



## DEVELOPING AND IMPLEMENTING INSTRUCTIONAL MATERIAL ENGLISH FOR SCIENCE THROUGH LESSON STUDY

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### Abstract

English Language Teaching in Integrated Science Department is often challenging to train students to understand science content in English and present it fluently. In the implementation of daily lecturing activities, Basic English theories such as grammatical structure and IPA content are taught separately. It causes no integration between the two materials. Based on the problems an instructional material that integrates the basic theory of English and science content is needed to support the learning activities. This product is designed to improve previously unstructured instructional materials. The product developed through lesson study stages. In the Plan stage, the need analysis and product development were conducted. While at the Do stage, the instructional material was implemented in the learning process. Finally is the See stage, this stage is a reflection on the whole process of lecturing both in the process and products used. The instructional material was validated by language, content and media experts and it can be said to be feasible to use in the learning process. Then the product was used in the learning process and can help students to improve the English proficiency in science with an average of 80.

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## INTRODUCTION

Universitas Negeri Semarang (Unnes) as one of the Higher Education Institutions in Indonesia has one mission is to organize and develop an excellent education and international level in the area of education and non-education (unnes.ac.id). To support the university mission, Faculty of Mathematics and Natural Sciences (FMIPA) as one of the faculties in Unnes also has a mission to produce the excellent human resources, and one of the requirement is mastering English to support international standard education. It is in line with the opinion of Wachter and Maiworm in Doiz *et al.* (2012) that states the impact of the context of international education is the rapid development of the use of English as an introduction to teaching in schools.

Department of Integrated Science as one of the majors in FMIPA Unnes that is expected to produce prospective science teachers of junior high school level has been preparing students to develop their English proficiency, especially in teaching science in English by providing English for science courses. The English course for Science aims to train students in conveying science materials in a right concept and language structure. In this course, students are expected to present a paper about the article with the topic of Science in English. It can be concluded that the materials provided in the course are materials that support the preparation of students writing and presenting in English.

The problem of English mastery is always a challenge in the learning process; students are still difficult to understand the material given the lecturing process so far using English as Medium of Instruction (EMI) which can be interpreted as the use of English as the language of instruction (Artini, 2013). Only 15% of students scored > 86 while most or 60% scored with a range of 71-85 and the remaining 25% scored <70 copies. Vu and Burns (2014) identified four challenges teachers must face using EMI: teacher language skills, students' language skills, method accuracy and insufficient resources.

Based on the observation it can be identified the cause of problems in the lecture is the inadequacy of learning resources or instructional materials in the course. The materials are usually presented separately between science material and English. Therefore appropriate instructional material that combines science and English materials are needed

because appropriate instructional materials must be prepared to produce meaningful learning outcomes (Balim *et al.*, 2008). Development of appropriate instructional material in accordance with the analysis of potential problems can produce student learning outcomes at good levels (Wisudariani *et al.*, 2013). Developing appropriate instructional materials is one of the alternative solutions to improve students' learning outcomes.

Instructional material is developed through lesson study (LS) process that is derived from Japan but has been adopted in various countries, Cerbin and Kopp (2006) adapting and using it in the college-level learning process in America. In its application in both Japan and America, LS involves a teaching team working together to design, teach, and review learning in a classroom. The LS stage according to Dudley (2014) consists of three stages of 'research lessons': planning, teaching/observing and analyzing together. Inprasitha modified LS in Thailand in 2002 until now using the collaborative stage of the plan, do, and see (Thinwiangthong *et al.*, 2012).

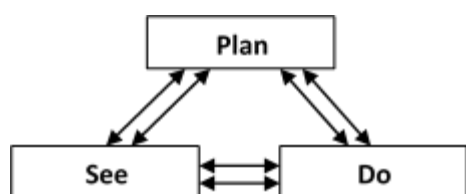
LS stages that have characteristics consist of teaching teams that collaborate in planning, observation in the learning activities and re-learning steps that have been considered appropriate if combined with the development of learning materials. As mentioned earlier the selection of appropriate instructional material can help students to achieve good learning outcomes and development of instructional materials can be done through the planning stage or plan in step LS. At this stage, students are also invited to discuss in determining the material needs they need to improve their skills in English for science courses because good learning is developed based on students' needs (Thinwiangthong *et al.*, 2012). After the instructional material is developed in the next stage of the plan the, instructional materials are applied to the learning process.

LS is conducted to improve the quality of teaching, one of the purposes of LS is reflection part that is an essential stage in the teaching process. The ability to consider what and how we are teaching, and to reflect on the performance as teachers to determine what works best for the students, is central to successful teaching (Myers, 2012). The reflection will result in some notes for improving the quality of teaching. LS also

facilitates teacher to see the best strategy and material to their class; the focus is on the students' development.

## METHODS

The research design is research and development (R & D). R & D is a fundamental research activity to obtain the need of users, and precede it to product development. According to Borg and Gall, research and development is a method to develop or validate the products in education and learning process. The product of instructional material was developed through lesson study stage that is illustrated in Figure 1.



**Figure 1.** Lesson Study Stages

The product development was in the planning stage, then it was used in the learning process in the do stage and reviewed its effectiveness in the see stage. The subject was the first semester students of science education department who took the course English for Science. The number of students was 50 from the total population of 100. The instruments used to collect the data were the expert validation, students' validation, and lesson study observation instruments. The data were analyzed descriptively.

## RESULTS AND DISCUSSION

This research consists of three stages of Plan, Do, and See that are LS stage activities. The plan is the first stage of LS; the product development was performed in this stage, it consisted of formulating the learning scenario. The next stage is Do or the implementation phase by applying the teaching material that has been developed. The last stage was See; this stage was a reflection of learning activities which includes reflection on lecturer activities and teaching materials that have been developed.

