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The development of EXAIR (example auditory thinking repetition) learning model based on BBL (Brain-Based Learning) and its effect on problem solving capability on secondary school in coastal area

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Abstract. As an archipelago country, Indonesia has a large coastal area. The condition of a coastal area known as underdeveloped regions. That condition correlated with the low quality of education, so need to be improved. It can be changed by optimalizing requires with special skills for students to be able to solve problems. Develop a learning model designed with enjoyable learning, one of them is EXAIR model of learning (combination of Example Non-Example model and AIR model) based on BBL (Brain-Based Learning). The aim of this research was to create a learning model and to increase problem-solving skills. The research was conducted by using 4D method. The first step is to define which is used to know the needs, the second step is to design which is used to produce the prototype model, the third step is the development used to produce a book of instruction learning model EXAIR based BBL. This research then continued with quasi-experiment. The result on product validation is 84.47% and the category is very valid. The results showed a significant effect on the BBL-based EXAIR learning model with a probability value of 0.00 <0.05.

1. Introduction

The maritime community is a community living in coastal areas. Coastal communities include people who are still underdeveloped and in a marginal position. These communities are communities that are lagging behind with the quality of human resources having low compassion. The low quality of human resources in coastal areas needs to be supported by effort to improve the quality of education. Increasing the quality of education in maritime areas will improve the quality of human resources, to be able to manage optimally large and abundant natural resources in coastal areas. Optimal management of natural resources requires special skills, one of which is the need for problem-solving skills. Based on the observation result, students problem solving skill in coastal area is still low. One of the reasons reason is the lack of student knowledge and lack of student's capability in understanding prob-lem-solving.

Characteristics of coastal communities with the low awareness of education need to be improved by making students feel good when they are at school. One of the ways that can be done is by using the Brain-Based Learning approach. The BBL-based approach in this principle is the learning done by creating a fun atmosphere in the classroom. Where the whole learning by oriented towards brain empowerment. BBL approach consists of cognitive, affec-tive, and psychomotor to indicate how

students learn to perceive, interact, and respond to learning environments. The principle of BBL is making the brain work to increase academic achievement(Duman, 2010). Brain-based learning helps students in optimizing the brain to think and find knowledge through an active learning process so that student learning is more meaningful. It also helps to create the relaxed learning environment as well as create an optimal learning environment emotionally and socially (Salem, 2017). Based Brain-Learning, seeks to optimize the brain works by creating a challenging learning environment for students' think-ing skills, create a pleasant learning environment, and create a situation of active learning and meaningful for students. An im-portant point in BBL-based learning is meaningful learning for students (Dikici et al., 2014).

The learning process that involves activating the students will make the learning happy. It happens because the student will play a role in it and can develop his potential. Cooperative learning is an instructional model that promotes cooperation among students to achieve learning. It is useful for each group member (Hsiung, 2012). Cooperation among students can occur through student involvement in solving problems, so students should have good problem-solving skills. That is one's basic ability to solve a prob-lem that involves critical, logical, and systematic thinking. Prob-lem-solving in a daily life is complex and ill-structured (Yu et al., 2014). One of the activities in solving the problem is AIR (Audi-tory, Thinking, Repetition).

Cooperative learning AIR model can motivate students to partici-pate actively in learning so that can foster the students problem solving skills. The advantages of learning AIR model (Auditory, Thinking, Repetition) is that students can participate more activelyin learning and often express their ideas. Besides, it can alsi make the students have more opportunities to utilize knowledge and skills comprehensively. Students with low ability can also respond to problems in their own way (Sari et al., 2016). Many students learn to use visual and kinesthetic; others use verbal and auditory learners (Joseph et al., 2013).

AIR learning is an effective learning when it comes to 3 things: Auditory, Intellectually, and Repetition. AIR model learning (Au-ditory, Thinking, Repetition) also has weaknesses in terms of pre-paring meaningful problems for students which not an easy job, but it should also raise problems that students can understand what happens with students having difficulty in responding to the to the problem. According to Purnamasari (2014), the weakness of the AIR (Auditory, Thinking, Repetition) model also lies in the three aspects that must be integrated (Auditory, Thinking, Repetition) so it takes a long time, this can be minimized by group formation (Kodir, 2010). The weakness of the AIR model with students who are difficult to accept a problem can be assisted by other coopera-tivelearning, that is learning model Examples Non-Examples.

