"Sometimes I use things around the school as a medium, like a sum or subtraction can use gravel in school."

"The media used in the neighborhood, media around the environment used for learning." (Interview with teacher's School B).

The use of media following the material can help students understand the concept well. Students who are active in using learning media are proven to make students better understand the material well.

CONCLUSION

Difficulties of learning mathematics experienced by students consist of five components namely Reading Error is 4.93 % or 4 students, comprehension error is 39.51 % or 32 students, Transformation Error is 20.99 % or 17 students, Process Skill Error is 51.85 % or 42 students, and Encoding Error is 8, 64 % or 7 students. Factors that cause learning difficulties

come from internal factors and external factors. Internal factors derived from students include students' attitudes in learning mathematics, student learning motivation is still low, the health of the body is not optimal, and the ability of students' senseless. While external factors that come from outside the students, among others, the lack of teaching variation, and the use of learning media that have not been maximized Efforts that can be done to reduce the difficulty of learning mathematics based on the difficulties experienced and factors that background, among others, teachers should be able to teach math with fun, using congruent learning media and multiplying exercise questions.

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Profile of Students' Errors in Mathematical Proof Process Viewed from Adversity Quotient (AQ)

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Abstract: Mathematical proof is an important aspect in mathematics, especially in analysis. An error in the mathematical proof construction process often occurs. This study aims to analyze the students' errors in producing proof. Each of the categories of students' Adversity Quotient (AQ) is identified related to the type of students' error. The type of students' errors used according to Newmann's Error Analysis. This study used a qualitative approach. This study was conducted to 25 students who were taking real analysis course. Documentation, test, and interview were used to gather the data. Analyzing the students' test result and then interviewing them for each AQ category were done for the analysis process. The results show that there are 48% climber students, 52% camper students, and no one is identified as a quitter student. Climber students tend to make some proving error such as transformation error, process skill error, and encoding error while camper students make the comprehension error, transformation error, process skill error, and encoding error when they are producing proof.

INTRODUCTION

Analysis is one branch of mathematics. This is stated in one of the courses called real analysis. It should be noted that mathematics is not merely numbers. This is in line with Hernadis' (Hernadi, 2016), an opinion which says that so far the views on mathematics were still within the scope of the calculation activities relating to variables and numbers. However, it should be noted that important activities in the study of mathematics are mathematical proof the truth or facts applied and communicated in mathematics. Therefore, Yi Yin Ko and Eric Knuth say that mathematical proof is one of the basic abilities for advanced mathematical thinking (Ko & Knuth, 2009). Besides that, Knuth also says that mathematical proof plays a role in systematizing statements into axiomatic systems (Sucipto & Mauliddin, 2016). Mathematical proof includes thinking about new concepts, focusing on important aspects, using relevant prior knowledge, defining new things (if needed), and compiling valid argument (Hidayat, 2017; C. K. Sari, Waluyo, Ainur, & Darmaningsih, 2018). This must be based on a deductive mindset so that students are able to understand the mathematical proof process (Ekayanti, 2017). There is often a misunderstanding in solving mathematical proof problems, including the use of empirical arguments in the process of mathematical proof

(Stavrou, 2014). This is not an easy job, and it can be seen from the many errors made by students in completing mathematical proof cases.

Some errors in mathematical proof occur because students have not fully understood the true nature of mathematical proof. Students still often do mathematical proof using examples. Of course, this is invalid for the mathematical proof process. Besides that, the argument used is illogical. There are times when the mathematical proof made does not conclude. This can occur because of failures or errors in the first few stages are failing to reach the next stage (D. P. Sari, Darhim, & Rosjanuardi, 2018; Wijaya, Heuvel-panhuizen, Doorman, & Robitzch, 2014). The problem, critical thinking skills are needed so that students can plan and execute it effectively and accurately (Sukoriyanto, Nusantara, Subanji, & Chandra, 2016). This also applies in the case of mathematical proof where the students are required to have tenacity and resilience in facing existing difficulties.

Tenacity and resilience in facing challenges or difficulties are called Adversity Quotient (Stoltz, 2000). Stoltz divides three types of AQ, namely quitters, campers and climbers. The quitters tend to lack the willingness to accept the challenges that exist in their lives. The campers already have the willingness to try facing the challenges and problems, but this type of individual thinks that the effort is enough. The climbers tend to survive and struggle in facing problems, challenges, and obstacles (Yanti, Koestoro, & Sutiarso, 2018).

Considering that, the real analysis course is more dominated by mathematical proof, including in the rules of proof derived from formal definitions, as well as the theorems or lemmas associated previously (Ah, 2016). This is considered a difficult thing for students. Because of these difficulties, AQ is needed in learning mathematics (Guntur Suhandoyo, 2016). Therefore, this research was carried out in real analysis course to know more about the types of errors made by the students in learning mathematics, especially mathematical proof in terms of Adversity Quotient.

THEORETICAL SUPPORT

Hernadi says that mathematical proof is a method of communicating a mathematical truth to others who also understand the language of mathematics (Hernadi, 2016). A proof is a series of logical arguments that explain the truth of a statement or proposition. (Stefanowich, 2014) states that proof is a series of logical statements, where one statement influences the other statement, of course, there must be a valid explanation of the truth of the statement. Logically, in this case, it is intended that each step in the mathematical proof must be based on previous steps or other facts with guaranteed truth.

Anne Newmann classified types of errors into five types, including reading errors, comprehension errors, transformation errors, process skill errors, and encoding errors (Bagus Nur Iman, Toto Nusantara, 2016). Students are said to make a reading error if they experience errors in reading and understanding the command of the questions and errors in recognizing the symbols on the question. Comprehension error occurs when the students did not know what is known and asked from the question. Transformation errors occur if students experience errors in determining problem-solving strategies. Students experience a process skill error if they make algebraic operational errors and are wrong in carrying out completion procedures. While encoding errors occur when the students are able to determine the solution to the problem, but they are unable to write the procedure and form the answer correctly.

Intelligence is one of the psychological factors that influence

learning achievement (Leonard, 2017). There are several types of intelligence including Adversity Quotient. Adversity Quotient (AQ) is a person's ability to struggle with and overcome obstacles, difficulties, or problems that exist and will turn them into opportunities for success (Stoltz, 2000). Understanding the importance of AQ in achieving success will encourage the students to always struggle in the learning process even though they must face various obstacles and difficulties (Rukmana & Paloloang, 2016). AQ possessed by each individual in facing and overcoming difficulties is different. The level of ability possessed will have an impact on the ability to go through life and be able to provide great benefits for success (Nurhayati, 2015). Stoltz illustrates that life is like climbing a mountain. Therefore, Stoltz divides AQ into three types, namely Quitters (groups of individuals who stop) are groups of individuals who lack the willingness to accept the challenges that exist in their lives. The quitter will be more likely to reject challenges or problems (Hidayat, Herdiman, Aripin, Yuliani, & Maya, 2018; Christina Kartika Sari, Sutopo, & Aryuna, 2016). In the world of education, students who belong to the quitter type are students who are easy to give up and despair in facing the problems. Campers (groups of individuals who camp) are groups of individuals who already have the will to try to deal with challenges and problems but then they feel that it is enough. These individual groups prefer safe situations or prefer to be in a comfort zone. Students who belong to the campers usually type already struggle, but one factor could make them give up and eventually lost the challenge. Climbers are groups of individuals who tend to survive and struggle in facing problems, challenges, and obstacles. Students who belong to the climber type are learners who always sought and unyielding (Wardiana, 2014; Yani, Ikhsan, & Marwan, 2016). Students of the climber type tend to have the desire to get better (Indra Kurniawan, Kusmayadi & Sujadi, 2015).

Someone with high AQ will be encouraged to get the best results by actively acting, always taking advantage of the opportunities that exist, and having the willingness to learn independently (Novilita & Suharnan, 2013). Yanti and Syazali suggest that the high and low AQ can be measured using an indicator which consists of four dimensions including Control, Origin, Reach and Endurance (Yanti & Syazali, 2013), as shown in Table 1. The AQ score can be counted using the formula $C + O_2 + R + E = AQ$ (Stoltz, 2000).

Table 1. The Indicators of Adversity Quotient

Indicators (AQ Dimension: CO_2RE)		Description
C	Control; the level of control toward the events lead to problems	Students' self-control when sensing a problem
O_2	Origin and Ownership	O_r : The ownership of the origin of problems O_w : The ownership toward the problems
R	Reach; how far the problem could reach other aspects of live	The students' ownership of how far the problem could reach other aspects of live
E	Endurance	Students' perception of how long will the problems going on

METHOD

This study uses the qualitative approach with descriptive research type. This research was conducted at the Mathematics Education Study Program. The research subjects were the students who took Real Analysis courses in the second semester of the 2017/2018

Academic Year with a total of 25 students. Sampling technique used was purposive. The data collecting techniques were documentation, tests, and interviews. The students first fill out a questionnaire of Adversity Quotient to later group them into three categories namely climbers, campers, and quitters. From the questionnaire, the AQ score was obtained.

Furthermore, the categorization of AQ in this study refers to the determination of the interval category (Azwar, 2002), based on the theoretical mean (μ) and standard deviation (σ). The categorization criteria can be seen in Table 2 below. Where X states, the AQ score obtained.

Table 2. Categorization of AQ

Criteria	Category
$\mu + 1{,}0\sigma \leq X$	High
$\mu - 1{,}0\sigma \leq X < \mu + 1{,}0\sigma$	Medium
$X < \mu - 1{,}0\sigma$	Low

After analysis of the AQ, questionnaire had been conducted, and the results were obtained as presented in Table 3.

Table 3. Results of Adversity Quotient Questionnaire

Dimension	Number of Subjects	Score				Mean		Standard Deviation	
		t-Min	t-Max	e-Min	e-Max	Theoretical	Empirical	Theoretical	Empirical
C	25	8	32	20	28	20	23.32	4	1.95
O_2	25	11	44	26	41	27.5	32.84	5.5	3.80
R	25	12	48	28	41	30	35.80	6	3.11
E	25	9	36	21	35	22.5	26.28	4.5	3.17
AQ	25	40	160	101	140	100	118.24	20	9.04

Furthermore, from the data in Table 3, the theoretical mean and standard deviations were then used to determine the AQ categorization criteria in this research. The categorization criteria are in Table 4.

Table 4. AQ Categorization

Criteria	Category
$120 \leq X$	High
$80 \leq X < 120$	Medium
$X < 80$	Low

For the category of the Adversity Quotient, the highest category is assumed to be the Climbers category, and the medium category is assumed to be the Campers category, while the lowest category is assumed to be the Quitters category. Then the students were given a test of mathematical proof, the results of the tests are analyzed as a determination for the next process, namely interviews. From each category selected the work results of students with the type of error that represents other students and then selected as a subject who will be confirmed the results of their work through interviews. As for the analysis of the results of interviews conducted by going through several stages, namely data reduction, data presentation, and final conclusion.

RESULT AND DISCUSSION

Based on the data obtained, grouping students is based on Adversity Quotient by referring to Table 5.

Table 5. Student Grouping Results

Category	Number of Students	Percentage
High	12	48%
Medium	13	52%
Low	0	0%

This study did not find any students with the quitter Adversity Quotient category. The result is taken from the campers and climbers category. The test questions given were three mathematical

proof questions. The first problem is as follows:

Given the function $f: \mathbb{R} \to \mathbb{R}$ defined by

$$f(x) := \begin{cases} x & if\ x\ rational \\ 0 & if\ x\ irrational \end{cases}$$

Prove that $\lim_{x \to 0} f(x)$ exist, but $\lim_{x \to c} f(x)$ do not exist if $c \neq 0$.

The answer from the climber- type students can be seen in the following Figure 1.

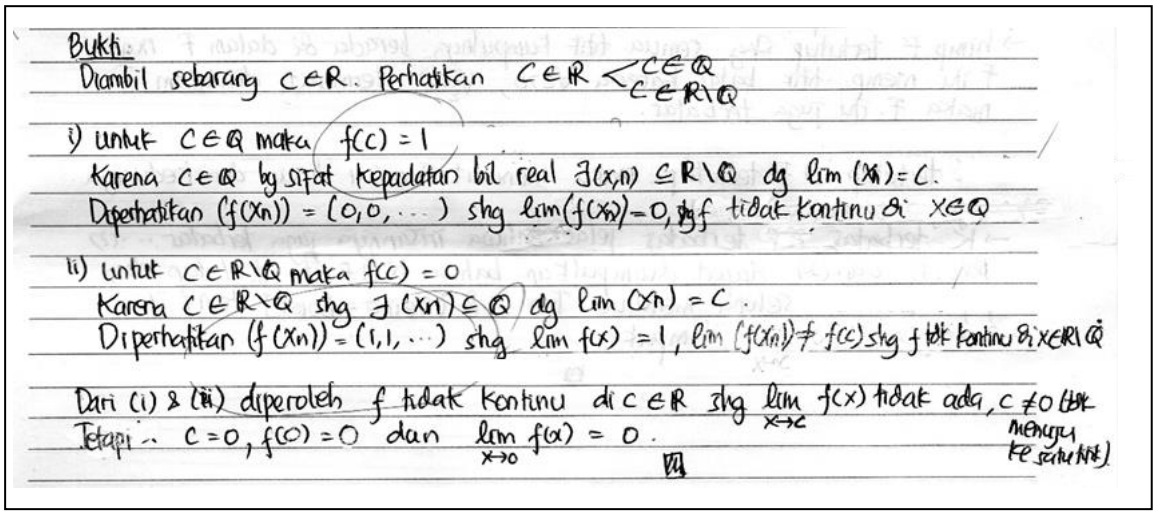

Figure 1. The Results of Climbers Type Students' Work for Question Number 1

Based on Figure 1, it appears that students proved that the function did not have a limit by connecting it to a continuous function. Students thought that if a function is not continuous, the function has no limit. This is a wrong understanding. Furthermore, when further analyzed was conducted, it appears that when $c \in \mathbb{Q}$ obtained $f(c) = 1$. Of course, this is not true based on the function definition given in the question. After these things were confirmed to the students concerned, it turns out that students were still referring to the example discussed in the previous lecture. In addition, students still had the wrong understanding regarding the limit of functions and continuous functions. Therefore, students experienced errors in determining strategies to solve these problems. While in the process, there were still a number of incorrect steps. The results of this analysis can be seen in the following Table 6.

Table 6. Results of Analysis of Type Student Work Climber for Number 1.

Types of Errors	Analysis Results
Reading Error	Students do not experience problems in reading errors. Students understand the problem given in question number 1.
Comprehension Error	Students know and understand what information given by question number 1 and what must be proven. It is seen that students are able to write the definition of functions given in mathematical language.
Transformation Error	Students make mistakes in this type. It is seen that the strategy used by students is to show that a continuous function has no limit. Of course, this is in contrast to the facts.
Process Skill Error	Students still make mistakes in carrying out some verification steps. It can be seen $c \in \mathbb{R}\backslash\mathbb{Q}$ is written $f(c) = 0$. course this is not in accordance with the definition given.
Encoding Error	Students have not been able

Types of Errors	Analysis Results
	to determine the resolution of this problem correctly.

Thus, it can be seen that students experience a tendency for transformation error and process skill error. Next in Figure 2, the results of Camper type students for question number 1. The results of this work indicated that there was a mismatch between the answers and the questions. The students were required to prove that the limit for $x \to 0$ exists, while the limit for $x \to c$ and $c \neq 0$ do not exist. However, it can be seen that students show f continuous in $x = 0$ and not continuous in $x \neq 0$. After being confirmed through interviews, it turns out that students were fixated on the sample questions that were discussed at the lecture. Students understood when they were asked to prove that the limit exists, but did not know what can be used from the information given by the question. So that students had difficulty in determining the next step for the verification process.