### 1. Plan

The planning phase consists of the development stage of the lecture planning that includes needs

analysis, device development and, development of teaching materials.

### A. Needs Analysis

At this stage, students who have received English for Science courses were interviewed to find out their needs to develop their English proficiency. The interview resulted in a conclusion that students need English contextual material in the field of science so to can help them to master the vocabulary in science and practice other English skills.

### B. Product Development

Teaching team consisting of English and Science teachers prepared teaching sets of Semester Course Plans (RPS), instructional material and assessment.

### C. Development of instructional material

The instructional material was designed based on the need analysis in English for the science course. The instructional material was developed by integrating science and English content. After finishing the design, the instructional material was validated by material, language, and, media experts to find out its feasibility, it must meet criteria of  $\leq 62.50\%$  to be used in the learning process. The experts' validation result was presented in Table 1.

**Table 1.** Expert Validation Result

Expert	Before Revision (%)	After Revision (%)
Content	100	100
Language	92	100
Media	92	100

The validation results and suggestions for improvements from content, language, and, media experts are described below.

#### 1) Content expert

A content expert assesses the material accuracy of instructional material to avoid misconceptions in the material provided. The expert gave an excellent assessment of all aspects, so it did not require a revision, the percentage of assessment is 100% of all assessment indicators, or it can be said in very good criteria. Although all aspects of the assessment have succeeded in reaching 100% percentage, the material expert still provides improvement suggestions that improve the position of the text on page 10 which previously in the form of just to be changed into aligning text left to make it easier to read.

## 2) Language expert

The Language Expert assessed the effectiveness of the use of language structure in instructional materials; she gave 92% to all aspects. Some aspects got a score of 4 from the total score of 5, in the grammatical structure aspect or sentence structure so that there is little improvement in the language aspect in the teaching materials. The first suggestion is to improve the order of the sentences on the instruction of the workout exercises so that students can understand better. Another suggestion is to put the time in tenses diagram.

## 3) Media expert

The media expert gave 92% of assessment and suggested some revision of putting the right illustration in the passage.

## 4) Students' response to limited scale trial

In limited scale trial, students respond that the developed instructional materials were interesting and can be used independently. Book sizes were also handy to carry, but, the font size that adjusts the size of the book becomes a problem for them because it was too small. The revision made based on students' suggestion was enlarging the font size of the book.

In English for Science subject, lectures using the EMI method so during the learning process the students receive the material presented in English. Thus, it can be concluded that integrated teaching materials that combine the concept of science and English should be developed to support the learning process in English for science lectures. Appropriate instructional materials should be prepared to produce meaningful learning outcomes (Balim *et al.*, 2008) whereas the inadequacy of teaching materials can lead to student passivity in the learning process (Okobia, 2011).

The development of instructional material succeeded in achieving the feasibility score based on validation of content, language and, media experts. Instructional material was developed based on student needs analysis and in adjusting the characteristics of the course. Development of instructional material based on potential problems can also be proven to improve students' understanding and applicability (Nurjaya, 2012). It is by the results of this study that can encourage students to learn English independently in the area of science.

## 2. Do

At the Do stage, the teaching scenario planned in the Plan stage was applied, it was based on the design made by the teaching team to apply the instructional

materials products that have been designed and validated at the Plan stage. The lecturer model at this stage was Stephani Diah Pamelasari, M. Hum. Because of most of the material in English material in science topics. The teaching team consisting of Indah Urwatin Wusqo, M.Pd. And Risa Dwita Hardianti, M.Pd. Acted as the observers. In the learning process, the instructional material was used to help students training their English proficiency in science content. Students' learning outcomes average was and, the level of the percentage criteria of their learning outcomes is presented in Table 2.

**Table 2.** Students' Learning Outcomes

Criteria	Percentage
Very good	47%
Good	44%
Moderate	9%

Development of teaching materials can also improve students' learning outcomes average in good criteria, in line with research Ekawarna (2007) which states the appropriate instructional material proven to improve the students' motivation and to result the excellent learning outcomes with average A. Students also show good motivation by showing their agreement in the workbook statement can be used as self-study supplement and help understand the science content in English.

## 3. See

See is a stage of reflection of the Do process, at this stage observers and lecturer model reviewed the learning activity to discuss the planned strategy that has been done and improvements to the developed instructional materials. In the first meeting, observers found that the students did not give a lot of interaction to the learning process, they studied their instructional material and did not ask if they have problems related to the material. In the second meeting, the learning process gave students the opportunity to work with the group and performing some presentation, their activeness increased but due to the time limitation not, all students can present their paper. In the third meeting, students showed their active participation in the learning process. They said the instructional material helped them to study science content in English. The instructional material was also sufficient to help students in

training their English proficiency in the classroom or used independently.

This instructional material was developed through the LS process chosen because it has collaborative steps by designing the learning process, implementing it and reflecting on the learning. The collaborative process involves planning the lesson, doing the learning process, doing the reflection, giving criticism, improving and repeating the process in the next lesson (Myers, 2012). LS can be used as an appropriate tool to see the quality of a lecture guided by a team of teachers who have different scientific fields and teach in an integrated way.

Through the LS the teaching team can reflect on learning activities together to see the advantages and disadvantages of each. LS can also be used as a tool to improve the learning process because according to Lewis in Shúilleabháin (2013) states that LS has four steps in the process of conducting curriculum studies and determining objectives, designing learning, implementing learning, and reflecting on learning and re-planning process that has been done before.

Development of instructional materials through LS has been proven to help students to achieve the score in a good category because the instructional material is designed based on the needs of students. Development of instructional materials through LS is proven to produce appropriate teaching materials for use in learning and used to improve the learning process (Indrowati *et al.*, 2011; Izati *et al.*, 2013).

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