Learning model examples non-examples is a learning model that uses examples. Which can be obtained from cases or images rele-vant to Basic Competence. This type of learning model Examples non-examples is one of the learning models to study the students sensitivity to the problems that exist in the vicinity through the analysis of examples of images, photographs, or cases that have a problem. Examples of images, photos, or cases provided will make it easier for students to understand a problem. Taking into account the advantages and disadvantages of each learning model, it is necessary to do a development to obtain a new learning mod-el. The learning model resulting from the development research carried out generally results in a valid, practical, and effective learning model (Ferreira et al, 2012). The combination of AIR learning model and Examples non-examples will motivate stu-dents and practice good problem-solving skills and to improve student learning outcomes.

Students in coastal areas with less academic ability will be easier to solve a problem by having images to assist them. This is based on observation data in several coastal schools in Lumajang dis-trict, MTs MiftahulUlum, MTs Nurul Islam and SMPN 2 Pasiri-an. In general, science teachers, the Biology ones, still explain a lot by using lectures a cooperative approach has actually been done but the result is still not good. Because the students are not active and cannot finish their work until after school hours be-cause they only play with many peers. They also have difficulty in understanding the problem given, because the problem is given in the form of description, making the student learning

outcomes less than the Minimum Standart Criteria. Therefore, based on the background of the problems that have been described and by look-ing at the characteristics of students in coastal areas, it is necessary to develop AIR and Non-examples model of learning to optimize student participation in coastal areas in particular and to practice problem-solving skills with a fun learning process. The purpose of this study is to create a learning model based on Brain-Based Learning EXAIR that can support problem-solving skills in junior high school students in coastal areas.

2. The Developmenet of EXAIR Learning Model Based-on BBL
Learning models of Exair based BBL is happy learning for stu-dents, with example (picture/experience), auditory, thinking, and repetition to increase learning outcome. Repetition is one of the most powerful effect in memory. The effect of repetition is to strengthen their readiness for question (Hintzman, 1976). Example in the learning model is giving a picture and experiment for stu-dents. So, they have a best learning experience in long-term memory. Many researches showed that experiment in learning can make student interested in a good development leaners (Shan, 2014). Some of information would be longer in memory besides information is picture (Mandler et al, 1977). The principle of Brain-Based Learning is optimizing of working a brain. Which is able to memorize, self-correct, and learn from experience (Tafti et al, 2016). The BBL approach is a learning approach with princi-ples to make students happy during the lesson. Before starting the lesson, the students should have breakfast. Eating breakfast before the learning helps the students make fewer mistake and help them work faster in the class (FRAC, 2014). 8. References

3. Method
The type of research conducted is the development (research and development) continued with quasi-experiment. Research devel-opment is research conducted with the aim of developing or pro-ducing a product (Joyce et al, 1986). Product development carried out in the form of learning model of EXAIR (Examples non-examples, Auditory, Intellectually, Repetition) in science lesson. Development is done by applying 4D design (Define, Design, Develop, Disseminate). However in this research, researchers do until the stage of development, due to limited time and cost. Here is the result of the development process starts from the stages of Define, Design, Develop. The define stage consists of five stages, namely front-end analysis, student analysis, task analysis, concept analysis, and formulation of learning objectives. This development stage aims to produce a revised learning tool based on the input of development experts. Some steps taken at this stage are, a) Valida-tion of models by experts or experts, the things that are validated include guidance on the use of models and learning tools. This validation is performed by the expert, the model development expert. b) Validation of the device by experts followed by revi-sions, b) Activities operationalize the lesson plan (Simulation), c) Limited trials, in accordance with real situations to be faced, d) Re-model revision after trial, e) Implementation of models on wider area by a quasi-experimental application. To determine sampling we used homogeneity test to determine control class and experiment class. Experiment class by using Exair model based BBL (Brain-based learning) and control class by using conven-tional model.

4. Result and Discussion
The Define stage produces knowledge about needs by sharing the need assessment. Which is the process of collecting data and in-formation needed to find the problem. The design stage generates a prototype model embodied in the form of a manual product. The results from product validation at the developement stage of the learning model guidebook produces a mean value of 81, 45 % with a valid category. The average yield of product tie vaults (learning model guidance, syllabus, lesson plan, cognitive test) as a whole was 84, 47 % with a very valid category. Therefore the product can be applied to the limited test and field test. This lim-ited test is conducted in coastal areas, namely in Lumajang, Bades Village Pasirian Sub-district of Lumajang Regency. Limited test conducted to 10 students based on the previous assessment with 3 students in high academic ability, 4 students in medium category, and 3 students in the low category. The material taught in the lim-ited test is the

Digestive System. The results obtained are then revised in the field tests conducted in the class. The field test of the EXAIR learning model was conducted in the VIII C class of MTs Nurul Islam BadesPasirian Sub-district, Lumajang District. Classes are defined as experimental class and control class derived right of homogeneity and normality. Homogeneity and normality tests were analyzed by using SPSS 17.0 using the previous daily values. Assessment of students problem skills is obtained from the results of performance assessment of problem-solving skills in groups. The results of students problem-solving skills are also obtained from the questionnaire to find out the student's response to learning to practice problem-solving skills using the BBL-based EXAIR model.