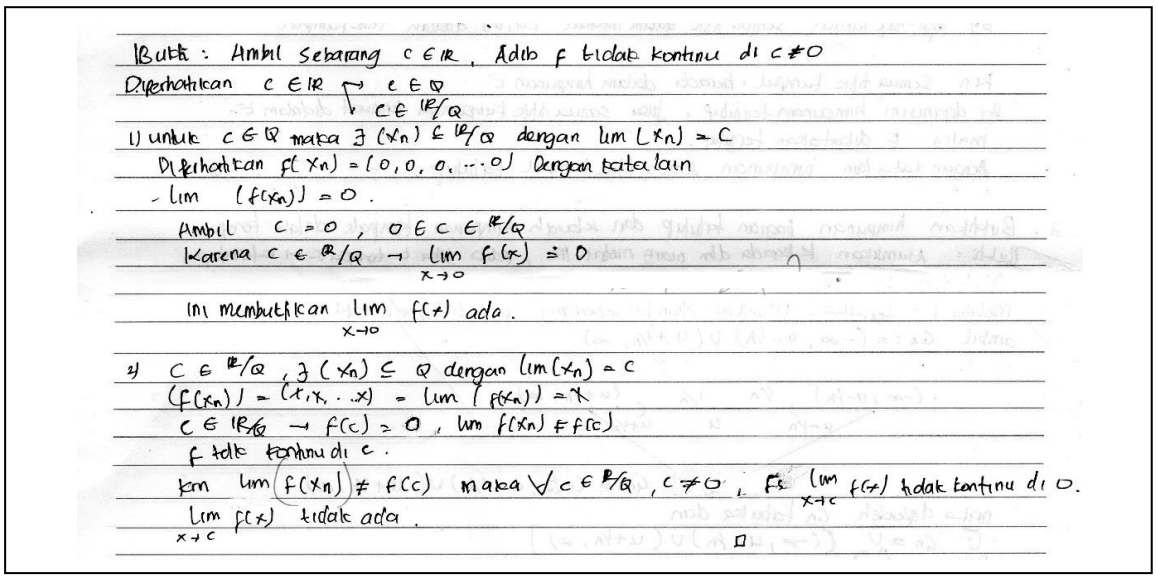

Figure 2. The Results of Camper-type Students' Answer for Question Number 1

The results of the analysis are in the following Table 7.

Table 7. The Analysis Results of Camper-type Students' Answer for Question Number 1

Type of Error	Analysis Results
Reading Error	If you see the results of student work above, it seems that there is an error in the reading process. Because there is a mismatch between questions and answers. However, after being confirmed through interviews, it turned out that students were aware of that. So, students know that the answer given is not by the question.
Comprehension Error	Students provide such answers because they only know a little from the information. The rest of the students did not know what could be used from the information provided by the question.
Transformation Error	Students did not know what strategies to use to solve problems in this question.
Process Skill Error	Students do not carry out verification procedures correctly.
Encoding Error	Students have not been able to determine the resolution of this problem correctly.

Thus, on the question, it can be seen that the student tend to do comprehension errors, transformation errors, and process error skills. For the second question, it is

still in the form of mathematical proof. The second question is as follows:

For example, let $f: A \to \mathbb{R}$ be continuous on R and let x_n sequences in A is convergent. Prove the $\lim(f(x_n)) = f(\lim(x_n))$.

Following is the work results from the climber-type students for the second question.

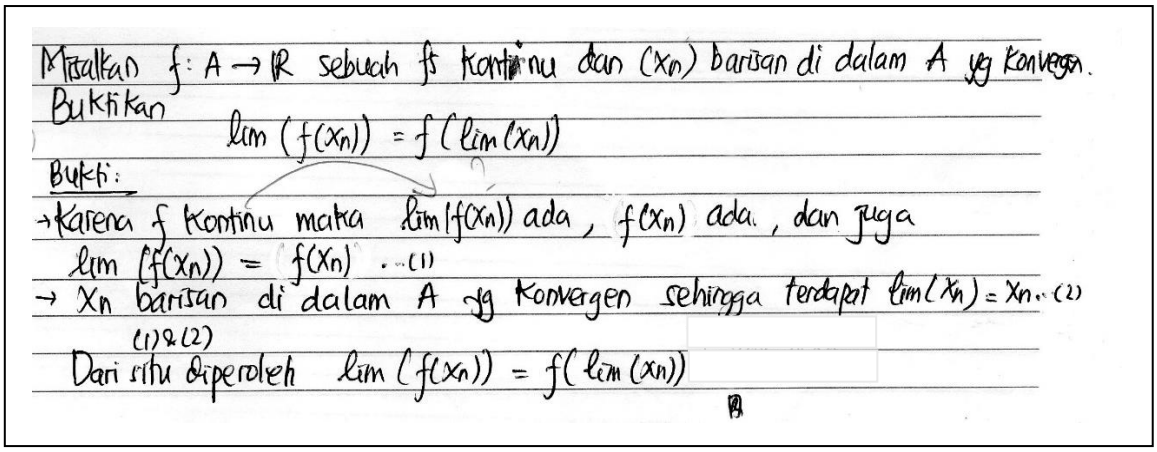

Figure 3. The Results of Climber-type Students' work for question number 2

From Figure 3, it appears that students proved this case by connecting the concepts of continuous functions and limit lines. In the first stage, students took advantage of the concept that when a function is continuous, the limit is exist, the function value is exist, and the limit value is the same as the function value. However, students did not provide a justification regarding the line of (x_n) used. Next, students used the concept of converging sequence for the next process. However, it appears that students wrote down $\lim(x_n) = x_n$ since (x_n) was a convergent sequence. Then the conclusion was that the limit value was equal to the value of its function. After being confirmed to the students concerned, information was obtained that the students used line (x_n) on continuous concepts so that they could be linked to the information given, namely sequences (x_n) convergent. Furthermore, when the students wrote $\lim(x_n) = x_n$ in hopes that they could be connected to the concept of continuous function. From the results of this confirmation, it can be seen that the students used the correct strategy, but at the time of execution, it seems that students used inappropriate methods. Thus, it can be seen that in this problem students did not make a transformation error, but a process skill error. Furthermore, students had led to solving the problem, but the form of the answer given was still incorrect. It can be concluded that this thing is included in encoding errors. The results are presented in Table 8.

Table 8. The Results of analysis of the Climber-type Students' Work for Question Number 2

Type of Error	Analysis Results
Reading Error	Students do not experience problems related to reading.
Comprehension Error	Students understand the purpose of the problem, and it seems that students use all the information provided by the problem.
Transformation Error	Students have had a strategic idea to prove this case, namely by connecting the limit of the line and the continuous function. This is done by utilizing the properties that apply to the limit of functions and

Type of Error	Analysis Results
	continuous functions.
Process Skill Error	In the process, it appears that students are still writing inappropriate procedures. This can be seen from the statement $\lim(x_n) = x_n$. Of course, this statement raises questions, but there is no justification for this statement.
Encoding Error	Student answers have led to solving the problem, but the form of the answer given is not correct. Because there are some steps that are not clear and there is no justification.

Furthermore, the following (Figure 4) is the work result of the camper-type students for question number 2. After further observing the results of student work in Figure 4, students intend to prove this case by using formal definitions of continuous functions and limit functions. However, students do not provide a definition of continuous functions but a definition of limit functions. It seems that students have not been able to correctly identify what is informed by the problem and what can be utilized from the question information. It seems that students experience error comprehension.

Furthermore, in the process, the definition of convergent sequence does not appear in the results of students' work. There appears to be a statement $\forall \varepsilon > 0, \exists \delta > 0 \ \ni |x_n - \lim(x_n)| < \delta \rightarrow |f(x_n) - f(\lim(x_n))| < \varepsilon$ caused by the convergence of lines (x_n), but there should be an explanation before writing the statement above because if so, the causal relationship above is not suitable.

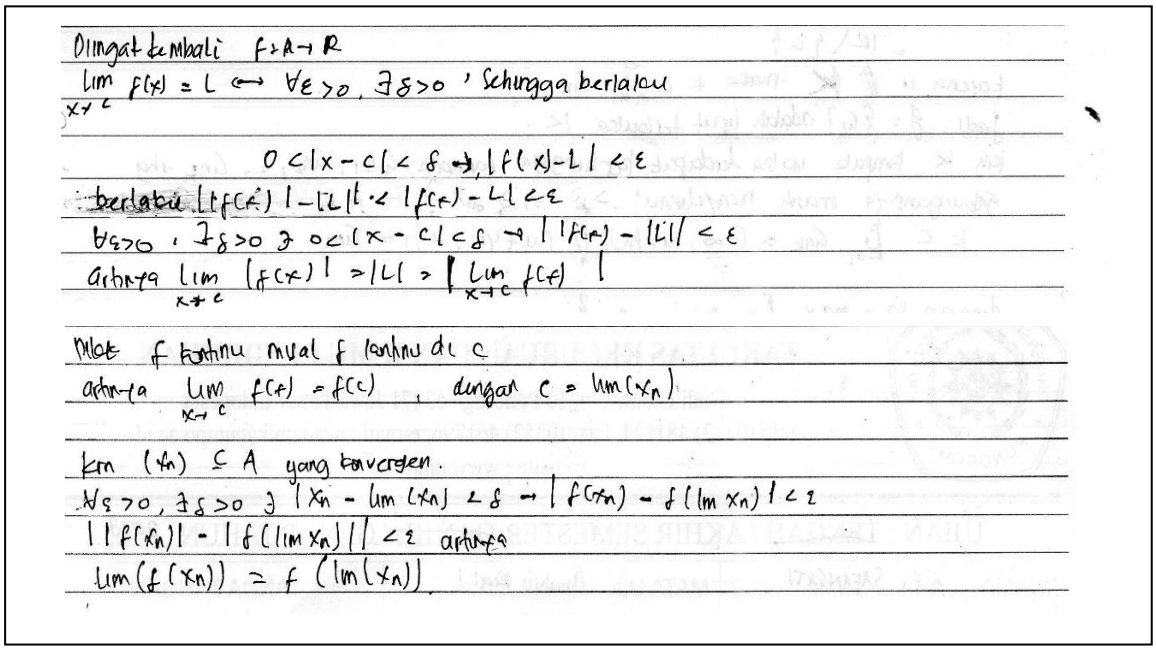

Figure 4. Results of Camper-type Students' Work for Question Number 2

After being confirmed with the students concerned, it turns out that students are still confused about how to use the concept of converging sequence. Therefore, students direct the answer to statement 1. It appears that in this problem, Camper-type students are similar to Climber-type students in the sense that they have the right problem-solving strategies, but made mistakes in carrying out the strategy.

Table 9. The Results of the Analysis of the Camper-type Students' Work for Question Number 2

Type of Error	Analysis Results
Reading Error	Students do not experience problems related to reading.
Comprehension Error	Students cannot use the information provided by the problem. The actual concept that needs to be reviewed in this problem is the definition of continuous functions. However, students instead provide a definition of limit functions.
Transformation Error	Students have the right strategy, namely by utilizing formal definitions. Furthermore, students try to associate the concept of continuous function with a line limit.
Process Skill Error	In the process, the student only mentions once the line limit is locked and there is no justification at all regarding the line limit.
Encoding Error	The results of the students' work have led to the completion of the desired final form. However, the verification procedure provided is still incorrect.

Thus, for question number 2, the Camper-type students have a tendency toward the comprehension errors, process skills error, and encoding errors. The third question is still in the form of mathematical proof. The third question is as follows:

Prove that the set of limit points of a set is closed.

The following is the result of students' work for the third question.

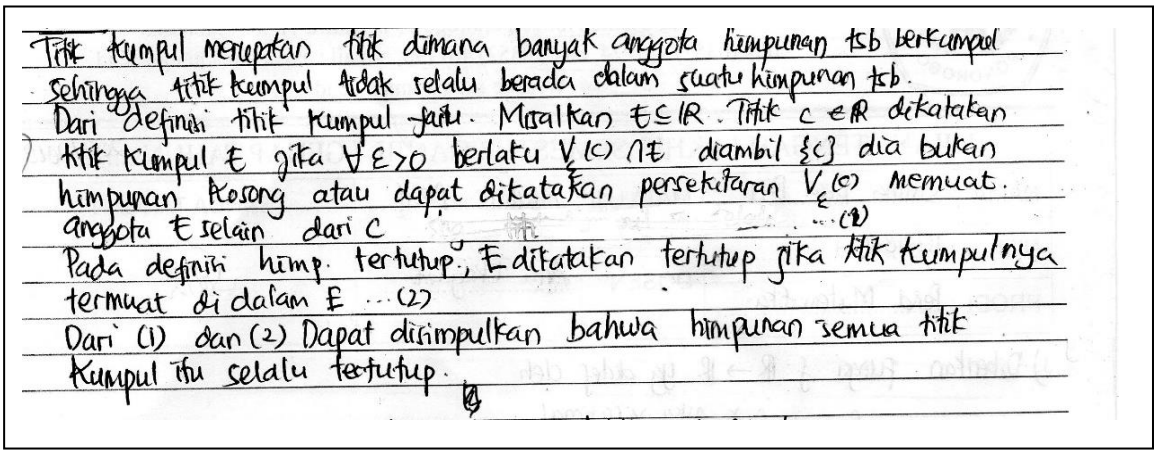
Titik kumpul merupakan titik dimana banyak anggota himpunan tsb berkumpul sehingga titik kumpul tidak selalu berada dalam suatu himpunan tsb.
Dari definisi titik kumpul jadi. Misalkan $E \subseteq \mathbb{R}$. Titik $c \in \mathbb{R}$ dikatakan titik kumpul E jika $\forall \varepsilon > 0$ berlaku $V_\varepsilon(c) \cap E$ diambil $\{c\}$ dia bukan himpunan kosong atau dapat dikatakan persekitaran $V_\varepsilon(c)$ memuat. ...(1)
anggota E selain dari C
Pada definisi himp. tertutup, E ditatakan tertutup jika titik kumpulnya termuat di dalam E ...(2)
Dari (1) dan (2) Dapat disimpulkan bahwa himpunan semua titik kumpul itu selalu tertutup.

Figure 5. Results of Climber-type Students' Work for Question Number 3

The result of the student work above shows that the strategy used to prove the case was the definition of a closed set. However, the reason or explanation given was not so strong to conclude. After being confirmed to the students, they were still confused to provide mathematical proof of justification. As a result, students provided compelling conclusions. In this case, it can be seen that the students already had mathematical proof of ideas or strategies, but the same as in solving the previous questions, they still had problems with the execution of the strategy.

Table 10. Results of Analysis of the Climber-type Students' Work for Question Number 3

Types of Errors	Analysis Results
Reading Error	Similar to other cases, students do not experience problems related to reading.
Comprehension Error	Students have understood information that can be used from the questions given. It is seen that

Types of Errors	Analysis Results
	students can provide definitions of gathering points and definitions of closed sets.
Transformation Error	Students have the right strategy, namely by using the definition of closed set.
Process Skill Error	When executing an existing strategy, students are still lacking in giving justification at each step.
Encoding Error	The results of this students' work have led to completion and have the desired final form. But the justification is still lacking, and it can be said that the justification is still not strong enough to conclude this proof.

Thus, it can be seen that the climber-type students have a tendency to make mistakes in the process skills error and encoding errors (Indra Kurniawan, Kusmayadi & Sujadi, 2015). The following is the work of the camper-type students for question number 3.

