Textbook design of integrated science subject with integrated model in bio magnetic topic

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Abstract. Textbooks is a student medium to gain the information about the lessons in school. One of the goals of textbooks based on the 2013 curriculum can be used to grow student’s curiosity and develop their skills. In Science Lesson, the textbook has an alignment of topics for physics, biology, and chemistry subjects. Based on observation and needs analysis results textbook have not reached the standard of student needs. Science textbooks are still fragmented and the content is incomplete. In this research, the design of science textbook was made to make students' interest in learning and have a connected theme of each material. The integrated model was developed in bio magnetic topic. This model was linked for each basic competency material that related with chosen topic. The results of the design obtained a student worksheet form that can describe every event of subjects, in addition there are steps of science integrated learning in teaching and learning process. There were three subthemes produced, i.e. bio magnetic in the body, bio magnetic in blood circulation and bio magnetic measurement.

1. Introduction
Humans are creatures that always learning at all times. From infancy to old age, humans continue to learn. At the stage of human learning reaches the age of maturity of every level of education it passes. The very crucial phase is the phase as a teenager, ie, at the age of 13-15 years. In this phase humans usually absorb more information and more observe the environment around with logic and reason possessed. Certainly in this phase also determine the personality and attitude for the future.

In the process of teaching and learning students at this age entered the junior high school level. The lesson they get is certainly not a basic lesson anymore. The lesson has begun to observe more but not too specific. At this stage also, students begin to link between a material with other materials. Integrated Science is one of the subjects discussed at this level. The linkage between the material should be presented so that the students can understand it well. An integrated learning approach to the subject of Natural Sciences is often referred to as an interdisciplinary approach. The integrated learning model is essentially a learning model that allows learners both individually and actively seeking, digging, and finding concepts and principles in a holistic and authentic way [1]. One of them is combining Basic Competence. Through integrated learning learners can gain hands-on experience, so as to add strength to receive, store, and produce impressions about the things they learn. Thus, learners are trained to be able to discover for themselves the various concepts being studied.

The packaging of the learning experience designed by the teacher is very influential on the meaningfulness of the experience for the learners. More learning experience shows the relevance of
conceptual elements will make the learning process more effective. Conceptual linkages studied with relevant sides of the field of Natural Science studies will form a cognitive scheme, so that children acquire wholeness and unanimity of knowledge. The acquisition of wholeness of science learning, as well as the unanimity of views on life, the real world and natural phenomena can only be reflected through integrated learning.

One of the media in transferring instructional objectives is textbook. Field facts found there is still separation of material in the presentation. The materials are still separated from the concept of one subject to another. In addition, teachers who teach sometimes tend to lead to one subject in accordance with background education.

In the 2013 curriculum, basic competence of science subjects has integrated the concept of physics aspect, chemical biology and IPBA, but not all aspects are combined because on a topic of science not all aspects can be integrated. There are several potential models to be applied in integrated IPA learning, including connected, webbed, shared, and integrated. Four models are selected because the concepts in the basic competence of IPA have different characteristics, thus requiring the appropriate model in order to provide optimum alignment results.

Integrated learning (integrated) is an approach in learning that deliberately links some aspects both in intra subjects and between subjects. With the integration, students will acquire the knowledge and skills intact, so that learning becomes meaningful for the students. Meaningful here means that in integrated learning students will be able to understand the concepts they learn through direct and tangible experiences that connect between concepts in intra subjects as well as between subjects.

In this research, a textbook design in biomagnetic topic was created. This theme is chosen because there are several relationship concepts from the subjects. The design is made based on the initial analysis of needs done in the classroom. From the problem was made textbook design through research and development with the model of Reeves development.

2. Textbook

Textbooks are books containing material descriptions of particular subjects or subject areas, organized systematically and selected based on specific objectives, learning orientations, and student progress to be assimilated [2]. According to Lange in [3] the textbook is a standard book of each branch of study and can consist of two types of basic books and supplements used to support a particular lesson, organized systematically to provide an understanding according to the needs of the readers of the students.