4.1. Equations
Percentage validation can be measuredby using the following equation:

$$V = \frac{T}{T_s} \times 100\%$$

Where :
V : percentage of validation
T : score of achieved
T_s :score maximum

Problem-solving skills can be measured by using the following equation:

$$P = \frac{N}{n}$$

Where :
P :percentage of problem-solving
N : score maximum
n : score of achieved

4.2. Tables of Results
The value of BBL-based EXAIR learning model can be seen in Table 1.

Tabel 1. Results of Problem-Solving Skills.

Class	Pretest	Postest
Control	59.35	69.10
Experiment	59.16	88.7

Table 1.can be shows the average of the control class and experi-ment one. The experiment class has a higher post-test result than the control class. The example given is the stage where the teacher gives a picture then explains the material to the students. Images used as examples in explaining are also implemented in the stu-dent worksheet. Student worksheets that contain pictures with problem-solving can make it easier for students to understand. The picture is one of the tools used in teaching and learning process that can encourage students to more train themselves in develop-ing the mindset. Junior high school age students prefer having picture than writing as a tool in the study. The result of problem-solving skill was analyzed by using SPSS namely Ancova to see the effect, it is known that the probability value is 0.00 less than 0.05. It means that the learning model EXAIR based Brain-Based Learning had a significant influence on troubleshooting skills. Problem-solving skills for students especially in coastal areas need to be trained. Students, especially in the coastal areas are the re-sources of development that must be realized in the era of globali-zation are the young generation who have high-level thinking, such as the ability to solve problems, logical reasoning, communi-cating, critical thinking, creative, meticulous, fast and precise (Caine et al, 2000). In addition to the

results of the performance of problem-solving skills, the researchers also distributed question-naires to problem-solving skills. Here is the result of the question-naire of problem-solving skills in Table 2.

Tabel 2 Results of the questionnaire of problem-solving skills.

Indicator	Average (%)	Category
Identify the problem	80.72	Very good
Formulated the problem	80.02	Very good
Analyze the problem	80.72	Very good
Conclusion	87.5	Very good
Solve the problem	82.29	Very good
Finished the problem	90.62	Very good

Table 2 can be shows the result of questionnaire problem-solving skills with average problems which is the excellent category. This indicates that the student can understand and solve the problem given by the teacher through the image taught by BBL-based EXAIR expenditure model. EXAIR learning model-based Brain-Based Learning has several components including example, auditory, thinking, repetition, combined with 12 characters Brain-Based Learning.

Development learning model of EXAIR by using 4D. The first stage is define. The stages of define includes five stages: 1) the front end analysis, 2) analysis of the students, 3) analysis tasks, 4) analysis of the concept, and 5) the formulation of learning objec-tives. Stages of defining is done by distributing questionnaires to teachers in some schools in the coastal areas to get the problems or needs required by the teacher *(needs*-assessment). *Need assess-ment*function to locate quality and information about education,through *needs assessments* will be collected various information needed and expected. The second stage is design. The researchers designed a prototype model that correspond to the learning objec-tives. In this stage consists of three phases, which include 1) the preparation of a benchmark reference test *(Constructing criterion-referenced* test), 2) the selection of media *(media selection),*3)prototype models *(initial design).* Prototype models developed that combines learning model Example Non Example with coop-erative learning model AIR*,* so as to create EXAIR learning mod-els, learning model of Exair combined with BBL approach *(Brain-based Learning),* so create a learning model Exair based on BBL.

The thirth stage is develop. In the develop stage consist of three phase: a) the model validation of Exair by experts followed by a revision, b) simulation, that operationalize the activities of teach-ing plans, c) limited test with real students. Validation of instru-ments and products of development by experts (professors) devel-opment model and the user (teacher). Stages validation is per-formed in stages is validation of the instrument first, subsequently validated instrument used to validate the product of development. The research instrument will be validated includes sheet validation guide learning model Exair based BBL *(Brain-based Learning)* for experts and users, sheet validation of syllabi, sheet validation Learning Implementation Plan (RPP), sheet validation tests cogni-tive, questionnaire responses of teachers, questionnaire responses students.