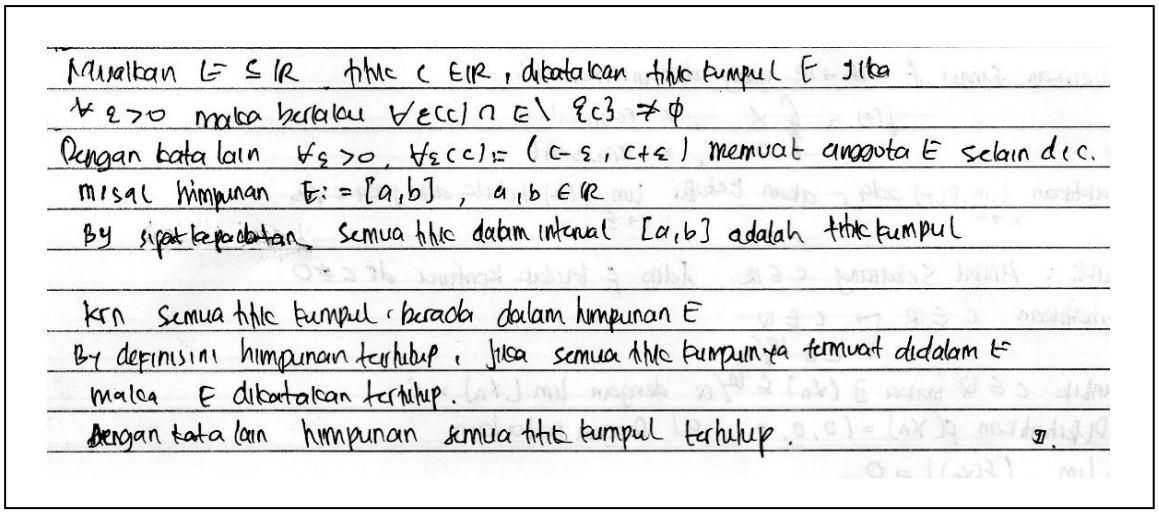
Misalkan $E \subseteq \mathbb{R}$ titik $c \in \mathbb{R}$, dikatakan titik kumpul E jika
$\forall \varepsilon > 0$ maka berlaku $\forall \varepsilon (c) \cap E \setminus \{c\} \neq \phi$
Dengan kata lain $\forall \varepsilon > 0$, $\forall \varepsilon (c) := (c-\varepsilon, c+\varepsilon)$ memuat anggota E selain c.
misal himpunan $E := [a,b]$, $a, b \in \mathbb{R}$
By sifat kepadatan, semua titik dalam interval $[a,b]$ adalah titik kumpul
krn semua titik kumpul berada dalam himpunan E
By definisi: himpunan tertutup, jika semua titik kumpulnya termuat didalam E
maka E dikatakan tertutup.
Dengan kata lain himpunan semua titik kumpul tertutup. ∎

Figure 6. The results of the Camper-type Students' Work for Question Number 3

The result of question number 3 is generally similar to the answer of the climber-type students. The students use the definition of closed sets to prove this case. However, students encountered problems in how to justify this verification. So, students don't have problems in determining strategies, and problems arise when executing the strategy. This shows that the error that tends to occur for question number 3 is the process skill error and encoding error.

CONCLUSION

There are several types of errors that students tend to do in solving mathematical cases in the form of mathematical proof. For climber-type students, some types of errors that they tend to do in doing mathematical proof are transformation errors, process skill errors, and encoding errors. The camper-type students tend to do comprehension errors, transformation errors, process skills error, and encoding errors. In comprehension error, it can be seen that in compiling proof, the students understand the intention of the problem but do not know what information can be taken. For transformation error, it can be seen from the misunderstanding between the concept of continuous functions and limit functions. As for the process skill error, it can be seen from students' errors in writing mathematical proof, and there are still steps that are not accompanied by

justification, or even steps that are not written correctly. The encoding error can be seen from the evidentiary steps that have been written down, have not been compiled with the correct flow, and there is still a lack of mathematical proof justification for drawing conclusions.

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Physics Learning Based on Virtual Laboratory to Remediate Misconception in Fluid Material

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Abstract: An understanding of concepts is very necessary in physics learning. It has been confirmed that often students have different understanding of scientific concepts, this term is what commonly called Misconception. Misconception is a problem that must be addressed immediately because misconception is one factor that causes students to experience difficulties in learning physics. This study aims to determine the effect of physics learning with the PDEODE model (predict-discuss-explain-observe-discuss-explain) assisted by virtual laboratory in the form of PhET simulation in remediating students' misconceptions in the fluid material. This type of research is a Pre-Experimental One Group Pretest-Posttest design. The samples of this study were eleventh-grade science students of State Senior High School in Gadingrejo District, Lampung Province, taken through simple random sampling technique. The test used was in the form of a multi-tiered multiple-choice test of the four-tier diagnostic test with certainty response index (CRI) consisting of 20 items. The result of this study indicates that students' misconceptions decrease for all sub-concepts of fluid material. Based on the previously described statements, it can be concluded that physics learning based on virtual laboratory can remedy students' misconceptions, especially in fluid material.

INTRODUCTION

Education cannot be separated from the process of teaching and learning activities. One means of supporting the learning process is through formal education in schools (Diani, 2016). The learning process in schools is done so that students get new knowledge from what they learn (Yudhittiara, Hindarto, & Mosik, 2016).

Understanding of concepts is very important in the early stages of thinking, especially in the field of physics. Physics is one of the fields of science that focuses on understanding the concepts rather than memorization (Sholihat, Samsudin, & Nugraha, 2017). Physics contains many scientific concepts, laws, equations, and events that occur in everyday life (Aldila, Setyarsih, & Kholiq, 2016; Syahrul & Setyarsih, 2015; Yuwarti, Pasaribu, & Hatibe, 2017; Zulia Witanecahya & Jatmiko, 2014). Learning physics can make students master knowledge in the form of facts, concepts, principles, and the process of discovery (Diani, Yuberti, & Syafitri, 2016).

Knowledge possesses by the students is not just poured into their minds but must be actively constructed

(Saputra, Halim, & Khaldun, 2013). Prior to obtaining a formal education, students have preconceptions with different understandings. In line with Pinker's research in wahyuningsih, et al., generally students come to school not with a blank mind, but they have brought a number of experiences or ideas formed before when interacting with their environment (Wahyuningsih, Raharjo, & Masithoh, 2013). The concept that students have could be in accordance with scientific concepts yet can also experience irregularities. Concept deviations or incompatibility of understanding of these concepts are often called misconceptions (Hono & Yuanita, 2014; Subagyo, Suyono, & Tukiran, 2014; Suparno, 2005). The misconception is the initial concept held by students, which is not in harmony with scientific conceptions or physicists (Ariyastuti & Yuliawati, 2017; Martinez-Borreguero, Pérez-Rodríguez, Suero-López, & Pardo-Fernández, 2013; paul suparno, 2013).

The students' misconceptions often occur in a fluid material, which is also one of the fields of mechanics, where mechanics experiences the greatest misconception. According to the data obtained by Wandersee, et al. in Suparno, with an article entitled Research on Alternative Conception in Science, which was studied from 700 studies of alternative concepts in physics (Suparno, 2013). It reveals that there is 300 research on misconceptions in mechanics, 159 research on electricity, 70 research on heat, optics, and material properties, 35 research on earth and space, and 10 research on modern physics (Zulvita, Halim, & Elisa, 2017). One form of misconception on the fluid is that students assume the density of water is smaller than the density of kerosene with the same volume and height (Pratiwi & Wasis, 2013).

One of the causes of the students' misconception is the lack of the mastery of concepts (Arjanggi & Suprihatin, 2010), wrong intuition (Fariyani, Rusilowati, & Sugianto, 2015) and broadly caused by students, teachers, textbooks, contexts, and teaching methods (Jannah, Ningsih, & Ratman, 2016; Wahyuningsih et al., 2013). Misconceptions that occur as early as possible must be known and corrected, because the ignored conceptual errors will have an impact on the low learning outcomes (Chaniarosi, 2014; Susanti, 2013), influence the process of understanding of the subsequent concepts, and disrupt the process of identifying examples of physics phenomena in everyday life (Artiawati, Mulyani, & Kurniawan, 2016; Pebriyanti, Sahidu, & Sutrio, 2015).

Therefore, one effort to overcome misconceptions is by remediation which is an activity to improve learning that is less successful in understanding subject matter (Zulvita et al., 2017). Remediation needs the right and complex learning model, one of which is the application of the Predict-Discuss-Explain-Observe-Discuss-Explain (PDEODE) learning model. PDEODE Learning Model is a model that refers to the views of constructivism (Costu, 2008), which has six stages namely Predict, Discuss (first), Explains (first), Observe, Discuss (second), Explain (second) (Sdarmi, Suarni, & Dibia, 2013). The stages of the PDEODE model can familiarize the students to form scientific concepts because they can think independently, carry out and directly investigate an experiment, discuss in groups, and get more scientific new concepts because the students' initial concepts are compared to the results of investigations (Ardiyan, 2015).

The PDEODE learning model also helps students to understand science in daily life (Costu, 2008), the learning process is more active and conceptual. The changes occur from the students' incorrect initial thoughts to the new knowledge that is definitely true (Kolari,

Savander-ranne, & Tiili, 2005). In addition, the PDEODE Model is effective in identifying misconceptions and improving critical-thinking skills (Sri & Wulandari, 2013), effectively reducing misconceptions that occur in students (Dewi & Suhandi, 2016; Siregar, 2015), and can improve students' learning outcomes (Budianto & Istyadji, 2015).

To support the PDEODE learning model which contains observe stage (experimentation), an instructional media is needed that may improve the concepts understanding as well as lowering misconceptions (Suhandi, Sinaga, Kaniawati, & Suhendi, 2008). Along with the development of the times marked by the development of products and the use of technology and information, the implementation of learning has also shifted into an effort to realize modern learning.

One of the learning media that enables an experiment without using many tools is PhET simulation equipped with student worksheets. PhET Virtual Media simulation can help students to understand concepts, receive feedback, provide interactive approaches, constructivists, and think critically and creatively because PhET simulation prioritizes the relevance of real-life phenomena with underlying knowledge (Perkins, Adams, Dubson, & Finkelstein, 2006; Sholihat et al., 2017). Students will compare their predictions with the experiments conducted. PhET media simulation can reduce misconceptions and can improve learning outcomes (Atmoko & Wasis, 2015; Jauhari, Hikmawati, & Waahyudi, 2016).

Based on the results of pre-research conducted on the eleventh-grade science students of State Senior High School in Lampung Province, learning is still dominated lecturing centered on teachers. The students only focus on memorizing formulas without understanding the concepts. In addition, the identification of misconception was done using the four-tier diagnostic test equipped with the certainty of response index (CRI) on fluid material. The average percentage of misconceptions in fluid material is 44.83%. One form of misconception in Archimedes' sub-law is that students assume that the density of objects is greater than the density of the water, so the object will sink. So, the effort made in this study was by applying the PDEODE model assisted by PhET simulation in reducing misconceptions in a fluid material.

METHOD

This study employs a pre-experimental method. The design of the research is One-Group Pretest-Posttest Design. This design is used in one group of subjects (Irwan, Thamrin, & Budayawan, 2016). Treatment is given to a subject group after that the effect of the treatment is observed (Saputra et al., 2013). The research variable is the PDEODE model assisted by PhET simulation as an independent variable and a misconception as the dependent variable.

This study aims to remedy students' misconceptions in a fluid material. It was conducted in the first semester of the 2018/2019 academic year. The population of this study was all students of eleventh-grade science students of State Senior High School (SMA) in Gadingrejo District, Lampung Province, with the sample of 30 students as an experimental class. The sampling was carried out through simple random sampling technique. The instrument of this study was 20 items of multiple choices in the form of four-tier diagnostic tests equipped with CRI. The test was a four-tier test developed from the three-tier test. There also present a confidence rating (level of confidence) using CRI on the reason for the answer so that the level of confidence is more accurate (Zaleha, Samsudin, &

Nugraha, 2017). The categories of combinations of answers to the four-tier diagnostic tests are shown in Table 1 (Fariyani et al., 2015; Sheftyawan, Prihandono, & Lesmono, 2018), and the categories for confidence level scale of the Certainty of Response Index (CRI) is in Table 2 (Hasan, Bagayoko, & Kelley, 1999).

Table 1. The Answer Combination of the Four-tier Diagnostic Test

Answer Combination	Answer Combination			
	Answer	**Level of Confident**	**Reason**	**Level of Confident on the Reason**
Understand the Concept	Correct	Sure	Correct	Sure
	Correct	Unsure	Correct	Unsure
	Correct	Sure	Correct	Unsure
	Correct	Unsure	Correct	Sure
Do not Understand the Concept	Correct	Unsure	Incorrect	Unsure
	Incorrect	Unsure	Correct	Unsure
	Incorrect	Unsure	Incorrect	Unsure
	Correct	Sure	Incorrect	Unsure
	Incorrect	Unsure	Correct	Sure
	Correct	Unsure	Incorrect	Sure
	Correct	Sure	Incorrect	Sure
Misconception	Incorrect	Sure	Correct	Unsure
	Incorrect	Sure	Correct	Sure
	Incorrect	Sure	Incorrect	Unsure
	Incorrect	Unsure	Incorrect	Sure
	Incorrect	Sure	Incorrect	Sure

Table 2. The Category of the Scale Confidence Level of Certainty Response Index (CRI)

Category	Scale	Level of Confident
Guessing	0	Low/Unsure
Really Unsure	1	
Unsure	2	
Sure	3	High/Sure
Really Sure	4	
Very Sure	5	

Before the question was used for the research on misconception, first the validity was tested using the Karl Pearson correlation test (Arikunto, 2013). The 20 questions were stated as valid. The reliability test used was Cronbach alpha formula. The differentiating power and the level of difficulty of the questions were also tested.

After it can be used, the questions were tested for its normality by using the Lilliefors test (Samidi, 2015), homogeneity with the F-test (Irwan et al., 2016) and hypothetical test using the t-test to see the difference in the mean between pretest and posttest, which conclusions were then drawn. Furthermore, the scores of students' learning achievements were compared between the pretest and posttest, and then analyzed using the N-gain test (Khairati, Feranie, & Karim, 2016). The normalized N-gain score obtained were categorized as shown in the Table 3 (Simbolon & Tapilouw, 2015).

Table 3. Category of N-Gain Value

Category	Criteria
$g > 0,70$	High
$0,30 \leq g \leq 0,70$	Moderate
$g < 0,30$	Low

Then to calculate the percentage of the students who understand the concept, misconception, and do not understand the concept, the equations proposed by (Arikunto, 2013; Sudijono, 2013; Utami, Agung, & Bahriah, 2017) was used. Then the results of calculation of the misconceptions were categorized according to the percentage in Table 4 (Fitria, Muhibbuddin, & Safrida, 2017; Suwarna, 2014).

Table 4. Criteria for Misconceptions Level

Value of P	Criteria
61 % - 100 %	High
31 % - 60 %	Moderate
0 % - 30 %	Low

RESULT AND DISCUSSION

The Implementation

This study was conducted at the eleventh-grade science students of State Senior High School in Gadingrejo District, Lampung Province, in four meetings. The following is the data from the implementation of the learning process through PDEODE model assisted by PhET Simulation.

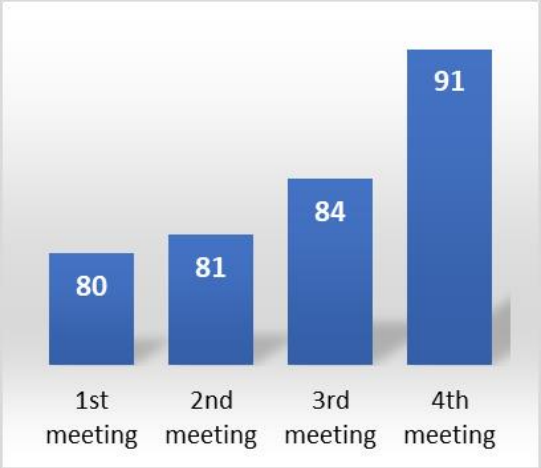


Figure 1. Percentage of Implementation of Learning Models

Based on Figure 1, the average percentage is 84% with a very good category. The following is one of the results of the implementation of the PDEODE model assisted by PhET on Archimedes law subconcept.

Predict Stage

In this stage, the students observed the problem formulation of static fluid events in daily life as follows.

Based on the images above, iron nails or steel nails that are placed into a glass of water immediately sink but why does a ship made of iron that weighed up to thousands of tons could float? Why are the two events different even though they are both made of iron? Explain according to your hypothesis!

Figure 2. Formulation of Problems in Archimedes Law

Students individually observed and give hypotheses from the answer to the problem given. The following is the hypothesis of one of the student.

