

## **The Effectiveness of Directed Activities Related to Texts (DARTs) to Improve Reading Comprehension for Science Students**

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**Abstract:** Teaching English especially in a country where English is used as foreign language is quite challenging. Teachers have to deal with LEP (Limited English Proficiency) students or students that have limited ability in English. Meanwhile, the students of science of Semarang State University, Indonesia are required to comprehend science text in English because they are expected to be able to use science literature in English as the reference for their final research. Based on that background, the authors tried to find out whether DARTs strategy is effective to help students to improve their reading comprehension skill. This research was experimental research where DARTs was compared to direct instruction (DI) strategy to find out the most effective method to improve students' reading comprehension skill. The instrument used to collect the data was reading comprehension test and questionnaire to find out students' response of DARTs. The test result showed that for DI group pre test mean was 67,2 and post test was 70,2 while for DARTs group pre test mean was 69 and post test was 78,6. It turned out that DARTs proved to be more effective to improve students' reading comprehension skill than DI. The students also gave positive response for DARTs, they said that DARTs worksheet was more interesting compared to regular reading passage worksheet and they also could do different activity to improve their reading comprehension like sequencing text, completing text and table, labeling, filling the gaps, and so on.

**Key words:** DARTs, reading comprehension, science students

### **Introduction**

#### **Background**

English is classified as foreign language in Indonesia because it is not used regularly to communicate in the society. People only use English for certain occasion so their ability of using English actively is limited, therefore they can be classified as Limited English Proficiency (LEP) people. Although English is taught at school but most of Indonesian students are still classified as LEP students because of their limitation of English skill.

Most of science education students of Semarang State University are LEP students. They might have good skill in science field but they have limited ability of English because they do not use English regularly for everyday communication. However they should master English language because they are expected to find and comprehend any references of science subject not only from Indonesia but also from another source or country. The literature from other sources is mostly written in English therefore they need to improve their ability to master English language in order they can get a lot of new knowledge from those sources.

To prepare students improve their English ability, Study Program prepares 4 credits of English subject for students in the first and second semester. The purpose of this subject is to prepare them to improve their English ability so they can use it to find and comprehend some references like book or journal in the international level that is usually written in English.

English subject provides general and specific English material, general English material consists of basic English grammar and general reading skill then specific one covers specific reading comprehension, writing and speaking. General English material is provided first to give them the overview of English skill, basic English grammar is provided as the initial skill of writing, then general reading skill is to introduce them to simple English passage before they go to the specific one. Specific material consisting of specific reading comprehension, writing and speaking is focusing on science area, students are given science materials in English. In the end of this subject, students are expected to comprehend science literature in English, so lecturer should help them with their limited ability of English to master science context in English.

Learning science in English surely raises certain difficulties especially for LEP students, they usually get difficulties to understand the content of the materials. Henderson and Wellington (1998) said that the biggest difficulty in learning science is from language barrier aspect. Language barrier means there are a lot of specific terms in the science materials, while the students only have limited ability of English that they often use English in the general or daily aspect not in the specific content like science. Jarett (1999) also conveyed that academic language or science is more abstract compared to social language and sometimes it has different meaning from daily language. So the difficulties of learning science in English surely will rise if students only master limited vocabulary or another language aspect.

To help students mastering science content in English, Directed Activities Related to Texts (DARTs) activity is applied. DARTs are alternative activities that require students to interact with text. The purpose is to improve students' reading comprehension activities in comprehending science in English text. Technique usually used Direct Instruction (DI) to help students learning reading comprehension by giving the worksheet and providing it with questions to find the main idea of the passage. But sometimes the regular worksheets bore them because they get some difficulties to do the worksheet because of their limited ability in English. So the lecturer tries to apply DARTs strategy to motivate students to improve their learning outcomes, because by using DARTs strategy the worksheet can be modified to be more interesting and lower the language barrier.

DARTs activities can be divided into two, reconstruction and analysis activities. The students are guided to do some activities like completing text, diagram, table, or disordered text; predicting; underlining; labeling; segmenting; etc.

### **Research Question and Hypothesis**

According to the previous report the purpose of this research is to find out the effectiveness of DARTs strategy to improve students' reading comprehension achievement better than Direct Instruction (DI) strategy. Therefore the research question of this research is "is DARTs strategy able to improve students' reading comprehension achievement better than Direct Instruction (DI) strategy?" and the hypothesis tested in this research is  $H_a$  : DARTs strategy is able improve students' reading comprehension achievement better than Direct Instruction (DI) strategy.