Textbooks are a major part of some educational system that helps to expose the things contained in the curriculum and can be a clear aid for educators in carrying out learning. Textbooks are useful and an easy learning resource so students and teachers can use them as needed [4]. Meanwhile states that textbooks are designed by subject experts based on national and local curricula [5]. Textbooks are one of the learning materials for students who have been prepared in accordance with the existing curriculum. The book is a source of teaching has a function as a means of communication between teachers and students so that the subject matter can be conveyed delivered properly. Textbooks can also be a means of complementary learning for teachers in teaching and learning [6][8].

According to [3] there are two benchmarks in the basics of textbook compilation, the first general benchmark applicable to any textbook and a second specific benchmark applicable to certain textbooks, for example textbooks of mathematics, biology and language textbooks Indonesia. The general rule of thumb is usually sourced from the curriculum while the specific benchmark is sourced from characteristics of each subject. According to [3][9] the general benchmarks that apply to each textbook include the following. 1) Approach, 2) Purpose (Cognitive, Affective, Psychomotor), 3) teaching materials, 4) Program (Class, Semester, Course time), 5) Method, 6) Means and sources, 7) Assessment, 8) Language.

3. Needs Analysis
Needs analysis is a process of finding, improving, modelling and specifying. So, the needs analysis is the first step that a person does to identify his needs. Needs analysis aims to detect or find out the fundamental problems in the development of textbooks lessons. Needs analysis carried out illustrates the background of problems in the field that includes analysis of front-end analysis, learner analysis, and material analysis.

4. Integrated Model

Integrated learning is an integrated learning model that uses a cross-sectional approach, incorporating a field of study by setting curricular priorities and finding overlapping skills, concepts and attitudes in several fields of study [6].

The integrated learning model has a special feature of combining a number of topics from different subjects but the core of the topic is the same. In this model the related and overlapping theme is the last thing the teacher wants to find and select in the planning stage of the program. The teacher first selects the concepts, skills and attitudes taught in a semester from several fields of study, then selected some concepts, skills, and attitudes that have close and overlapping connectivity among the various fields of study (Figure 1).

In this model there is a teaching team that comes from several different subjects but has an overlapping theme (overlap). In this stage, the combined teachers must be compact and have high skills. This stage can also build confidence and trust as a model designer [6].

5. Results

Front-end analysis was obtained based on a questionnaire consisting of performance analysis, graduate competence standard analysis, objective learning analysis, and analysis of learning difficulties given to four IPA teachers of MTsN 6 Padang. Results of performance analysis with an average value of 75% of eleven indicators. Indicators that get the lowest value that is used in the book has not used the appropriate model of integrated learning and has not been themed in accordance with basic competency. Analysis of graduate competence standard with an average value of 76.56% of eight

![Figure 1. Integrated scheme](image-url)
indicators. This shows that in the achievement of the competence of graduates there are still results that are less than the maximum in learners in having knowledge related to the phenomena of IPA in the field of health and its application in everyday life. Analysis of learning objectives with an average score of 77.08% of the six indicators proposed and can be categorized well. Furthermore, the analysis of learning difficulties obtained an average value of 71.53% of the nine indicators (Figure 2). The results obtained in the analysis of learning difficulties indicate that learners have difficulty in learning science, not yet the learner learners to learn from the facts or the environment around him and exploit the phenomena that exist around to find new knowledge.