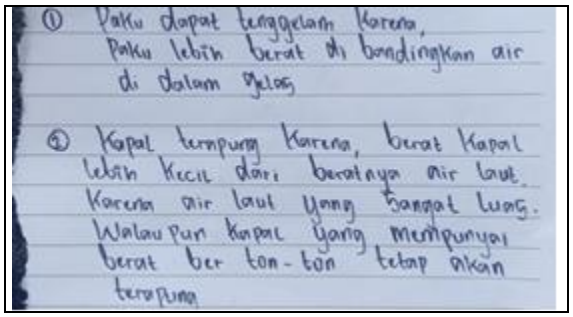


Figure 3. Answer of the Predict Stage

In the first answer, it can be seen that students experienced a misconception in which the nails sink due to the density of nails is greater than the density of water, not weight but density. Misconceptions in question number 2 are that the ship is able to float because the ship's volume is smaller than the volume of seawater so that the density of the ship is lesser than the density of seawater.

Discuss Stage I

In this stage, the students were grouped to discuss the formulation of the problem. They combined the individual prediction to produce a problem-solving. Here is the result of discussion from one of the groups.

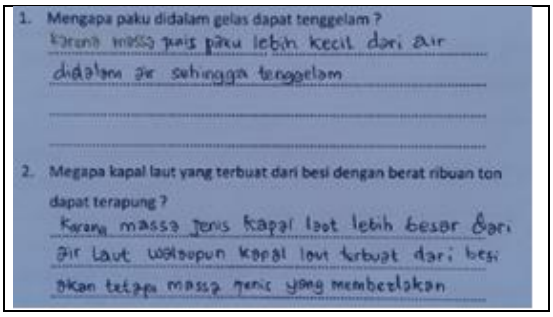
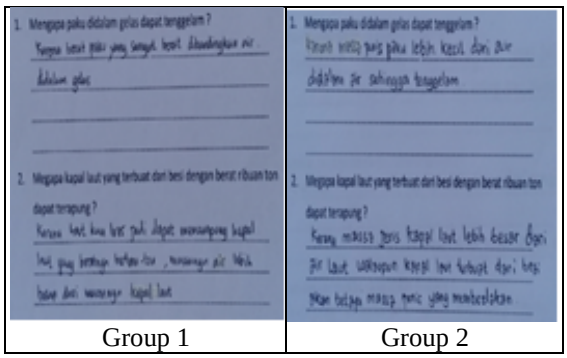


Figure 4. Results of the Discuss Stage I

Explain Stage

In this stage, the representative of each group come forward to read the results of the discussion. The result of the study reveals that there are differences between groups, one of which is shown in the following images.



Group 1	Group 2

Figure 5. The Results of Explain Stage I

It can be seen that there are differences of opinion between groups in which group 1 experiences a misconception that nails sink because they are heavier than seawater while sea water is heavier than the ship, so it floats. For group 2, there is a misconception where the density of nails is smaller than the density of seawater, so it sinks while the density of the vessel is larger so it sinks. Both groups experienced a misconception that it should be the first group that affects density not weight and the second group should be the density of objects is greater than the density of water so that objects float while the density of objects is smaller than the density of water so that objects sink. The misconceptions will be proven in the later stage.

At the observing stage, the students did an experiment using PhET simulation equipped in the student worksheet. The experiment was carried out based on the formulation of the problem above. The following are the PhET simulation images.

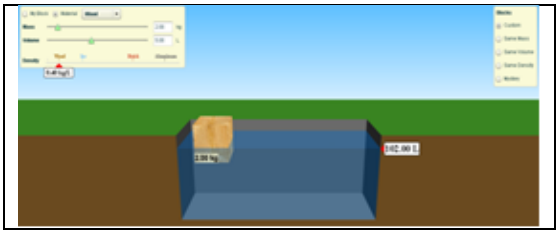
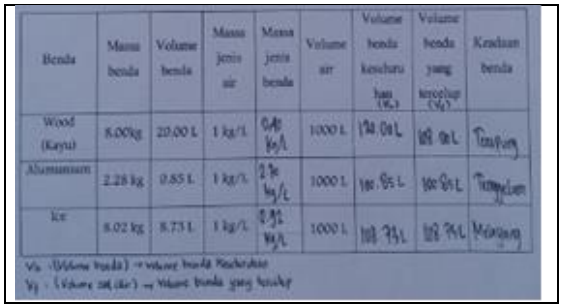


Figure 6. Experiment on PHET Simulation

Students did 3 experiments. The following are the results of the experiments on Archimedes law.



Benda	Massa benda	Volume benda	Massa jenis air	Massa jenis benda	Volume air	Volume benda keseluruhan	Volume benda yang tercelup	Keadaan benda
Wood (Kayu)	8.00 kg	20.00 L	1 kg/L	0.40 kg/L	1000 L	120.00 L	80.00 L	Terapung
Aluminium	2.28 kg	0.85 L	1 kg/L	2.7 kg/L	1000 L	100.85 L	100.85 L	Tenggelam
Ice	8.02 kg	8.73 L	1 kg/L	0.92 kg/L	1000 L	108.73 L	108.73 L	Melayang

Figure 7. Students' Experiments Data

In this second discussion stage, the students in groups discussed the results of the experiments conducted. The results of the discussion are shown in the following images.

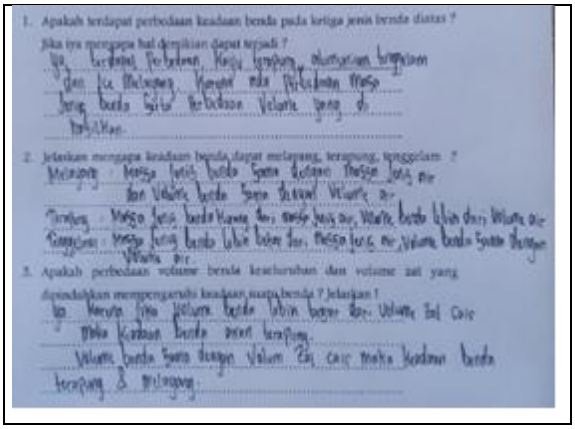


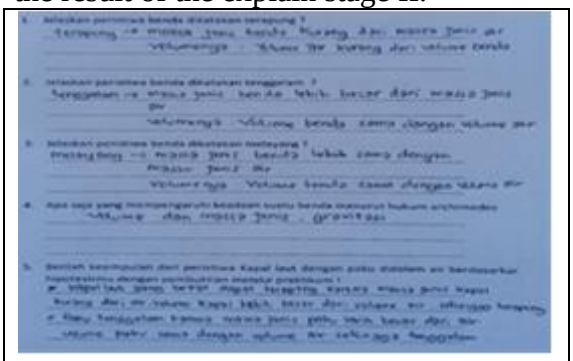
Figure 8. Results of Discuss Stage II

Based on the results of observation, the students compared the initial

hypothesis with the results of experiments. It is known that the students who experience misconceptions can change their concepts to understand the concepts. For example, the students initially predict that the ship floats because the density of the ship is greater than the density of seawater. After the observing stage was applied using PhET simulation, they know that the ship can float because the density of the ship is smaller than the density of seawater.

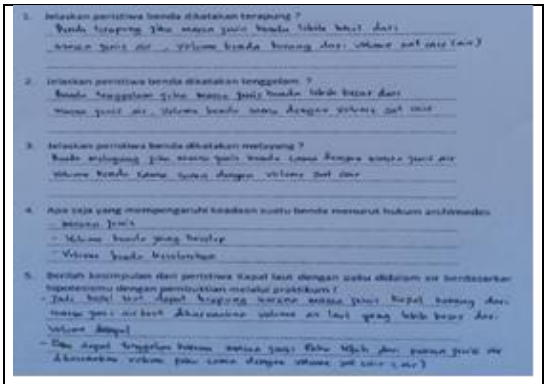
Explain Stage II

The representatives of each group explained the answers to the formulation of the problem in detail. The following is the result of the explain stage II.



Group 1

Figure 9. Results of Discuss Group 1



Group 2

Figure 10. Results of Discuss Group 2

The Results of Students' Misconception

The differences in the results of the pretest and posttest can be calculated using the normalized gain formula. The following is the data of pretest and posttest.

Table 5. Normalized Gain Test

Test Type	Ave-rage Score	N-Gain	% N-gain	Category
Pretest	16.9%	0.41	41%	Moderate
Posttest	26.3%	3		

Statistical test which is one of the characteristics of quantitative research that aims to direct the researcher to answer the formulation of the problem and to test the predetermined hypothesis. Before the hypothesis can be accepted, a series of statistical tests are conducted on the data of pretest and posttest obtained in the study. The recapitulation of statistical tests is presented in Table 6.

Table 6. Statistical Test Results of the Pretest and Posttest

Data Analysis Techniques	Types of Test	Results
Normality	Lilliefors	Sig. Pretest = 0.140 Sig Post-test = 0.09
Homogeneity	Test-F	Sig. = 1906
Hypothetical Test	T-Test	Sig. = 12:15
A	0:05	
Conclusions	data were normally distributed and Homogeneous Ho is rejected H_1 is accepted	

Based on the results of the t-test, there is a difference of significance seen from the average score that posttest is greater than the pretest. It can be claimed

that the PDEODE learning model assisted by PhET simulation can remediate students' misconceptions in the fluid material. The decrease of the misconceptions' average in the fluid material is presented in Figure 10.

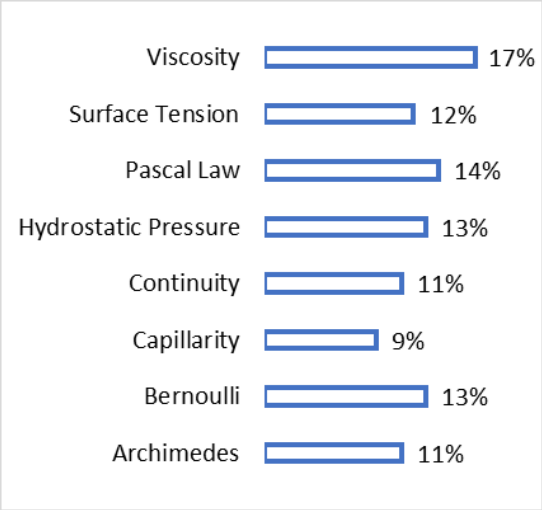


Figure 11. The Percentage of the Misconception's Average Decrease in Each Sub-concept of Fluid Material

Based on the implementation of the PDEODE learning model assisted by PhET simulation in 4 meetings, it obtains a positive response from the students based on the interviews and conditions in the field. The students said that the learning process is very fun so that they can better understand the fluid material. seen from the enthusiasm and activeness of students, they followed all stages of the PDEODE model assisted by PhET simulation although initially they felt confused with the repetitive learning process and the use of PhET media simulation but in the next meeting, with the guidance of teachers, the students could understand the purpose of using the PDEODE model and the use of PhET simulation. This opinion is also reinforced by research from Costu stating that the PDEODE model is effective in helping students to understand science in everyday life and contribute to get a better understanding of concepts (Costu, 2008). This research was also conducted by Fatimah et al., that state the PDEODE model receives good responses from students and increases the ability to understand the concept of organizational life (Fatimah, Martono, & Hadiansah, 2015). Besides, according to Kolari et al., the PDEODE model makes the students more active in interacting with study groups, more active in constructing their own knowledge, and feeling confident (Kolari et al., 2005).

The steps of the PDEODE model assisted by PhET simulation are: (1) predict, students individually predict the formulation of the problem given by the teacher, so that it gives an initial picture of the misconceptions. In line with research from Riko which states that the predict stage is used as an estimate of the initial knowledge that students have about DC electrical circuits (Riko, 2018). (2) Discuss stage I, the students are grouped to actively exchange opinions and to unite their individual predictions into one conclusion. This is in line with research by Nursinar, which states the discussion makes students able to complete the task by exchanging opinions between students which influence the learning outcomes (Nursinar, 2017). (3) Explain stage I, and each group has a different opinion so that at this stage, the students experience cognitive conflict. In line with the research from Suparno, that cognitive conflict can arise if the data or concepts possessed by students are very different from what was thought before, then students experience conflict on their minds (Suparno, 2013). (4) Observe, the activeness of the students is high when students were experimenting using PhET simulation. It is seen that students really enjoy learning when they experience and shape their own knowledge through experiments using the PhET simulation. In accordance with the opinion of Nurjanah in Riko, that through experiments, the learning process becomes very interesting because students

can observe events that occur directly, so they don't just listen (Riko, 2018).

In addition, the Observe stage makes learning become more interesting students' conception at the beginning of learning could be quickly corrected during the experiment in which students can obtain data. This is because students interact directly with the fluid material when they are changing the size, comparing, and finding out the criteria contained in the experiment using PhET simulation so that the truths can be more believed by the students who experienced misconception.

The results of this study were also conducted by Joyce in Mursalin, stating that PhET simulation makes students more active in increasing their knowledge of concepts or principles, making it simpler to understand the concept of electric circuits, and learning becomes more interesting so that many things can be learned (Mursalin, 2013). Research by Sari et al., reveals that students can relate their initial knowledge with PhET simulations experiments (Sari, Lutfi, & Qosyim, 2013). The learning activity is in the form of playing while learning, so that learning becomes more interesting. (5) Discuss stage II, in this stage, and the students construct knowledge from existing knowledge (existing hypotheses) with new knowledge (experimental results) and the students fix the errors of thinking. This is in line with the research conducted by Costu that the PDEODE model at the Discuss stage promotes knowledge construction (Costu, 2008). (6) Explain stage II, by reading the results of the discussion in front of the class, and the groups verify the truth. Because at this stage, through the guidance from the teacher, the students respond to questions asked by other groups to find out which concepts are right and wrong on prediction stage, experiment stage, and discussion stage so that misconceptions that occur can be resolved and the students could construct old knowledge and new knowledge. This is in line with the research conducted by Kearney in Riko, which reveals that when the discussion phase of the experiment runs properly, the students' misconceptions can be overcome (Riko, 2018).

Based on the percentage of the average misconception experienced by students, the following are the misconceptions in the hydrostatic pressure sub concept which reveal that in a flat plane, the large density of a vessel will have a large pressure. The pattern of students' answers is in accordance with the research conducted by Wartono et al., that there is a misconception in the hydrostatic pressure sub concept but after remediation, the misconception decreases (Wartono, Saifullah, & Sugiyanto, 2016). Misconceptions that occur in the hydrostatic pressure sub-concept in the pretest are 59.17%, but after remediation with the PDEODE model assisted by PhET simulation, it decreased by 26.67% in the posttest. Students' misconceptions, in this case, are caused by incomplete information, or according to Suparno are caused by incomplete reasoning due to over generalization (Suparno, 2013).

Whereas in the Pascal law concept, the students assume that a plastic bag containing water with three holes when it is squeezed, the big hole will get a great pressure as well as a greater force, this is, however, different from the scientific concept. Misconceptions that occur in the Pascal law concept at pretest are 56.67%, but after being remediated with the PDEODE Model assisted by PhET simulation, it decreases by 33.3% in the posttest. This misconception is thought to be caused by the students' experience in their daily lives and according to Suparno is caused by the wrong associative thinking (Suparno, 2013).

For the sub-concepts of Archimedes law, students consider the object sinks because the density of objects is less than

the density of water, but while floating, the density of objects is greater than the density of water. When the density of objects is similar to the density of water, the concept deviates from the real concept. The misconception that occurred in Archimedes law concepts in pretest was 43.44%, but after being remediated with the PDEODE Model assisted by PhET simulation, it decreased by 24.44% in the posttest. Misconceptions that occur are thought to be caused by the students' wrong intuition based on provided pictures, or the students only guess the answers and the reason. According to Kurniawan and Arief, that the lecturing method is used by the teachers can cause misconceptions (Kurniawan & Arief, 2015). In line with the research conducted by Rukmana, that in the sub-concepts of Archimedes law, the students experience many misconceptions regarding the position of objects in the fluid (Rukmana, 2017).