### **Benefits**

The benefits are:

1. For student

The student can get different variation of activity of reading comprehension that can bring some benefits for their reading skill.

2. For lecturer

Lecturer can use DARTs as alternative strategy in the teaching learning activity to improve students' reading comprehension.

## **Review of Literature**

### **Teaching English for LEP Students**

Teaching English for LEP students is not quite easy. Their limited ability of English skill will make them difficult in comprehending science text in English, because sometimes science language has different meaning with daily social language. In science text it is full of science terminology to explain a concept that usually cannot be understood by the beginner (Wood, 2005). So, if they do not comprehend basic English it will raise some difficulties to comprehend science language or text in English or it is called language barrier for students.

Kim (2007) suggested that one of ways to help students comprehending science context is by lowering the language barrier in the learning activity. While, Anstrom, Lynch and Dicerbo (1998) said that by giving bigger chance for students to get involved in the science filed or context they will be easier to absorb the science context itself. Therefore, teacher or lecturer as the mediator is expected to create a strategy to make interesting learning activity that can make students easier to understand the materials. They should be facilitated with any materials dealing with science context.

To create appropriate learning materials Shaw (2002) suggested teacher to help students to analyze their language needs, teacher also should apply more specific strategy to help students comprehending certain passage like reading simple graph. Herr (2008) shared that one of strategies to learn science is by focusing in the visual interaction like reading vector diagram, table, and chart. So, one of strategies that can be offered to facilitate students is Directed Activities related to Text (DARTs), DARTs helps students to comprehending text and involve them to understand the text. It is also a valuable method to provide students a purposeful interaction with the material because according to Crawford (1995), students will learn new terminology if they do interactions with the material.

### **Directed Activities related to Text (DARTs)**

Directed Activities related to Texts (DARTs) is a strategy developed by Gardner and Lunzer (1980). DARTs encourage students to read text in more detail and develop the text more than just getting the text understanding, because in this activity they will not only read the regular text in the paragraph but in the visual text like image, diagram and graph. DARTs also can help students to remember the information, develop the idea and increase the learning motivation because they get involved actively in the learning activity. This technique is also aimed to encourage students to read actively and independently, and it can be used for any levels of student with any types of text.

DARTs can be divided into two types:

1. Reconstruction DARTs

This activity uses modified text and it requires students to reconstruct a text or diagram by filling in missing words phrases or sentences, or be sequencing text that has been disorderly constructed.

2. Analysis DARTs

It uses original text or unmodified text, and activities that require students to reconstruct a text or diagram by filling in missing words, phrases or sentences, or by sequencing text that has been disorderly constructed. The activities require students to find and categorize information by marking or labeling a text or diagram.

The activity including in DARTs according to Davies and Green (1984) can be seen in Table 1.

**Table 1. DARTs**

<b>Reconstruction Activities (use modified text)</b>	<b>Analysis Activities (use straight text)</b>
<b><i>Text completion</i></b> Predicting deleted words (cloze), sentences, or phrases.	<b><i>Underlining</i></b> Searching for specific target words or phrase that relate to one aspect e.g. key words.
<b><i>Diagram completion</i></b> Predicting deleted labels on diagrams using text and other diagrams as sources.	<b><i>Labeling</i></b> Labeling segments of text which deal with different aspects, e.g. labeling scientific account.
<b><i>Table completion</i></b> Completing deleted parts of a table using table categories and text as sources of reference.	<b><i>Segmenting</i></b> Segmenting of paragraph or text into information units.
<b><i>Completions activities with disordered text</i></b> Predicting a logical order for a sequence and classifying segments according to categories given by the teacher.	<b><i>Diagrammatic representation</i></b> Constructing diagram from text e.g. using diagrams, concept maps, mind maps, and labeled model.
<b><i>Prediction</i></b> Predicting next part of text with segments presented in sequence.	<b><i>Tabular presentation</i></b> Constructing and representing information in tabular form, extracting from a written text.