Figure 2. Front end analysis

Student analysis is also done to know how the characteristics of learners consisting of aspects of spiritual attitudes, social attitudes, knowledge, and skills. The result of spiritual attitude aspect analysis was obtained 82.05%. The result of attaining spiritual aspect is in very good category, students have shown good spiritual attitude in learning. The result of social attitude aspect analysis was obtained 71.75%. In the aspect of social attitudes, learners are less ready to learn because they do not read the subject matter at home before the teacher explained in the classroom, so it needs to be improved again in the learning. In the knowledge aspect obtained 77.56% good categorized. However, the understanding of the concept and the use of the equation directly is not maximal so it needs to be re-trained. Furthermore, in skill aspect, the average score is 78.01% and categorized well (Figure 3). However, the presentation of the results of group discussions in the lab and displaying the results of group discussion has not been maximized. From the results obtained can be seen that the values of attitudes are very important role to make learning meaningful for each learner.
Based on the results of the analysis that has been done on science textbooks and students in the MTsN 6 Padang, new innovations needed in the development of textbooks in accordance with the characteristics and environment of learners as well as in accordance with the 2013 curriculum, which is to apply integrated learning model and approach in learning [7].

One of the integrated learning model that can be applied in the textbook of science lesson is integrated model. Integrated learning integrated psychological model can provide a meaningful experience for learners, because learners experience directly and connect it with other concepts. This is in accordance with the philosophy of I hear-I forget, I see-I remember, I do-I understand.

The resulting textbook design can be seen in Figure 4. Cover is made to reflect the contents of the book. Based on the theme taken biomagnetic made more prominent with the illustration of the combination image of the body with magnet. In the table of contents (Figure 4), a sub-material with the identity of the material combined from the core competencies and basic competencies (Figure 6) based on Ministerial Regulation of Education and Culture No. 24 years 2016. Materials discussed in this textbook are biomagnetic on the body, biomagnetic in the blood circulation, and biomagnetic measurements (Figure 5). These materials are made different from textbooks in generally. The material is adapted to the theme of the book which is appointed biomagnetic but not contrary to the material in accordance with Ministerial Regulation of Education and Culture No. 24 years 2016 and materials in the student textbook.
Figure 4. Left: textbook cover. Right: table of contents

Figure 5. Material contents
The integrated model is done in this research. Add material that can be used with themes. For the first material (biomagnetic on the body) can meet the material based on physics and biology (Figure 7). Physical material obtained are magnetic properties. As for biology is the nervous system. Integrated concepts can discuss the properties of magnetism in the body, magnetic impact and navigation in animals. This concept examines optimally both physically and biologically.

The material used in this textbook is biomagnetic in blood circulation. Integrated concepts derived from physics and biology. Models with disabilities are seen in Figure 8. The concept of physics described are magnetic properties, and electromagnetic waves. For the biological material discussed are the nervous system, the circulatory system, and the blood structure. Using physical and hay materials, the corresponding integrated model is a magnet in the blood.

The complete materials of biomagnetic measurement of materials used are: biomagnetic measurements, raw and nonstandard units, principal values and derivatives (Figure 9). Physical materials are measurement, calibration, quantity and unit, international unit, and the principal quantity and the value of derivative. While the biological material of the nervous system, blood circulation, and body health.

**Figure 6. Identity materials**

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Figure 7. Integrated model in biomagnetic on the body

Figure 8. Integrated model in biomagnetic on the body

Figure 9. Integrated model in biomagnetic measurements
The components contained in this textbook are introduction, material presentation, guiding the training, reviewing the understanding and providing feedback, developing by providing opportunities for continued landing and application, analysis and evaluation (Figure 10). Prior to the presentation of the material, it was given an introduction that was general and easy to digest, which gave rise to student motivation. The spiritual aspect is also given with examples in everyday life. The exercises are given in order to measure students' understanding. At the end of the analysis and evaluation. In this textbook is also given summarized and glossary to find the words difficult and understanding in brief (Figure 11).

6. Conclusions
The textbook design is created based on the analysis of problems that have been found in schools. Design that can not get out of Ministerial Regulation of Education and Culture No. 24 years 2016 and also based on material introduced in junior high school. Alignment is made on the subject-related topics Physics and biology lessons. Three materials used are biomagnetic in the body, biomagnetic in
blood circulation, and biomagnetic measurement. The design of this textbook is also created by displaying alignment with materials and exercises to be easily understood by students.

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