In the principle of continuity, the students assume that in a large pipe, the speed will be large while in a small pipe the speed will be small. The concept deviates from the actual concept. Misconceptions that occur in the continuity sub-concept is 42.22%, but after remediation with the PDEODE model assisted by PhET simulation, it decreases by 23.33% in the posttest. The misconception is allegedly caused by the students themselves. In addition, according to Repi in Winarto et al., information received by students is incomplete when the teacher explains, and the students also use wrong intuition (Suparno, 2013; Winarto, Tandililing, & Mursyid, 2015). Intuition can influence the students in giving reasons. In this case, it occurs in the concept of continuity where students rely on the characteristics of the image. In the Bernoulli principle, students assume that the small fluid velocity in the pipe with a small cross-sectional area will produce small pressure also. Misconceptions that occur in the Bernoulli principle are 50.56%, but after being remediated with the PDEODE model assisted by PhET' simulation, it decreases by 22.22% in the posttest. The students' assumptions give rise to misconceptions due to the students' lack of understanding and analysis. The reason for the answer is shown in the CRI level of confidence. This is in line with the research conducted by Sholihat et al., that the misconceptions experienced in the Bernoulli concept are caused students' analysis using inappropriate understanding and logical thinking (Sholihat et al., 2017).

Misconceptions experienced by students with the average pretest score of 50.66% and after remediation using the PDEODE model assisted by PhET simulation, it decreased by 24.58% so that there is a decrease in misconceptions between pretest and posttest by 51.96%. This proves that there is an influence of the PDODE model assisted by PhET simulation in reducing misconceptions. The success of the PDEODE model assisted by PhET simulation in this study in reducing misconceptions is in line with the research from Kolari et al., which suggests the PDEODE model can enable students to have conceptual changes from the initial mistaken concept into correct new knowledge (Kolari et al., 2005). Another study shows the success of the PDEODE learning model in remediating misconceptions and to get a better understanding of the concept in the material changes in physics and chemical change (Dewanti & Hidayat, 2018), and effective in identifying misconceptions and improving critical-thinking skills (Sri & Wulandari, 2013). As well as the research conducted by Dewi and Suhandi, that the PDEODE model can reduce misconceptions and change the incorrect conceptions into scientific concepts (Dewi & Suhandi, 2016). The PhET media simulation plays a role in strengthening the PDEODE model in remediating misconceptions. This is in line with the

results of the study by Atmoko and Wasis, that state the guided discovery learning using the demonstration method in the form of PhET simulation can reduce misconceptions in dynamic electrical matter (Atmoko & Wasis, 2015).

So that by decreasing the level of misconception, it will also have an effect on increasing students' learning outcomes based on the result of pretest and posttest data shown in Table 3. The results of this study are also in accordance with research conducted by Lebdiana et al., which states that students who experience misconceptions are reduced after remediation and it could improve students' learning outcomes in temperature and heat material (Lebdiana & Sulhadi N.Hindarto, 2013). The research by Budianto and Istyadji, regarding multimedia-based PDEODE learning model, could effectively improve learning outcomes (Budianto & Istyadji, 2015). In addition, the use of PhET can also improve student learning outcomes (Jauhari et al., 2016).

However, this study did not completely reduce misconceptions because misconception is a difficult thing to fix and usually it is consistently maintained by the students. This opinion is also reinforced from the research conducted by Ibrahim in Rahayu and Nasrudin, that misconceptions are resistant to change, tend to maintain the concept so that it is difficult to change (persistent) (Rahayu & Nasrudin, 2014).

CONCLUSION

Based on the results of the study, it can be concluded that physics learning with the PDEODE learning model based on virtual laboratory PhET simulation was influential in remediating students' misconceptions in the fluid material. The results obtained also show that misconceptions have not been completely erased. This is because misconception is a difficult thing to fix. For this reason, there is a need for continuous and consistent effort to implement the PDEODE learning model based on virtual laboratory PhET simulation on physics learning.

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Reading Concept Map-Think Pair Share (Remap-TPS) Learning Model on Cognitive Ability and Scientific Attitude

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Abstract: The recent integration of learning models in the learning process has become the focus of science education experts, especially in Indonesia, such as the adoption of the Reading-Concept Map Think Pair Share (Remap TPS) learning model. This study aims to improve the students' cognitive abilities, and scientific attitudes through the Reading-Concept Map Think Pair Share model. The study was conducted to junior high school students by employing Quasi-experimental with Non-equivalent Control Group Design. The instruments used were multiple choice tests and observation sheets. The result of the research shows that the students' cognitive ability is in the medium category with an N-gain value of 0.47. Based on this result, it can be concluded that the Remap TPS learning influences the students' cognitive ability. The obtained average percentage score of the students' scientific attitudes is 81.76% which belongs to the very good category. Thus, it can be concluded that this study provides important implications for educators to be more creative in designing learning models in order to improve the students' cognitive abilities and scientific attitudes.

INTRODUCTION

The education in Indonesia is facing 21st century challenges. An effective learning process is one of the ways to overcome those challenges (Darmawan, Islami, & Yennita, 2018; Makhrus, Harjono, Syukur, Bahri, & Muntari, 2018; Matsun, Ramadhani, & Lestari, 2018). By learning, students can obtain discoveries based on development over time (Barus & Sani, 2017; Karwono & Mularsih, 2012). Learning outcomes are new abilities, which produce changes in attitudes and measurable knowledge and skills (Aldila, Tapilouw, & Sanjaya, 2018; Nur, Salam, & Hasnawati, 2016).

One of the abilities that must be possessed by students is cognitive ability. Cognitive ability is considered important in learning outcomes (Arimbawa, Santyasa, & Rapi, 2017). This is because the cognitive learning process is more concerned with the learning process, not only involves stimulus and response but rather the behavior of situations related to goals of learning (Barus & Sani, 2017; Kamelia, Ahmad, & Novitasari, 2017; Yusro & Sasono, 2016). Besides, the attitudes need to be considered as a tendency to respond to conditions in a norm (Damanik & Bukit, 2014). Scientific attitudes can affect student achievement in both cognitive and

affective aspects (Rohmani, 2015). The higher the students' scientific attitude, the learning behavior will surely get better.

Every student has different abilities in absorbing learning material (Himawan & Yunus, 2016). In science learning, physics is considered the most difficult lesson among other science lessons (Rosdianto, 2017). This assumption is because physics contains difficult to understand formula, lack of access to references, and not all students are able to work together in groups (Irwandani, Latifah, Asyhari, Muzannur, & Widayanti, 2017; Yaqin, 2018). Thus, an active learning model is needed as a supporter of physics learning so that the students could be assisted in the learning process.

Active learning models are very important in physics learning to help to minimize the students' difficulties (Ariyani, Nayana, Saregar, Yuberti, & Pricilia, 2018; Balta & Sarac, 2016). Physics is one of the scientific disciplines that not only involve qualitative measurement but also quantitative (Akcay & N. Doymus, 2012). The main purpose of physics learning is to teach problem-solving skills and to understand natural phenomena (Komikesari, 2016; Niss, 2018). Physics is considered as a set of basic knowledge in solving problems. Therefore, a learning model is needed to help to solve the problem in learning physics.

Several models to overcome learning problems have been used by previous researchers such as Guided Inquiry Learning Model, Cooperative Learning, Problem Based Learning (PBL), Discovery Learning and Reading-Concept Map model (Damawiyah, 2015; Husen, 2017; Shalihah, 2016; Zulfa, 2016). In this study, researchers used the Reading-Concept Map Think Pair Share (Remap TPS) learning model by combining reading (reading), drafting a concept map (concept map), and cooperative learning (cooperative learning) using a cooperative model Think Pair Share (Lutfia Kurniawati, 2016; Siti Zubaidah, Tendrita, Ramadhan, & Mahanal, 2018).

Remap TPS learning model is effective for giving different experiences to students as an effort to improve interest in the lessons, then emphasizes science and knowledge transfer, in improving student learning outcomes, and the potential to train students' scientific attitudes (Linda Tri Antika, 2018; Badar Al-Tabrany, 2014; Handayani, Tapilouw, & Wulan, 2018; Harum, Tarmizi, & A, 2017; Yerdelen & Ali, 2016).

Reading-Concept Map Think Pair Share learning model could help students to concentrate on solving problems, to carry out tasks that are considered difficult, and can help someone to estimate the magnitude of the difference in cognitive learning outcomes (Rahmatiah, H, & Kusairi, 2016; Saregar et al., 2018; Miswandi Tendrita, Mahanal, & Zubaidah, 2017). The difference between this study and the previous one is that this research focused on the application of the Reading-Concept Map Think Pair Share learning model to help students to improve their cognitive abilities and scientific attitudes.

METHOD

The method of this research is Quasi-experimental with Non-equivalent Control Group design. This research was implemented in 2 class of Islamic Junior High School in Gisting District, Lampung Province, which involved 58 selected students using a random sampling technique (Sugiono, 2012). The instruments of this research were multiple choice tests consisted of 20 valid and reliable items to measure the students' cognitive abilities as well as an observation sheet to measure the students' scientific attitude.

The increase of students' cognitive abilities can be calculated by the N-Gain test to determine the difference between

the score of pretest and posttest (Rahmawati, 2016). S_{max} is the maximum score (ideal score) from the initial test and the final test. $S_{pretest}$ is the initial test score, while the $S_{posttest}$ is the final test score (Sundayana, 2014). Then to answer the hypothesis, the t-test was used (Siregar, 2012). The high and low normalized gain (N-Gain) can be classified in Table 1. (Simbolon & Tapilouw, 2015).

Table 1. The Criteria for N-Gain Test

Category	Criteria
$g > 0.70$	High
$0.30 \leq g \leq 0.70$	Moderate
$g < 0.30$	Low

The observation sheet is used to observe the feasibility of the learning model and the students' scientific attitude during the learning process. The result of observation can be calculated as follows (Hamzah, 2014).

$$\% = \frac{\text{total score obtained}}{\text{maximum score}} \times 100\%$$

The following are the criteria for the implementation of the observation sheet (Anwar, 2013).

Table 2. Criteria for Observation

Range Score	Criteria
$p > 90\%$	Excellent
$80\% < p \leq 90\%$	High
$70\% < p \leq 80\%$	Fair
$60\% < p \leq 70\%$	Low
$p \leq 60\%$	Poor

RESULT AND DISCUSSION

The result of pretest was used to determine the students' initial cognitive abilities, and the result of posttest was used to determine whether there was an increase in the students' cognitive abilities. The increased students' cognitive abilities can be analyzed in Table 3.

Table 3. The Description of Cognitive Ability Improvement in the Experimental Class and Control Class

Class	Pretest		Posttest	
	Highest	Lowest	Highest	Lowest
Experimental	45	10	95	60
Control	60	10	95	60
Average score of the experimental class	31.03		76.70	
Average score of the control class	29.10		71.40	

Based on Table 3, it can be seen that the experimental class and control class show significant differences in cognitive abilities before and after the treatment. The increase in the students' cognitive abilities was analyzed based on the cognitive level namely remembering (C1), understanding (C2), applying (C3), analyzing (C4) (Anderson & Krathwohl, 2010). The following is the recapitulation of the average pretest and posttest scores for each cognitive level.

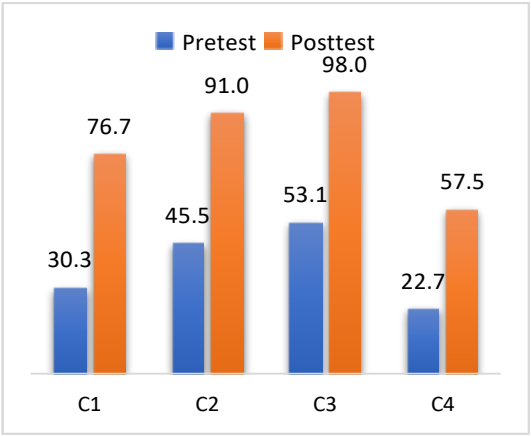


Figure 1. The Percentage of the Learning Outcomes improvement for Each Cognitive Level of the Experimental Class

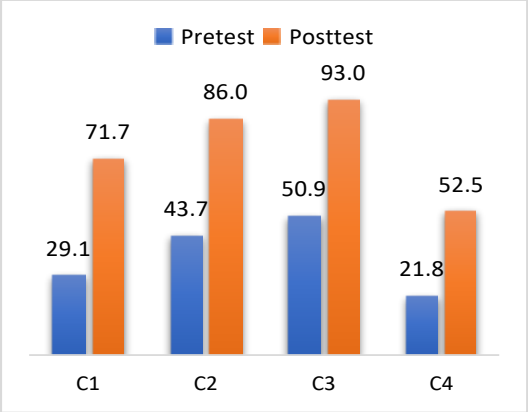


Figure 2. The Percentage of the Learning Outcomes improvement for Each Cognitive Level of the Control Class

The observed students' scientific attitude included the aspects of curiosity, accuracy in doing individual work, accuracy and caution in group work, perseverance and responsibility in working individually or in groups, communication skills in group discussions. The following is a recapitulation of the percentage of students' scientific attitudes.

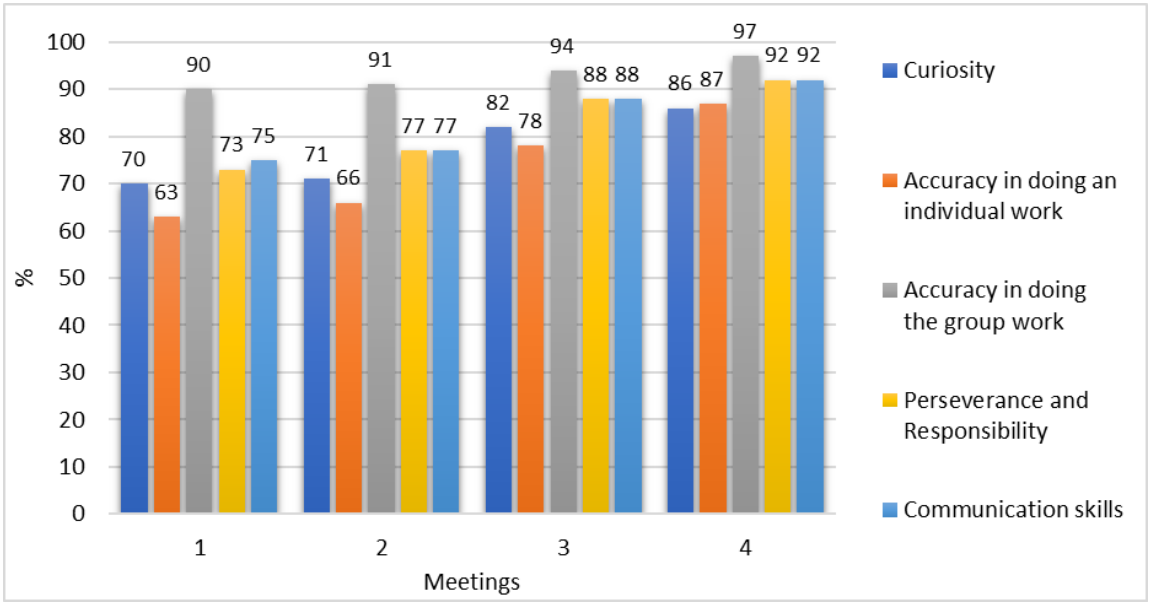


Figure 3. Recapitulation of the Students' Sientific Attitudes

Figure 3 shows an increase in the average score of each aspect of the students' scientific attitudes at each meeting. The obtained average percentage score of the students' scientific attitudes is 81.76% which belongs to the very good category. The increase was due to the implementation of the learning model in accordance with the stages in which participants were able to recognize the initial material and master the concept so that they began to get used to conducting discussions. Each meeting activity was evaluated, and the students could work together in their respective groups.

Hypothetical testing was done to determine the effect of the learning model. Lilliefors test was used to determine the normal distribution (Budiyono, 2009). After the data was determined to be normally distributed, it was then tested for its homogeneity to find out whether the experimental class and the control class had the same variance or not (Saregar, Latifah, & Sari, 2016).

Furthermore, hypothetical testing was done to test whether there was a difference in the effect of several treatments (application of the learning

models) on the students' cognitive abilities. The test results can be seen in Table 4.