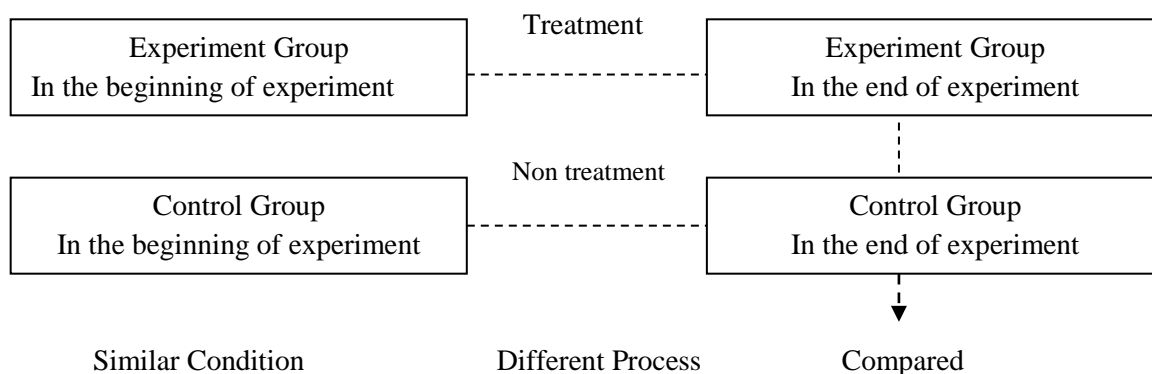
## Research Method

### Research Subject

The subject of this research was the first semester students of Science Education Program of Mathematics and Natural Science Faculty, Semarang State University.

### Research Design

This research used quasi experimental design, and used two equivalent groups as control group and experiment group. The design of the experiment can be seen in Chart 1.



## Chart 1. Research Design

### Data Collection Technique

Data were gathered using:

1. Test

Test was used to obtain students' reading comprehension score. The test material consisted of 30 multiple choice items of questions of reading comprehension. Multiple choice test type was chosen because it can measure the reading comprehension ability of finding main idea of the passage and also the vocabulary mastery.

2. Observation sheet

To observe the activity in the class during experiment, observation sheet was used to collect the data.

3. Questionnaire

Questionnaire was used to find out students' response of DARTs strategy.

### Data Analysis

Data were analyzed using *t*-test to find out the differences of students' reading comprehension outcomes between control and experiment groups.

## Results

### Hypothesis Testing

Independent samples *t*-test was used to evaluate DARTs can improve students' reading comprehension achievement better than Direct Instruction (DI) strategy.

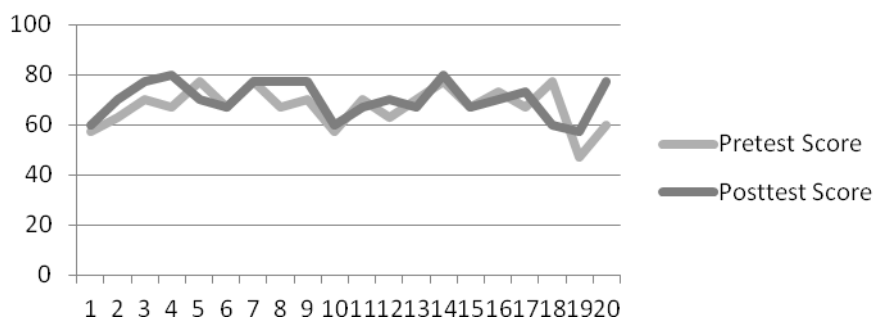
**Table 2. Hypothesis Testing**

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	post_test_control - post_test_eksperimen	-8.05000	12.50884	2.79706	-13.90432	-2.19568	-2.878	19	.010

Based on the result, it can be seen in Table 2 that  $p = .010$  with significance level  $p < .05$ , therefore  $H_a$  is accepted. It proves that DARTs strategy can improve students' reading comprehension better than DI strategy.

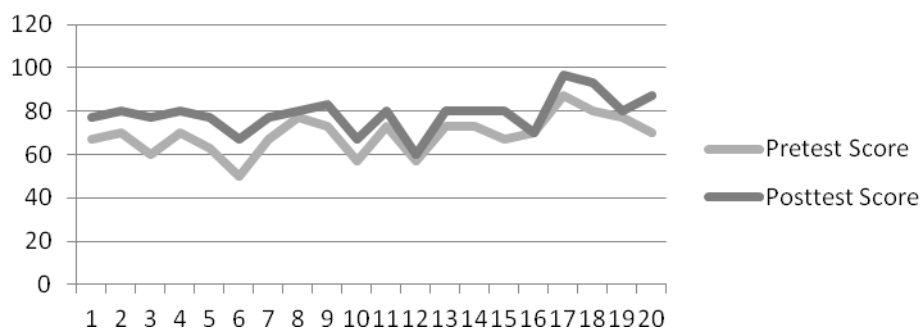
### Score Comparison of Both Groups

The score of both groups improved significantly but the experiment group improved higher than control group.



