The effect of integrated learning model to the students competency on the natural science

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Abstract. The students' competency of Junior High School in mastering the natural science concept is still low. Natural science learning is not yet integrated. The students are required to be active in learning and teacher is implemented the various learning methods. Therefore, the integrated learning is implemented in natural science subject. This research used quasi experiment method with pre-test post-test group control design. The subjects of the research were eight grades in Junior High School students. Data were collected using observation sheets, tests, and motivation questionnaires. The result of the research shows that the integrated learning model impact to improvement the students' competence, in the terms of: (1) There is a significant difference in the competence of students who use integrated learning and students who use conventional learning model. (2) There is a significant difference in the competence of students who high motivation and low motivation in the integrated learning. (3) There is interaction of learning model and motivation that effect to the student competence. Thus, student competence is significantly influenced by the implementation of integrated learning model. Effect of integrated learning model to the students competence including large categories.

1. Introduction
Natural Science is concerned with how to systematically identify natural phenomena, so science is not just a mastery of knowledge in the form of facts, concepts or principles but a process of discovery. Science learning is expected to be a vehicle for learners to learn about themselves and the environment, as well as prospects for further development in everyday life [1]. The nature science includes four main elements of attitude, process, product, and application. The four elements are the characteristics of the nature science intact that cannot be separated from each other [1]. In the process of science learning the four elements are expected to emerge, so that students can experience the learning process as a whole, understand the natural phenomenon through problem-solving activities, scientific methods, and imitate the way scientists work in finding new facts. The subject matter of science in junior high school is expected to be in accordance with the level of student development which is generally in the transition phase from concrete to formal.

Natural Science consists of products and processes. The natural science product consists of facts, concepts, principles, procedures, laws, and theories. Those products must be obtained by students through discovery processes through scientific methods based on scientific attitudes. In terms of process, natural science has a variety of science skills, for example: (1) identifying and determining independent variables and dependent variables, (2) determining what is measured and observed, (3) observing skills,
gathering relevant facts, seeking for similarities and differences, classifying, (4) skills in interpreting observations such as recording separately each type of observation, and connecting observations, (5) skill of finding a pattern in observation, and skill in summarizing observations, (6) skills in predicting what will happen based on observations, (7) skills using tools or materials [2].

Science learning in junior high schools should be implemented in an integrated in accordance with the curriculum 2013, not separated between Biology, Physics, Chemistry, and Space Earth. Such a thing is intended so that students can understand the integrity of the natural science concept. The whole theme of natural science on various types of objects and organizational level can be used as material study. The process of science learning that integrated various concepts of physics, chemistry, biology, and space earth has the potential to develop the experience and competence of students to understand the natural world. Through integrated learning students can gain hands-on experience to develop competencies to explore nature scientifically, making it easier for students to master and apply the science concept they have learned. The experience of learning through comprehensive scientific inquiry activities can help students to master the science more deeply. Learning experiences that can be developed include designing and making work through the application of the concept of science in its integration with scientific methods. The ability to think, work, and be scientific and communicate scientifically is an important aspect of life skills.

In the planning of integrated learning should be selected objects that will be developed into themes or projects that will be the focus of science study using various concepts of physics, chemistry, biology, and space earth. Thus the students are trained to be able to find the concept of science in a holistic, meaningful, and authentic. The learning experience designed by teachers is very influential on student competence. Contextual learning experiences can make learning more effective. The acquisition of wholeness of science learning, the view of life, the real world and natural phenomena can only be reflected through integrated learning [3].

Based on interviews with teachers in the MGMP IPA (conferences of subject teachers of natural science) in junior high schools in Padang it was found that science learning has not been integrated. Science lessons are taught separately, biology and chemistry lessons taught by biology teachers, physics lessons taught by physics teachers. This is due to: (1) The background of teacher education is physics education, biology education, and chemistry education. (2) There is no science learning materials that integrated the physics, chemistry and biology. (3) Limited time and teacher's ability. The results of preliminary observations indicate that: (1) Science learning does not always use lecture methods, cooperative learning has been applied. (2) Students' learning outcomes have not increased yet, many students are not yet mastery. (3) Not many students are active in learning.

The solution to this problem is to apply integrated learning in natural science lessons. Integrated learning applied refers to the integrated learning model with the shared type [4]. The integrated learning model type shared is a learning model that combines two or more subjects to form a specific theme. Integrated learning can be conducted if the atmosphere of learning is conducive and students are actively developing their potential. The integrated learning model type shared can enable students in learning, developing thinking skills, social skills, and organizing skills [4].

Integrated learning is designed by integrating the subject matter of science in one unit. Integrated science learning that the boundaries of the subjects are no longer visible, because they have been formulated in the form of problems or themes [5]. Integrated learning that provides effects, including (1) improving abstract thinking skills, (2) building identity, (3) building self-reliance, (4) improving learning outcomes [6]. Integrated learning can improve communicative skills (reading, listening, speaking, and writing), competence to communicate, intercultural competence, cognitive ability, and motivation [7]. The importance of integrated learning because it can improve student competence by applying four learning cycles namely; transformational learning, learning development, learning behavior, and additional learning [8]. The implementation of integrated learning can be increase students' science literacy [9,10].

The syntax of integrated learning follows the steps taken in each learning model, namely the planning stage, the implementation stage, and the evaluation stage [2]. The syntax of integrated learning is flexible. Syntax in integrated learning can be accommodated from various learning models. In addition to applying integrated learning model type shared, also combined with scientific approach, in accordance
with the curriculum 2013. Learning process with scientific approach, can challenge students to develop thinking ability [11]. This approach is effectively applied in learning by attention to different of the student learning styles, training students to develop their creativity to connect new information with existing information. This research aims to know the effect of integrated learning model on the students competence in natural science.