Table 4. The Results of Normality Test, Homogeneity Test, and Hypothetical Test

	Pretest		Posttest	
Normality Test	$L_{observed}$	L_{table}	$L_{observed}$	L_{table}
Experimental Class	0.149	0,161	0,126	0,161
Control Class	0,150	0,164	0,158	0,164
Homogeneity Test	$F_{observed}$	F_{table}	$F_{observed}$	F_{table}
	0,18	0,185	0,127	0, 185
Result	H_0 is accepted			
Hypothetical Test (t-test)	$T_{observed}$	T_{table}	**Sig (0,05)**	
	2,088	1,67	0,04	
Result	H_0 is rejected			

The analysis of the normality test in the pre-test and post-test of the experimental class and control class showed that the significant level of 0,05 with $L_{observed} < L_{table}$ so that it can be concluded that the data were normally distributed. Furthermore, the result of the homogeneity test on the pretest and posttest showed that at a significant level of 0.05 with $F_{observed} < F_{table}$, so that it can be concluded that the data was homogeneous. The results of the t-test with a significant level of 0.05 with $T_{observed}$ 2.088 > T_{table} 1.67 with sig 0.04 < 0.05, so that it can be concluded that Remap TPS model affects the students' cognitive abilities.

The results of the analysis of the increase of students' cognitive abilities can be seen in Table 5.

Table 5. Students' Pretest-Posttest N-Gain Score

Class	N-Gain	Criteria
Experimental	0.47	Moderate
Control	0.39	Moderate

Based on table 5, it can be seen that the results of the N-Gain of the experimental class and the control class have different significance in improving student learning outcomes.

Observation sheet was used to determine the application of Remap-TPS model conducted by researchers and supported by the observer. The result of the analysis of the implementation of the Remap-TPS model shows that there was an improvement in each meeting and the model has been implemented well, as shown in Table 6.

Table 6. Percentage of Model Implementation

Meetings	Percentage	Categories
First	84.82%	High
Second	91.07%	High
Third	93.75%	High
Fourth	96.42%	High

There were improvements in each meeting based on the result of the analysis of the implementation of the Remap-TPS.

Remap TPS learning model was proven to be able to improve the students' cognitive abilities and scientific attitudes in motion material. The stages of the model can be seen in Table 7.

Table 7. Stage of Reading Concept Map-Think Pair Share Learning Model

Stages	Students	Scientific Attitudes
Reading	Ask students to read the material determined by the teacher and to understand its contents.	Curiosity, perseverance and responsibility
Concept Map	Ask the students to make concept maps based on reading results.	Curiosity, accuracy in doing an individual work
Think	Ask some questions to the students then ask them to think of answers to the questions given.	Accuracy in doing an individual work, perseverance and responsibility
Pair	Ask the students to pair up and discuss. It is hoped that this discussion can deepen the meaning of the intersubjective answers with their partner.	Accuracy in doing the group work, communication skills
Share	The results of intersubjective discussion are then discussed with all of the members of the class. In this activity, teachers are expected to be able to guide the activities by closing the discussion and helping the students to summarize the discussion with a short question and answer.	Perseverance and responsibility, communication skills

The activity begins with reading to train the students' to understand the meaning of reading material and to expand their knowledge (M Tendrita, 2017). At this stage, the students are able to recognize the initial material and master the concept gradually. Reading is the process of transferring printed information to speak and understand (Lestari, 2016). Reading comprehension is an active process that involves the reader, the text, and activities or goals in order to understand the text or parts of the text, such as using background knowledge to understand the author's messages (Elsinta, 2017; Jian, 2015).

The next activity is to make a summary in the form of concept maps. In making the concept maps, the students are trained to be able to connect one concept with another concept to form a wholesome and interrelated concept (Rosyida, 2016). The concept map is students' cognitive structure for both the developed to dig into and to recognize the students and teacher as well as to see what students have known (Dahar, 2011). Concept maps are schematic devices to represent a set of conceptual meaning embedded in the framework of propositions (Marzetta, 2018).

The next stage is the implementation of Cooperative Learning, namely the Think-Pair-Share (TPS) learning model. The TPS model provides an opportunity for students to think independently and share ideas to help them to get new ideas. The existence of cooperation in pairs can improve students' learning outcomes.

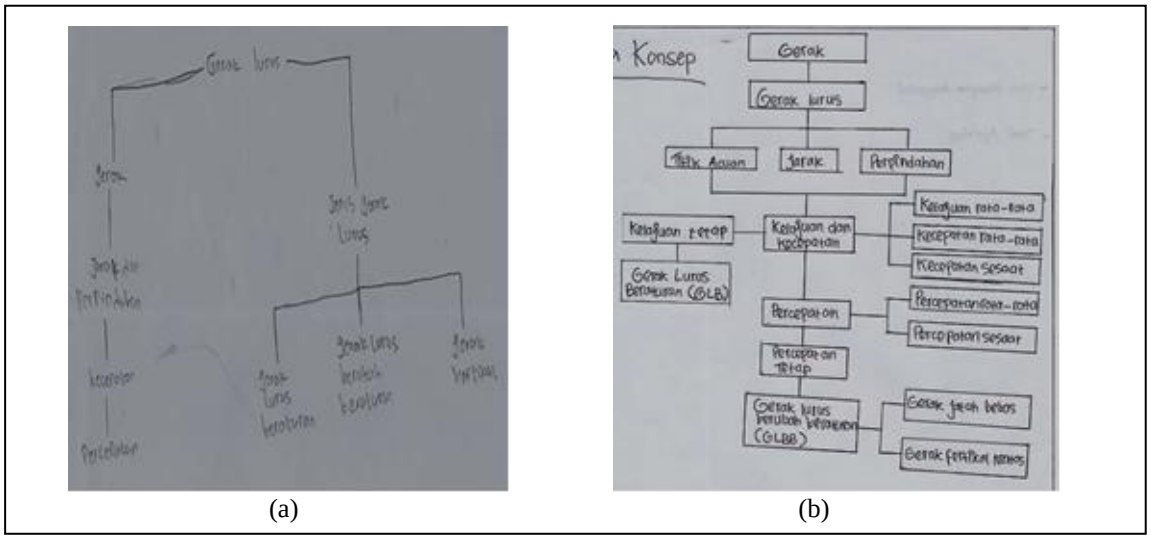
The think component in learning helps students to think of theoretical concepts that must be learned from the process of answering the questions asked so that they are able to develop ideas. This activity is combined with the reading process to help students to think of concepts that will be developed later.

The pair component encourages students to compare and differentiate understanding with their partner by training their responses in a small scope before expressing their opinions in front of the class. The opportunity to practice comments with partners tends to increase the readiness to respond to larger groups. At this stage, the activity is combined with making concept maps in pairs so that more opportunities for each pair to form ideas in making concept maps. Finally, the share component helps to generalize

ideas delivered in front of the class by giving each other responses.

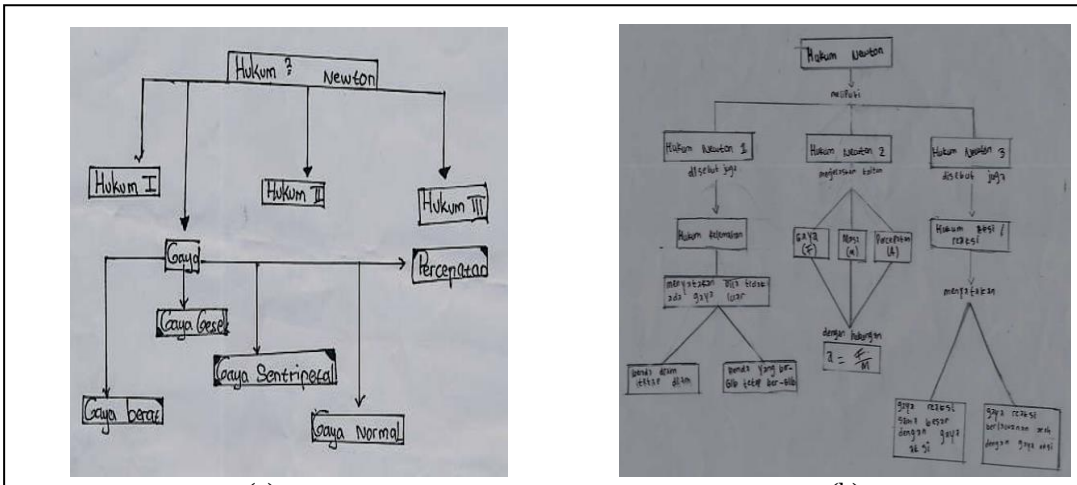
Besides the cognitive learning outcomes that have been increased, the affective domain has also been increased. Affective domain is related to students' attitudes, one of which is scientific behavior that is closely related to science. Students have different attitude abilities. Motivated students have very high independence, while students with low motivation need more support.

In the process of making concept maps, the students are trained to develop drawing patterns and important points on the material. At the first meeting, the students did not yet know how to determine the main topic ideas in the material then they were helped to develop the main ideas into a wider collection of points. The following are examples of concept maps made by students.



(a) (b)

Figure 4. (a) An Initial Example of Concept Map in Straight Motion Material, (b) Example of Concept Map After the Treatment.



(a) (b)

Figure 5. (a) Initial Example of Concept Map in Newton's Law Material, (b) Example of a Concept Map After the Treatment

At the first meeting, the concept map was only limited to parts or kinds of main points. Then after being guided, the concept maps were developed by adding understanding, types, similarities, and the applications of the material. Students were also able to explain the results obtained in front of the class.

The increase of the students' cognitive abilities and scientific attitudes cannot be separated from the influence of the applied learning model. In cognitive ability, the students were able to master each indicator of cognitive aspects from Remap-TPS learning model. Cognitive abilities involve collective intelligence in the form of procedures used to achieve more concepts. This collective intelligence can be improved through the intervention of certain groups (Venisari, Gunawan, & Sutrio, 2015). Ability in the cognitive domain is an ability that restates learned concepts or principles and intellectual abilities (Zulfa, 2016). In cognitive abilities, aspects of C1 involve low-level cognitive skills in the form of recognizing and recalling (Sugiana, Harjono, & Sahidu, 2016).

The results of the pretest and posttest analysis of the students' cognitive abilities have increased from the initial ability with the moderate category of the N-Gain. This increase occurs at every level of cognitive aspects. The students' low initial ability occurs because they have not mastered the learning material. The highest increase occurred in the aspect of understanding (C2) and applying (C3), while the lowest increase occurred in the analyzing aspect (C4).

In the aspect of understanding (C2), the students worked on the problem well. While in the aspect of applying (C3), the students were able to apply and use procedures in certain circumstances, including formulas, theories, and principles of the material that has been studied.

This is supported by previous research by Linda Tri Antika that states there is a relationship between reading interest and learning outcomes by the Remap-TPS model (L.T. Antika, 2017). Siti Zubaidah shows that Remap Coople can improve the discovery skill in the scientific approach (S Zubaidah, 2014).

This cognitive ability is related to the process of reading and making concept maps. Reading is a complex linguistic process that requires cognitive processes. When reading, visual information enters continuously and can be recognized (Latanov, 2016). There will be many ways to develop an understanding of knowledge and information by reading (Diass, 2014). From the process of remembering and understanding, the students can master and recall the meaning of reading and find the main ideas in terms of terms, definitions, and formulas then they will be able to apply them in everyday phenomena and analyze from the discussion process to create concept maps assisted by the teacher.

Each student has different attitude abilities. Motivated students have very high independence while students with low motivation need more support (Kyuk, 2011). Research on the students' scientific attitude is based on the analysis of the observation sheet at each meeting (Purwanti & Manurung, 2015). The difference in students' non-monotonicity lies in the normal development of scientific attitudes (Utami, 2017). The highest improvement was aimed at the experimental class. This was seen during the study. Remap TPS learning model has an important role in improving the students' scientific attitude.

The aspect of students' curiosity can be seen from enthusiasm, motivation, activeness, attention, and responses from each task/group discussion carried out from the process of reading and making concept maps. On aspects of accuracy in

carrying out individual work, Remap learning model helps students in managing time and is critical in doing the assignments given. The students are not in a hurry and are very careful in making concept maps. Aspects of accuracy and perseverance in group work experienced the highest increase compared to other aspects because this aspect was considered quite influential in group discussions. The process of creating a concept map trains students to carry out tasks well and according to procedures, work together, creative and innovative as well as satisfying work results. Perseverance and responsibility in working individually or in groups by students is enhanced through submitting assignments on time, returning the tools in place, seriousness in carrying out tasks, and diligent in the activities carried out including reading material.

Finally, the guiding process in the discussion trains the communication skill in group discussions in the form of asking, respecting others, and using polite language when expressing opinions/ criticizing friends' opinions. Students can be active in conducting discussions because students are required to work together in solving problems, dare to take risks in solving problems, honest, confident, and critical. Students show greater curiosity and can develop communication activities between groups by providing feedback on learning. Cognitive abilities and scientific attitudes are very closely related because they can increase self-confidence and basic learning independence.

CONCLUSION

This study concluded that the application of the Reading-Concept Map Think Pair Share (Remap TPS) learning model influences the students' cognitive abilities and scientific attitudes. The application of this learning is very helpful in the process of science learning activities, especially physics compared to conventional models. Therefore, this learning model can be used as an alternative in the teaching and learning process in the classroom. This learning model can help teachers to achieve national education goals in Indonesia, especially the one related to the cognitive abilities and scientific attitudes.

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A Paradigm Development of Community Learning Management in the Small Sized School in Buri Ram Province Thailand

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Abstract: The objectives from this research were to 1) develop and find out the efficiency of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school, 2) study the effectiveness of a community based learning paradigm management to promote creative thinking for teachers in the small-sized school, and 3) study the satisfaction of developing a community-based learning paradigm as a creative thinking paradigm for teachers in the small-sized school. This research was Research and Development (R&D) combined with the design of a single sample system. The research instrument used in the research was a learning management paradigm community based learning with three learning units and creative thinking evaluation form. The data was analyzed by average, standard deviation, and t-test dependent. The findings of this research are: 1) The efficiency of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was 81.20/82.50, 2) The effectiveness of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was that post-training session based on the paradigm of community-based learning management was higher than pre-training session significantly at 0.05, and 3) satisfaction in developing a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was very high. This study implies that the learning paradigm of the community needs to be applied so that creative thinking skills could be improved.

INTRODUCTION

The society of the 21st century world is a knowledge society and a lifelong learning community (Chantarasomabat, Udombunyanuparb, & Kenchaiwong, 2017; Gardner, 2010). Recently, educational management aims to educate people in the country to be good, clever, and happy (Chang, Chang, & Yang, 2009). Objectives of educational programs require students to learn to know, learn to be, and learn to do (Marzano, 2003). The education system aims people to have desirable characteristics as a citizen of the nation and learn to live together. For creating desirable characteristics as a world population in the 21st century, the way of education has been changed by focusing on higher-order learning skills, especially evaluation skills that are replaced by the ability to use new knowledge creatively (Burke, Sears, Kraus, & Cady, 2014; Good, 1973; Nesterova, 2017). School does not focus on grades, as the results, it focuses on the ways to train students to

prepare for future life in the real world (Shernoff, Sinha, Bressler, & Ginsburg, 2017). Moreover, it aims to prepare learners for lifelong learning by being flexible in the ways to teach. Classroom activities need to encourage and motivate students to have the skills to think and strive for knowledge when they graduate (Fernández, 2018; Mutakinati, Anwari, & Yoshisuke, 2018).

Education for new century focuses on the development of children's minds (Yıldırım & Akamca, 2017). The requirement for new generations expects that Thai people have skills and the process of thinking, analyzing, problems solving, and being curious (Wallach & Nathan, 1965). These can be applied with the knowledge properly to develop themselves continuously to fulfill their potential. One of them is by establishing a community to improve knowledge.

Community is a learning place for people to develop a learning process that is consistent with local needs (Siri & Chantraprayoon, 2017). Knowledge of the community is learning about problem management and community adaptation as known as local wisdom. The wisdom that comes from real experiences is integrated in terms of physical, mental, social, and environmental knowledge based on culture (Murphy & Timmins, 2009; Siri & Chantraprayoon, 2017). There is a deep link to the abstract which emphasizes the importance of ethics rather than materialism (Yin, 2003). Community learning is highly dynamic lifelong learning and problem solving. It is a process of learning that collaborates and reduces conflicts (Francis, M, L, & Colbry, 2016). It is a powerful tool for raising people and community development. This leads to thinking and solving problem.