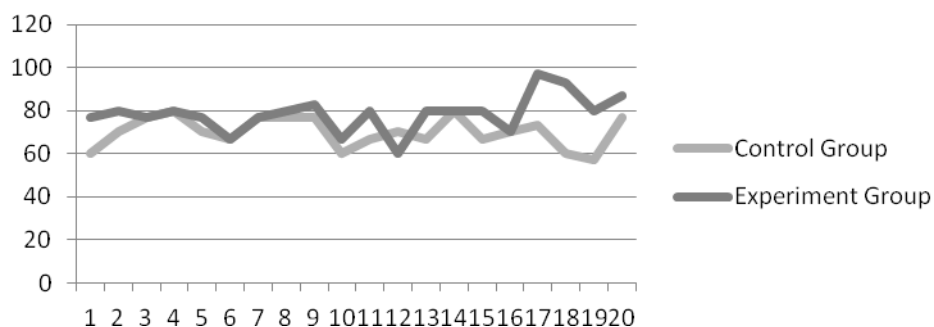
**Chart 2. Pretest and Posttest Score Mean of Control Group**

Based on the Chart 2, it can be seen that most of reading comprehension posttest score of control group was able to improve, most of the students were able to develop their score although some of them were not, 25% of them had lower posttest score. Pretest mean of control group was 67,2 while posttest was 70,2.



**Chart 3. Pretest and Posttest Score Mean of Experiment Group**

In the experiment group, 99% students were able to improve their reading comprehension score. They were able to improve their score significantly, the mean of pretest and posttest is 69 and 78,6.



**Chart 4. Posttest Mean of Control Group and Experiment Group**

Based on the table above, it can be seen that experiment group had higher posttest mean. It proved that DARTs was more effective to improve students' reading comprehension score.

**Discussion**

According to the analysis result, DARTs was proved to be more effective to improve reading comprehension score compared to DI. The result conformed the previous assumption that better achievement would occur in the group that used DARTs. The score showed that the improvement of experiment group higher than control group. This finding was consistent to Devi (2008) that DARTs or the modified worksheets were proven to improve students' reading comprehension of science text in English.

From the observation result the students in the experiment group were active to do the worksheet, they did it based on the instruction. They looked excited finishing their task of DARTs worksheet because they found new activities like sequencing, labeling, predicting, making chart, drawing picture, etc. They were also able to improve their posttest score, 99% of them improved the score significantly. The activity like making conclusion by drawing picture based on the passage can help students to comprehend the text with more concrete if compared to unmodified text. This finding was consistent to Herr (2008) that one of science learning strategy by focusing visual interaction by reading vector diagram or table.

Students also shared their positive respond about DARTs worksheet, they were interested because they did different activity for example sequencing text and making conclusion by drawing table or picture. They also said that the modified worksheet can help them to comprehend the science text in English and help them to master science term vocabulary. Students suggest this model continue to be developed and applied with other materials. In general students like learning using this model and feel that this model can help improve their comprehension science text in English.

In control group, only 60% students were able to improve their posttest score, 15% had the same score and 25% even had lower score. According to the observation sheet, students looked bored after they found the text was quite difficult for them. The activity was not interesting because they needed to read long passage with their limited skill in English and they should find the main idea after reading it. From the questionnaire response, control group that received regular reading comprehension text for their learning activity responded that they still had difficulties to comprehend science text in English.

## **Conclusion**

This paper discusses an alternative way to improve students' reading comprehension, DARTs were viewed to be able to help students to comprehend science text in English. It turned out that DARTs strategy that modified the worksheet was able to improve students' reading comprehension. From the hypothesis test ( $H_a$ ) that said DARTs is able to improve students' reading comprehension achievement better than Direct Instruction (DI) strategy, the hypothesis was accepted it means students' reading comprehension score in experiment group improved higher than in the control group.

Although control group students were able to improve their score but their improvement was not higher than experiment group. 99% experiment group students' posttest score improved significantly, while in the control group only 60% students posttest score improved better than their pretest. It turned out that worksheet modification was able to help students to improve their reading comprehension ability. DARTs worksheet was presented in vary ways that can make students feel more interested in learning reading science text in English.

Students gave positive response about DARTs, they felt that it can help them to learn science text in English, the interesting activity made them keep doing the activity excitedly. They also considered that DARTs can help them to master science vocabulary. For further development, DARTs strategy might be applied in the worksheet material.

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