BBL approach facilitates meaningful learning through brain way that works naturally, so that students can get a sense of learning (Salem, 2017). The focus of the Brain-Based Learning approach is how the brain works with a blend of senses, experiences, and learning so as to create a pleasant classroom environment (Hagligi, 2012). Twelve characters among others, are the brain as a parallel processor, learning which involves the whole body, the search for meaning is innate, the search for meaning through the patterns, emotions are very important in the search for meaning through pattern, the brain processes the whole and the parts simultaneously, learning involves centralizing attention and perception around, learning is conscious and unconscious, humans have 2 types of spatial and rote memory, the brain understands and remembers best when facts and skills are embedded in memory naturally, each brain is unique, learning is challenged by challenges (Caine et al, 2000). The BBL approach plays an emotional role and optimizesthe workings of the brain (enjoyable learning) that can affect learning outcomes (Connel, 2009). BBL approach is based on the structure and function of the brain in various aspects such as learning, thinking, and remembering (Uzezi et al., 2017). Meaningful education for students can be provided through a variety of approaches, such as the approach of Brain-based Learning (BBL), which involves the active participation of students, involving visual, audiotory.andkinesthetic. BBL approach is student-centered approach, which can help teachers to improve students' cognitive structure (Yasar and Diyaddun, 2017).

BBL-based EXAIR model has 4 components, namely example, auditory, thinking, and, repetition. Before the teaching begins students are required to have breakfast and doing brain gym. Brain Gym is slight movements involving the hands and feet if the opposite and can provide stimulus or stimuli to the brain. The movement that produces this stimulus that could help improve cognitive function. Movements Brain Gym same with the principles of the BBL that the brain is a parallel processor, the human brain is the primary organ of the human central nervous system, so that the brain has a very important role in the learning process (Motammed et al, 2017).The brain has an assortment of chemicals *(neurotransmitters)* that are involved in the learning process. Neurotransmitters are compounds that help the distribu-tion of stimuli between nerve cells or nerve cells and muscles. Examples of neurotransmitters are serotonin, dopamine, and ace-tylcholine. If someone is in a very relaxed circumstances, the neu-rotransmitter activates brain function in part of the limbic system (Claproth, 2011).

Breakfast is the most important meal is consumed first, necessary for student activities (Spence, 2001). Therefore, if learning is done in the morning then students are required to breakfast. This is because breakfast can provide energy for the body because food and oxygen will be ATP for brain work. Breakfast is the best energy supply for the brain because it can increase concentration in school (Al Bastway, 2017). Phase example is the stage where students are given examples which can be in the form of, real objects, or lab work. Focusing students through the example will encourage students to go deeper into the material (Marzano et al., 2001). From the sample given then the students listen to the explanation from the teacher. The teacher also provides aworksheet that contains troubleshooting. Students conduct discussions and proceed with a presentation. The stage is an auditory stage. When students discussed classical music discussion combined with the sound of the waves. The music used in this study is Sonata in D by Wolfgang Amadeus Mozart, canon by Pachellbel, bluestone alley by Congfei Wei, river flows in you by Yiruma, almost remember by Dennis Kuo. The rama, melodies, and frequencies of classical music can stimulate and energize creative areas and motivations in the brain. In the next stage the students thinking to solve the problems given by the teacher. The stage is a stage of thinking. Music can activate the flow of memories stored in the corpus collosum, music reminiscent of the integration of the entire region of the brain. Some students who demonstrate positive emotional attitude and stress is low, his brain functions better when compared with students who have a good feeling for and burnout (Tang, 2016). After that, the students are given a repetition of quizzes. Repetition aimed at information that has been obtained does not just disappear. Repetition in this research is done by giving a quiz to students.

Last activities that reward or celebration with applause and praise, these activities are included in the emotional learning that involve parts of the prefrontal cortex.Prefrontal cortex working at the time happy and comfortable state (Handayani and Corebima, 2017).

5. Conclusion

EXAIR learning model is a model developed from Example Non-Example and AIR models, combined with Brain-Based Learning. This model can increase problem-solving for student in the coastal area. Development is done by using 4D model (define, design, develop, dissemination), but in this study the stage of dissemina-tion is not done. The BBL-based EXAIR learning model (Brain-Based Learning) supports learning outcomes and problem-solving skills.

Acknowledgement

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