Small schools have many urgent problems; 1) The budget is not enough for a high quality education. The school budget is based on the number of students. When the number of students is decreased, the budget will be reduced. The shortage of equipment and necessary teaching aids, especially the lack of textbooks and exercise book leads to lacking effectiveness in learning and teaching (Biggs, 1999). 2) The rate of teachers and learning areas does not complete with the subjects in the curriculum (Borg, Kallenbach, Morris, & Friebel, 1969). At present, the whole system of primary school teachers is in short supply. 3) Teachers and learners lack the opportunity to use modern technology in learning and teaching (Haruthaithanasan, 2018). 4) Parents ignore their children education. In particular, some children were left with their grandparents because their parents need to work in the city. These children lack the close supervision of both family and teachers. One way for children to remain under the supervision of adults, though not families, is to hand over children to training institutions.

The training package is the management of training tools in accordance with the objectives and the learning environment (Divan & Mason, 2015; Sheydaei, Adibsereshki, & Movallali, 2015). Each case is appropriate for the students' needs. The training package is divided into three types, training equipment, training sets, and training modules. Training for personal development is very important for the organization because the success of the organization depends on the people who push the whole plan into reality. If an organization has an appropriate person who is well-equipped with the knowledge, skills, and capabilities for the operations, the operations will be relatively smooth.

On the other hand, the implementation of the organization will suffer from various obstacles if those staffs are in short supply. Especially, in the development of creative thinking which is the ability to think in a variety of ways. It can be applied to the theory or the principle which is carefully and

accurately coined. It leads to the invention and creation of novel or new ideas. In addition to the creative nature, there can be many creative ideas. This may be viewed as a process of thinking rather than thinking. They can use creative thinking in wider dimensions namely, being creative at work, study, or creative activities (Torrance & Myers, 1962). These dimensions can be from scientific experiments or sports that need to create a creative way. It can be said that it is the characteristic of academic creativity (Selvi, 2006). However, creative thinking is based on creativity. The person can be linked to daily life well (Yoon, Woo, Treagust, & Chandrasegaran, 2014). Creativity could be formed through academic education.

From this information, the development of students' creative thinking is a continuing issue of Thai education for a long time. The researchers as the instructors, the faculty of education, and the educator have achieved the objectives of the core curriculum in basic education BE 2551. The development of creative thinking in the measurement and evaluation of the National Testing Institute in the field of creative thinking. Teachers lack knowledge in paradigm of learning management for creative thinking. The researchers found that a study in a community-based learning management paradigm to enhance creative thinking for teachers in the small-sized school in Buri Ram Province.

METHOD

This research was a paradigm development of community learning management for enhancing creative thinking for teachers in the small-sized school in Buri Ram Province. The objectives were to; 1) develop and find out the efficiency of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province, 2) study the effectiveness of a community based learning management learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province, and 3) study the satisfaction of developing a community – based learning paradigm as a creative thinking paradigm for teachers in the small-sized school in Buri Ram Province (E, 2000). The research methodology was research and development (R&D) combined with the design of a single sample system, The One Group Pre-test Post-test Design. Researchers conducted the research and developed the processes in four phrases.

Table 1. Four Phrases in Research and Development

Phrase	Description
Phrase 1	Research (R_1): To analyze policy; the core curriculum of basic education BE 2551, and the context of small school teachers to develop the training package of a community-based learning paradigm to promote creative thinking.
Phrase 2	Development (D_1): To design and develop; development and finding out the efficiency of the training package of a community-based learning paradigm to promote creative thinking.
Phrase 3	Research (R_2): To implement; trying out the training package of a community-based learning paradigm to promote creative thinking.
Phrase 4	Development (D_2): To Evaluate; Development and improvement of the training package of a community-based learning paradigm to promote creative thinking.

The research methodology was research and development (R&D) (Borg & Gall, 2003). The sample in this study was 30. To understand and interpret the result of data analysis, the researchers formulated symbols for data analysis as followings.

n = Number of Samples
$\overline{X}$ = Average Score
S.D. = Standard Deviation of Scores
t = t- dependent on training package

The flow of research to develop the community-based learning paradigm is as Figure 1.

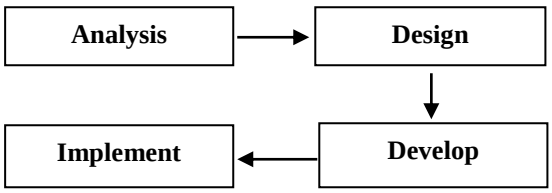

Figure 1. The Flowchart of Research and Development

RESULT AND DISCUSSION

Data Analysis

This research was a paradigm development of community learning management for enhancing creative thinking for teachers in the small-sized school in Buri Ram Province. To analyze the results of training package development for a paradigm development of community learning management for enhancing creative thinking for teachers in the small-sized school in Buri Ram Province by focusing group discussion. Using a technique of focusing group discussion by inviting six experts, three experts of the training package design and three experts of community in the fields, the experts were required to check the tool for a paradigm development of community learning management for enhancing creative thinking. The results were analyzed by content analysis that the researchers obtained feedback and concluded as follows.

Content

Overall, the focus group discussion concluded and determined the content of the training package based on creative thinking should not be overwhelmed. The researchers selected only the content that was necessary to create training packages for the community. The trainees could learn these by themselves and have a simple task. Creating unit plans was in accordance with indicators in the eight learning areas. The development of activities to give the trainees the sample practice for learning activities would make them more understanding.

Design of the training package

The design of the training package of a paradigm development of community learning management for enhancing creative thinking for teachers in the small-sized school in Buri Ram Province should be as follows; 1) It should have explained in order that the trainees can be able to perform with the material step by step effectively (Corcoran & Goertz, 1995), 2) It should consist of two or more types of media and design to encourage participants to understand the content of the training and more clearly in the activities, 3) It was a training package that can be used for self-study, 4) It was self-contained media in the training package which allowed the trainer to choose from the training packages. This required the trainees to study a particular subject from the training package so that they will be able to select a particular subject, 5) There were activities in the nature of the exercises in the core curriculum of basic education in BE 2551. These activities were a part of the training activities in individual practice to provide the trainees with the opportunity to practice activities in accordance with the learning activities for the learners, and 6) The media took a short session to complete the training. If there were much content, it would be made up in separate units. The content is divided by the area of the content so that the trainees were not bored in the study.

Learning Process

There were four main components to the learning process namely Community, Learning, Technology, and Evaluation (CLTE). Learning process consists of four steps called PSRA; 1)

Preparing, 2) Strategies, 3) Reflection, and 4) Assessing, described in Table 2.

Table 2. Stage of Learning Process

Stage	Learning Process
Preparing (P)	Preparing teachers for knowledge and basic information about the community by planning with community representatives, scheduling a calendar for action operations in the area, setting objectives for an action plan, and developing tools for data collection.
Strategies (S)	Choosing a variety of technics to be suitable for learning activities, there was an integration of learning content and used a variety of technologies, appropriate learning activities and different learning technics.
Reflection (R)	The process that enabled learning through thinking processes and experiences affected emotions and feelings. The empirical information that led to critical thinking helped learners to learn and be self-discovery (Edwards, 1950). It could be done by writing a note, reflection, question, interview, and evaluation of learning management.
Assessing (A)	Evaluated the activities of the community-based learning paradigm by assessing pre-test, during the class assessment, post-test, critical thinking ability, and creative problem solving (Halpern, 1998).

Discussion

The results of the development and the effectiveness of community learning management paradigm for enhancing creative thinking found that the community-based learning paradigm was high quality, structural integrity, and content. It was effective enough to use to learn. Covered by essential needs to enhance creative thinking for teachers in the small-sized school in Buri Ram Province, this may be due to a community-based learning paradigm developed systematically by using the result of basic information analysis related to the policy of educational management on standard of core curriculum in basic education BE 2551. It analyzed concept, theories and related researches to a paradigm development of community learning management for enhancing creative thinking and guidelines for organizing community learning activities (Davis, 1991). The statement is in line with Piaget's theory.

Piaget's theory of intellectual development and Vygotsky's social culture theory revealed that the context and community data which was the concept of a community-based learning paradigm was the basic learning management. This was consistent with the concept of developing learning management. It could be concluded that learning was a systematic approach to teach. It was correspondence with theories. Besides, there was a study on the state of teachers' learning management and learners' basic ability to learn. They could share their opinions about the problem and the way to organize the learning activities to promote creative thinking. This was the study of learning management. It aimed to implement to design the learning management.

From the constructivism theory, the researchers gave a guideline to organize learning activities for the learners to learn with the creative thinking process. It focused on learner-centered interaction and the real problem in the community. It was a subject that students were interested in solving the problems. They wanted to improve things to be better. It focused on cooperative learning by exploring community problems.

Then, students analyzed problems, planned solutions, practiced, and solved the problems with the solution planed, evaluated, checked, and finally presented by themselves. It also interacted with both people in the community and in the

classroom. They could apply knowledge to daily life and expand to the community. Moreover, they could solve the problems in other situations. The researchers synthesized the guideline of learning management to enhance intelligent ability for creative thinking for seven sorts as follows (Guilford, 1956); 1) problems and issues, 2) preparation and data collection, 3) analysis, 4) data selection, 5) thinking and clarification, 6) synthesis and data collection, and 7) evaluation.

Then, the researchers put into process of learning management on community-based learning paradigm (Community-based learning: CBL) to be a guide to learning activities. It enhanced learners to have creative thinking by four learning processes of PSRA. After that, it was synthesized and set the guideline of learning management of a paradigm of community learning management for enhancing creative thinking. Finally, it was set the packages for three unit plans; 1) principle and theories of creative thinking, 2) community based learning for creative thinking, and 3) how to write the lesson plan to develop creative thinking process.

The researchers designed learning activities based on creative thinking for the trainees by considering alternative ways to solve the problems in new ways. There were Guilford s' creative thinking skills for seven sorts. So, the researchers used them to set the main components of learning management to enhance creative thinking for teachers in the small-sized school in Buri Ram Province. The results of effectiveness of a community based learning management paradigm on E_1/E_2 were based on the samples in this research. As a result, the effectiveness of a community based learning management paradigm was 81.20/ 82.50.

This may involve participation in planning, co-thinking, co-operating, evaluating, transferring knowledge, informing, being proud, and taking responsibility for community-based learning management paradigms (CLTE). There were four components for community-based learning management paradigms. First, principles were community-based learning that took into account the four components of the CLTE such as community, learning management, technology, and evaluation by setting various learning management on the PSRA process. This encouraged students to learn by doing and solve the problems in the community with a variety of learning and creative tasks. Second, The objectives were to promote creative thinking for teachers in small-sized school. Third, the learning process consisted of four stages of PSRA, in which the learning activities must take into account four main components of the CLTE; 1) preparing to conference plan for jointed action between schools and the community provides basic education to students, 2) strategies to apply various learning techniques, 3) reflection to reflect the results of the community and student feedback to the paradigm of learning management, and 4) Assessing to be authentic assessment from all parties involved in the assessment. Fourth, the key to a successful learning paradigm consisted of 1) community supports and involving in every step, 2) teachers doing self-study in the community for practicing thinking and problem solving skill in real situations, and 3) plenty of time to organize appropriate learning activities outside the classroom.

The efficiency of the community-based learning paradigm (CLTE), based on E_1/E_2 criteria, was used for this research. Moreover, the result showed that efficiency of community-based learning was 81.20/82.50.

Table 3. Result of Efficiency of the Training Packages in the Experiment

Effectiveness	Total Score	Score				Percentage
		G.1	G.2	G.3	$\bar{X}$	
Process (E1)	250	219	207	225	217	81.20
Product (E2)	210		198.10			82.50

The effectiveness of a community based learning management paradigm to promote creative thinking for elementary students, the results were summarized as follows; 1) After a community based learning management paradigm (CLTE) session, teachers had the ability to think creatively after training session better than pre-training session statistically significant at .05 level. The teachers accepted the ability of creative thinking after training. The community based learning management paradigm was at a high level, with the average score being the ability of fluency thinking. The least average component was the ability of elaboration thinking. 2) After a community based learning management paradigm (CLTE) session, the teachers had higher level of creative thinking than the pre-training session at the .05 level. This indicated that teachers' level of creative thinking has developed. Test scores for creativity tests were higher than the scores higher. Considering the individual assessment, it found that overall teachers had a better ability of creative thinking after learning the paradigm of learning management using the community at a high level (Baxter & Lederman, 1999). The lowest score was the knowledge building skills. One of the skills developed in this research is creative-thinking. The following is the result of students' creative-thinking in this research.

Table 4. Comparison of Results of Creative Thinking Test on Trainees Before and After Training

Test	n	Total Score	$\bar{X}$	S.D.	t	Sig.
Before training	30	20	11.50	0.36		
					11.47	0.05
After training	30	20	14.25	0.18		

In Table 4, the average score obtained before and after the training was improving. This happens because the learning management was able to improve the students' creative thinking. Through grouping, the students were able to combine their ideas and to construct creative ideas.

CONCLUSION

The findings of this research, are 1) the efficiency of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was 81.20/82.50, 2) the effectiveness of a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was that post-training session based on the paradigm of community-based learning management was higher than pre-training session significantly at .05, and 3) satisfaction in developing a community-based learning paradigm to promote creative thinking for teachers in the small-sized school in Buri Ram Province was very high.

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English as a Second Language (ESL) Learning: Setting the Right Environment for Second Language Acquisition

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Abstract: Early exposure to English is very important as it is crucial for learners to acquire English language at early age as English is a global language that is used not only in the level of primary and secondary school but also in tertiary level of education. Schools can be one of the important roles in influencing second language acquisition, particularly English language. However, most schools did not consider acquiring English from the perspective of learners' fluency and rarely consider movements or approaches that they can take to improve ESL learning among students. This study intended to investigate the influence of school settings and routines on ESL learning among secondary students. A qualitative method is used in this study as data were collected through the method of observation and interview. The observation period throughout the process of collecting data has been conducted based on a field note specifically prepared for this study. The participants involved in this study were all-girl school students located in Selangor. The gathered data were then interpreted in the findings analysis. Based on this study, it was proven that there are co-relations between the school settings and routines on ESL learning among secondary students. It was found that school settings and routines do influence ESL learning among secondary students. Discussion and recommendations are further explained in this study. Thus, it is hoped for future researchers to conduct further research on related factors that might help to contribute in ESL learning among ESL learners.

INTRODUCTION

Various factors contribute to the success of Second Language Acquisition (SLA) (Alves & Oliveira, 2014; Kalati, 2016). The learners' environment and setting have been acknowledged as an important one (Castello, 2015). Schools are the place where English as a Second Language (ESL) learners learn English other than at homes. Acquiring a language is not only understanding the concept or format of that language but being able to speak the language fluently is what makes learners acquire the language (Dong & Ren, 2013). Some understand English and good in writing essays but not in communicating the language itself (Ghezlou & Biria, 2017; Khan & Khan, 2016). Schools play an important role in giving exposure to learners on the importance of English language and how can they acquire the language (Ahmed, 2015; Nguyen & Terry, 2017).

Early exposure to English is very important as it is crucial for learners to acquire English language at early age as English is a global language that is used in basically everything not only in the level of primary and secondary level (Akcay, Butuner, & Arikan, 2015). In

Malaysia, English is accepted as the second language and is widely used as a medium of instruction in both formal and informal settings. English is even used in tertiary level of education where every lectures, journals, and books are all in English. According to the Deputy Prime Minister Tan Sri Muhyiddin Yassin, it is a priority to the government in getting Malaysians to master English language as the language played an important role in nation building (Shah, Othman, & Senom, 2017; Thirusanku & Yunus, 2014). Environment and setting could be one of the best factors influencing ESL learning among secondary students. School can be one of the important roles in influencing ESL learning (Akcay et al., 2015). This statement indicates a crucial problem that a lot of students face in learning and particularly communicating the second or foreign language, specifically English language, in this case, many secondary learners express their problems related to that and sometimes even acknowledge their inability in learning to speak English (Akcay et al., 2015).