2. Method
This research used a quasi experimental method with a pretest-posttest control group design [12]. The experimental design used is 2x2 factorial design. This design include two models of learning (integrated learning, conventional) with two categories of learning motivation (high, low). Research was conducted on students in natural science subjects. The research stages are: (1) conducting preliminary survey, (2) developing lesson plan, assessment and research instrument, (3) giving pre-test, (4) giving motivation questionnaire, (5) giving treatment by implementing integrated learning on students of the experimental class, while the students of control class conducted conventional learning, (6) provide the post-test, (7) analyze the data and interpret the results. The instruments used in the research are: observation sheet, test, and motivation questionnaire. The observation sheet was used during the preliminary survey. Motivation questionnaire is used to classify the students based on learning motivation.

Questionnaire data of learning motivation were analyzed by percentage technique to classify the students into two groups of learning motivation that is high and low. The test data was analyzed quantitatively to know the effect of integrated learning model on student competence in science learning. Data analysing with two way Anova (analysis of variants) and effect size.

3. Result and Discussion
The effect of integrated learning model on students competence is obtained from two way Anova and effect size analysis. The analysis of two way Anova aim to know the difference of students' competency of experiment class and control class in terms of learning model and learning motivation. The effect of the implementation of integrated learning on students competence is known from the effect size results.

3.1. Differences of student competence based on learning model and motivation
Before analyzing the data to know the difference of students' competence based on the model and learning motivation, firstly tested the normality of data distribution and data homogeneity test. The result of normality test of data distribution shows that the students' competency of experiment and control class before the learning is normal distribution. Same result for students competence after learning. The result of homogeneity test of students competence data before learning shows that the students competence of experiment class and control class is homogeneous, as well as students competence after learning.

After the average difference test on the students 'competence data before the learning obtained the result that the average of the students' competency of the experimental class and the control class did not differ significantly (p = 0.52). Thus it can be stated that the student's competency before the learning is the same in both classes. The difference of student competence after learning is obtained from the result of two way Anova as in Table 1.

| Source of Variation | SS     | df | MS       | F       | P-value | F crit |
|---------------------|--------|----|----------|---------|---------|--------|
| Learning model      | 4890.234 | 15 | 326.0156 | 2.1345  | 0.03527 | 1.9919 |
| Learning motivation | 3828.516 | 1  | 3828.516 | 25.0665 | 0.00095 | 4.1491 |
| Interaction         | 3190.234 | 15 | 212.6823 | 1.3925  | 0.00985 | 1.9919 |
| Within              | 4887.5  | 32 | 152.7344 |         |         |        |

Based on the results of two way Anova can be concluded the first hypothesis was rejected, means there are differences in student competence that implement integrated learning with students who implement conventional learning. Student competence that implement integrated learning is better than the student
competence that implement conventional learning. The result of the second hypothesis test is rejected, it means there are differences of students competence that have high learning motivation with student competence that have low learning motivation in integrated learning. Students who have high learning motivation, competence are better than students who have low learning motivation. The result of the third hypothesis test is rejected, it means there is interaction between learning model and student's learning motivation in influencing student learning result. This shows that the model of learning and learning motivation affect student competence. The interaction between learning model and student learning motivation can be presented in Figure 1.

![Interaction between learning model and student's learning motivation](image.png)

**Figure 1.** Interaction between learning model and student's learning motivation

3.2. *The effect of learning model on student competence*

The effect of the implementation of integrated learning model on student competence is calculated using effect size with Cohen's formula, the effect size is 1.74. These results indicate that the effect of integrated learning on student competence is a large category.

3.3. *Discussion*

The implementation of integrated learning model in science teaching aims to improve the student competence. The results showed that the effect of integrated learning on student competence included a large category. This means that integrated learning is more effective than conventional learning. Integrated learning has an impact on students' learning mastery. Integrated learning can improve communicative skills (reading, listening, speaking, and writing), cognitive abilities, and student motivation [7]. Learning motivation can improve maximum learning outcomes if students are able to combine the motivation that is formed (intrinsic or extrinsic) due to the learning model with the ability to demonstrate its performance [13]. Therefore the implementation of learning models that have a significant effect on the improvement of learning motivation actually contribute to the improvement of student competence.

Motivation is a complex psychical factor. The strongest motivation is intrinsic motivation rather than extrinsic motivation [14,15]. The learning process should be able to create students intrinsic motivation by linking students' interests and supporting the development of their competencies [16]. In addition to applying the learning model to generate motivation externally, the teacher must strive for intrinsic motivation to be developed because the motivation is able to give the biggest encouragement for the development of students' potentials into competence.

Integrated thematic learning can improve the motivation and competence of learners [3,17]. Implementation of integrated learning can foster scientific skills such as science process skill, creative thinking skills and critical thinking skill, and growing scientific attitude [18]. Integrated learning can occur in events around the students life [5]. In accordance with the characteristics of integrated learning, the learning needs to be prepared various activities by using multi methods, such as experimental
methods, inquiry, role play, question and answer, demonstration, and exploration [5], [19]. Assessment in integrated learning is more appropriate using authentic assessment [20].

4. Conclusion
There is a significant difference of the students competence using integrated learning with students using conventional learning. There is a significant difference of the students competence that high and low motivation in integrated learning. There is an interaction of implementation of learning model and learning motivation in influencing students competence. Student competence increases because of the implementation of integrated learning model. Thus the students competence is significantly influenced by the implementation of integrated learning model. The effect of integrated learning model on students competence is in the large category.

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