It is only natural for students to encounter problems in learning. The dynamic of learning process could promote confusion and problems that could hinder the process of language acquisition. Students' difficulties found because of ineffective input and output, having no real need for interaction, attaching too much importance to language forms and written tests. Some learners also lack the motivation to speak English. They do not see a real need to learn or speak English (Al Hosni, 2014).

Some problems emerged in the students' daily interaction as stated above. The needs to interact in English need to be fostered by raising the students' awareness and understanding of why English should be mastered by them. The students' motivation should be paid a considerable attention since motivation is actually the driving force for the students to move further. For overcoming these previous problems can be done by involving learners in performing two types of communicative tasks: focused, communicative tasks and unfocused communicative tasks (Ellis, 2003). Both of these tasks seek to engage learners in using language pragmatically rather than displaying language. They seek to develop language proficiency through communication (Ellis, 2003).

School setting in this study plays an important role as a catalyst to help ESL learners in the process of ESL learning. School is the place where ESL learners learn how to interact with peers, teachers, and staffs at school. Providing good school setting and environment will be a good medium in improving ESL learners' language acquisition. Researches Firth and Wagner mentioned that the interaction of social activity of learners with peers and environment is considered as the best method of Second Language Acquisition (Wagner, Altherr, Eckert, & Jodl, 2007). Learning environment in Hidden Curriculum 2014 is referred as the diverse physical locations, contexts, and cultures in which students learn, such as outside-of-school locations and outdoor environments.

As mentioned in a paper done by Jantmary Thirusanku and Melor Md Yunus (Thirusanku & Yunus, 2014), they quoted on Tan Sri Muhyiddin Yassin's claim regarding the first wave of the Malaysian Education Blueprint Plan 2013-2025 on an amount of 6100 English Language teachers from primary and secondary schools were retrained nationwide to be more skilful in English language (Blueprint, 2015). The Malaysian Education Blueprint emphasizes the importance of this language in schools and introduces many innovative teaching and learning strategies to enhance students' English proficiency (Sidhu, Kaur, & Chi, 2018). In The Government committed in promoting the use of English in schools to ensure people, especially students to have

a better command of the language (Thirusanku & Yunus, 2014).

There are a lot of factors that might contribute to ESL learning among secondary students. Therefore, this study intends to see in what ways school setting can influence and affect ESL learning among secondary students, especially in Malaysian context. It can further support, or perhaps, disagree with past studies that proves the influence of school setting and routines on second language (L2) learning.

THEORETICAL SUPPORT

A simple way to define language learning is the process which the language capability develops in an individual. Learning language per say takes strategies, and according to Wenden and Rubin, learning strategies can be defined as actions, steps, plans or routines taken by the learners in processing the information they received (Wendel, 2011). Learners learn differently according to their language learning styles and preferences. Language learning cannot take place only in the brains of individual learners alone but are instead related to social factors when learners interact in daily life with other people in their surroundings in order to acquire the language (Dil, Öğretildiği, & Sınıflarında, 2015; Yanti, Cole, & Hermon, 2017). The results of research done by Stella show that the context of metacognitive and social strategies seems to play an important role in the learners' strategy use in the process of acquiring new language (Taquette & Minayo, 2017). This basically means that learning a language does not involve only the understanding of the theory and concept of the language. L2 learners also should be able to apply the language itself in daily life depending on the context and situation in order for the language to be learnt or acquired. Interacting with other people using the language and make use of the language in daily life is the part of the process of language learning. Harwati Hashim et al. also mentioned in a study that language learning process is not limited only within the classroom but also may continue to happen in a conventional setting (Hashim, Yunus, & Embi, 2016). According to Supyan cited by Harwati Hashim et al., ESL students need social support or scaffolding in improving their ESL learning (Hashim et al., 2016).

In today's society, English is very important and is the most common global language that is used for worldwide communication. The real situation that is currently happening in Malaysia is that the English is used only in a limited or confined situations such as during any presentation or written works that has to be done in English, but other times, Bahasa Malaysia is used. Learners are lacking in exposure to the language as there is quite a limited chances to use English outside of the classroom is one of the causes that leads to limited English proficiency among Malaysian learners and students. With all of this being said, it is obvious that learning English language is one of big importance in today's world.

In a study done by Ting et al., it is important to provide an English-speaking environment for Malaysian students' (Ting, Marzuki, Chuah, Misieng, & Jerome, 2017). Many students are very shy and afraid to speak English with other friends (Cole, Hermon, & Yanti, 2015). This is then later agreed by Ansari and Al Hosni in their study on speaking anxiety in ESL/EFL classrooms which his findings have found out that speaking anxiety is the major cause that leads and contributes to learner's language acquisition (Al Hosni, 2014; Ansari, 2015). One's effort and attempt to use and communicate in English outside the classroom are seen by others as being westernized and having the intention to abandon the use of Malay language, the official language of Malaysia. Students

are also afraid of using broken English which is why schools somehow play an important role in setting the right environment for learners' language acquisition where learners can speak freely and not be afraid for using wrong grammar or feel intimidated by other learners or the situation itself.

However, in regards to a whole school approach to supporting ESL learners, Idrus discusses in her study that there is a gap in current research surrounding the importance of making personal connections to show greater empathy and support to ESL learners (Idrus & Nazri, 2016). Relatedly, we also begin to learn that the whole school approaches to supporting ESL learners have the potential to increase the academic and social success of the students. Idrus mentioned in her study that there has been minimal attention and focus on whole school approaches in helping and supporting ESL learners (Idrus & Nazri, 2016). Thus, she concluded in her study that the findings of her study have shown that it is essential to create inclusive, caring and risk-free school-wide environment for ESL learners to succeed. Saad stated in her finding that it is very crucial to provide good environmental conditions that are able to assist and hamper English language learning (Saad, 2015).

ESL learning cannot be separated by the initial capabilities of the students and how they are able to develop things that they are lack of. The development undergoes by the students could actually be monitored and thus, could be assisted in the specific aspects that need to be improved. One theory that could be used as a basis for such monitoring and assistance is the theory proposed by Vygotsky. The theory is well known as the Zone of Proximal Development (ZPD). The concept of the zone of proximal development was originally developed by Vygotsky to argue against the use of academic, knowledge-based tests as a means to gauge students' intelligence. He also created ZPD to further develop Jean Piaget's theory of children being lone learners. The ZPD concept is seen as a scaffolding; a structure of support points for performing an action (Obukhova & Korepanova, 2009). This refers to the help or guidance received from an adult or more competent peer to permit the child to work within the ZPD.

Vygotsky's theory of ZPD (Zone of Proximal Development) is to say that learning awakens a variety of internal developmental processes that are able to function and work only when the child is interacting with people in his environment and communicating with his peers is an important feature of learning. Vygotskian paradigms promotes the idea that learning is a social process that occurs when learners interact, with an expert, with each other and with their environment (Srivastava & Joshi, 2014). Srivastava dan Joshi also mentioned in their study on how cognitive process happen to be helpful in the process of learning and mediated by social interaction which results in the occurrence of learning (Srivastava & Joshi, 2014). Through interaction, learners will learn best. Interaction between learners can scaffold and assist in the L2 acquisition language. In this way, social interaction is encouraged to help and improve learning. Vygotsky claims that the secret of effective learning came from the nature of the social interaction between two or more people with different levels of skills and knowledge (Vygotsky, 1978).

Motivation and attitude are could also be considered an important point in ESL learning. How the students view the language and what kind of motivation drives them could heavily affect its acquisition. It really isn't possible to give a simple definition of motivation, though one can list many characteristics of the motivated individual. For example, the motivated individual is goal directed,

expends effort, is persistent, is attentive, has desires (wants), exhibits positive affect, is aroused, has expectancies, demonstrates self-confidence (self-efficacy), and has reasons (motives) (Kieinginna & Kleinginna, 1981). The motivation to learn and acquire a second language is considered in the socio-educational model of second language acquisition (Gardner, 1985). Gardner's theory also argues that a positive attitude towards the second language community is required in order to enhance the level of motivation to learn a second language and a desire to become a part of that community is also equally important.

METHOD

A school located in Petaling Jaya had been chosen to be the participant for this study due to its location which situated exactly at the center of the city. This study involved the whole school. The particular school chosen is an all-girls school located in Petaling Jaya. The school consists of mix race students and the participants in this study were all selected randomly while the observation was conducted. The school had been chosen due to its location and also due to its history in a previous study by Rosli Talif and Malachi Edwin that has been stated as one of the best urban area schools in Malaysia that shows a very significant proofs of having mostly proficient students in English language (Talif & Edwin, 2001).

A qualitative research strategy is conducted which observation method was selected as an instrument to collect the data. Observations were conducted in that particular school to observe the level of proficiency among secondary students. Other than that, the most important part in the observations conducted was the school's settings and routines that have been proven as one of the mediums in language learning among secondary students in that particular school. Field notes were also included as the instrument of observation. Field notes were used to record behaviors, activities, events or of setting being observed, in this situation the school setting. Field notes helped in observing a culture, setting or social situation. The elements included in the field notes were as follows:

a. School Setting (includes the environment of the school).
b. School Routines (includes all the programs provided by the school in order to enhance students' English language proficiency).

In order to further support the study and to answer the research question mentioned, a casual but proper interview with one of the students was done in investigating her opinion as student on whether school settings and routines influence their English language learning. The following is the flowchart of this study.

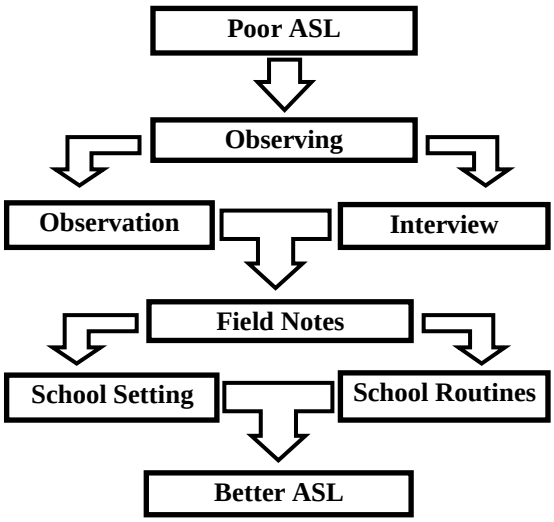

Figure 1. The Flowchart of the Study

RESULT AND DISCUSSION

School Settings

Based from the observation conducted, it can be seen that the school has such a good environment for the students. The place is calming and has all of the facilities that help students to be able to learn perfectly. In terms of acquiring language for secondary students, it can be seen that the school has

the perfect environment for students in acquiring English as their second language. The school is famous for its high proficient students who are fluent in English. Based from the observation conducted, it can be seen that most of the students of the school are all fluent in English language. Most of the students in the school has high self-esteem, and they are very proficient in communicating in English language among themselves and even with other people (teachers, staffs, etc.). One of the reasons is because of the school environment as has been supported and agreed by one of the students. *"Yes!"* quoting the interviewee referring to researcher's question of *'Do you think that school is the main reason of your fluency and proficiency in English language.'* Everyone in that school mostly interact and communicate in English with each other including the teachers and staffs thus making students to feel more comfortable and more motivated to use English in their daily interactions with the society and community. The findings are consistent with the findings from a study paper done by Shobana and Zairus on how social interaction is encouraged to help and improve learning (Srivastava & Joshi, 2014). The findings are also parallel to the literature of Gardner and Lambert's theory on how a positive attitude towards the second language community is required to enhance the level of motivation to learn a second language and a desire to become a part of that community is also equally important. Apart from that, the school has a lot of facilities that help students to be able to improve on their English language. Every corner of the school is occupied and filled with English vocabulary that help students to get used to the words and phrases of English language.

School Routines

It takes practices and efforts in order to acquire language. Every school in the world obviously has taken their efforts and strategies in improving their students' language proficiency in English language. School routines includes all of the activities that has been conducted by the school in making students to get used to English language. In contrary to the research findings from a study done by Idrus that says there is a gap in current research surrounding the importance of making personal connections to show greater empathy and support to ESL learners (Idrus & Nazri, 2016), it is found from the observation conducted that the school of study has done quite a lot of activities that help students in improving their proficiency in English language. These routines and programs are conducted regularly for the benefits of the students. '5-minutes English Reading Routine' is one of the activities conducted at the school. The routine needs students to allocate 5 minutes of their time early in the morning on every Wednesdays to read any English materials before the learning session begins. Apart from that, based on the study, it has also been found that the school has a routine of replacing every Fridays' assembly to a 20 minutes session of reading. Students are asked to read any English material during the assembly time. This kind of routine help students to be able to train themselves to get used to reading and indirectly help expanding their vocabulary in English language. Reading is one of the best methods in acquiring language.

Reading helps in improving students' level of accuracy in the use of English in their life. Students gain a lot through reading and they sometimes acquire language through reading thus maintaining a reading session weekly has been proven to be one of the best methods in helping secondary students in acquiring language. Besides having the reading programs as mentioned above, the school also has a weekly routine of having Public Speaking activity on every Tuesdays during assembly. Two volunteers were chosen every week to perform their public

speaking during the morning assembly. This activity helps students to be able to get themselves used to speak and talk in public in front of the crowd without feeling self-conscious and improving students' self-esteem in using English as part of their daily routine. Feeling shy and scared to talk in public using English language has always been the issue for students when it comes to ESL learning. It can be seen that through the program conducted by the school, majority of the students in that school are not ashamed of talking in public. Most of the students are participative and willing to speak in front of public. This indirectly helps students' level of proficiency by practicing their fluency in speaking English language casually. The findings are to be seen as the strategies of the school in helping the students to be more fluent in English language and to increase their level of proficiency.

On another note, as for the learning session from the observation conducted, English teachers are all encouraged to use the worksheets and handouts in the newspaper 'The Star' to be used in their learning session. The motives of using the materials from the newspaper is for students to be able to relate to real life with all the relatable themes provided in the handouts and not restricting them to only textbooks. The materials from the newspaper are all interactive and interesting thus help gaining students' attention to be more participative in the class during the teaching and learning session. These routines help students to be more confident in themselves in acquiring and using the language at the same time.

These analysis have also included the findings from an interview session with one of the students during the time of observation at the school to investigate the influence of school routines in language learning among secondary students. Based on the interview, the interviewee mentioned that she thinks the school has helped her a lot in acquiring English language. During the casual interview, she mentioned in her statement:

"I've always been a part of the Literature Concert my school organizes annually each year, and I've participated in a few international English competition such as the Sea Forensics. Thus I could fairly say my fluency in English boost up by involving in various school-based programs and international competition the school participated in."

The findings of the interview have shown that school routines do indirectly help students in boosting up their confidence level and produce sense of belonging within students.

CONCLUSION

School has been proven based on the findings of this present study, as one of the mediums for students to gain experiences in terms of sense-of-belonging and confidence in the process of acquiring ESL. This suggests that students need to believe that they would likely to get sufficient practice for learning English language. This study also believes that based from the findings of this present study, there are co-relations between school settings and routines with students' performance on ESL learning. The intersection point of these two relations would be the motivation of the students as we can always enhance and improves students' willingness to acquire ESL learning through motivations which can always be provided by the school with the help of the teachers and the settings of the school. It has also been proven that school settings and routines help students to have confidence, a sense of belonging and help them to maintain their sense of optimism in their process of ESL learning and acquiring language.

It is believed that the findings of this study can help both future and current

teachers to benefit from this study on gaining general ideas on how to help ESL learners in acquiring L2 outside the classroom by creating the right and suitable environment in helping learners to acquire L2. However, there is no specific measure to what extend do school settings, and routines influence secondary students' learning on ESL as there are other possible factors that might contribute to the matter of acquiring language among secondary students. Thus, it is hoped for future researchers to have further researches on related factors that might help to contribute in ESL learning among ESL learners.

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