

**ENHANCING STUDENTS' READING COMPETENCE
THROUGH WEB-BASED COLLABORATIVE
INQUIRY LEARNING: A STUDY ON
MECHANICAL ENGINEERING STUDENTS
AT THE STATE UNIVERSITY OF SEMARANG**



**A THESIS
In Partial Fulfilment of the Requirements
for Master Degree in Linguistics**

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**FACULTY OF HUMANITIES
DIPONEGORO UNIVERSITY
SEMARANG
2016**

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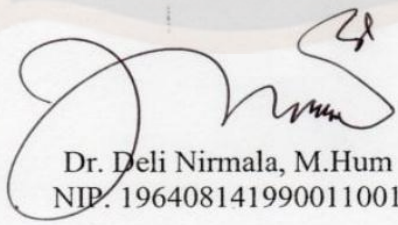
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MOTTO

“If you can’t stand the fatigue of study, you will feel the poignant of stupidity”
(Imam Syafi’ie).

“If you can't explain it simply, you don't understand it well enough”
(Albert Einstein).



DEDICATION

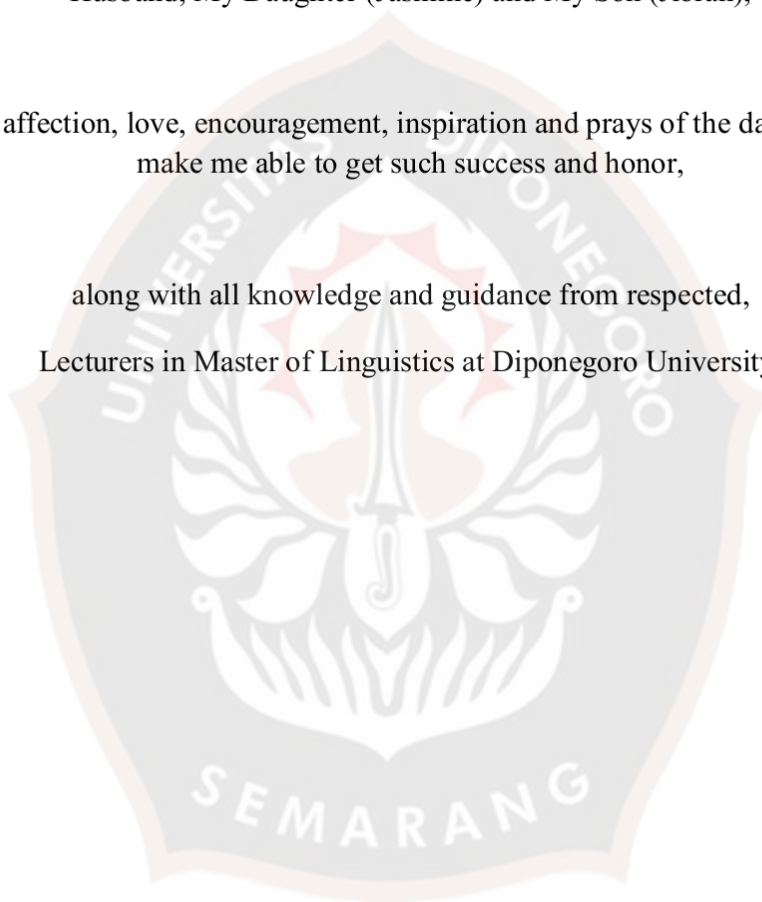
Every thought-provoking work needs self-efforts and supports from those who are very close to my heart. My humble effort I dedicate to my sweet and loving,

Husband, My Daughter (Jasmine) and My Son (Jibran),

whose affection, love, encouragement, inspiration and prays of the day and night make me able to get such success and honor,

along with all knowledge and guidance from respected,

Lecturers in Master of Linguistics at Diponegoro University.



STATEMENT OF ORIGINALITY

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, this study contains no material previously published or written by another person or material which to a substantial extent has been accepted for the award of any other degree or diploma of a university or other institute in higher learning, except where due acknowledgement is made in the text of the thesis.

Semarang, June 8, 2016

Nafisa Ghanima Shanty



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In the name of Allah, Most Gracious, Most Merciful, who gave ease along with hardship, finally I could complete my thesis, entitled “Enhancing Students’ Reading Competence Through Web-Based Collaborative Inquiry Learning for Mechanical Engineering Students at The State University of Semarang”.

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Semarang, June 8, 2016

The Writer

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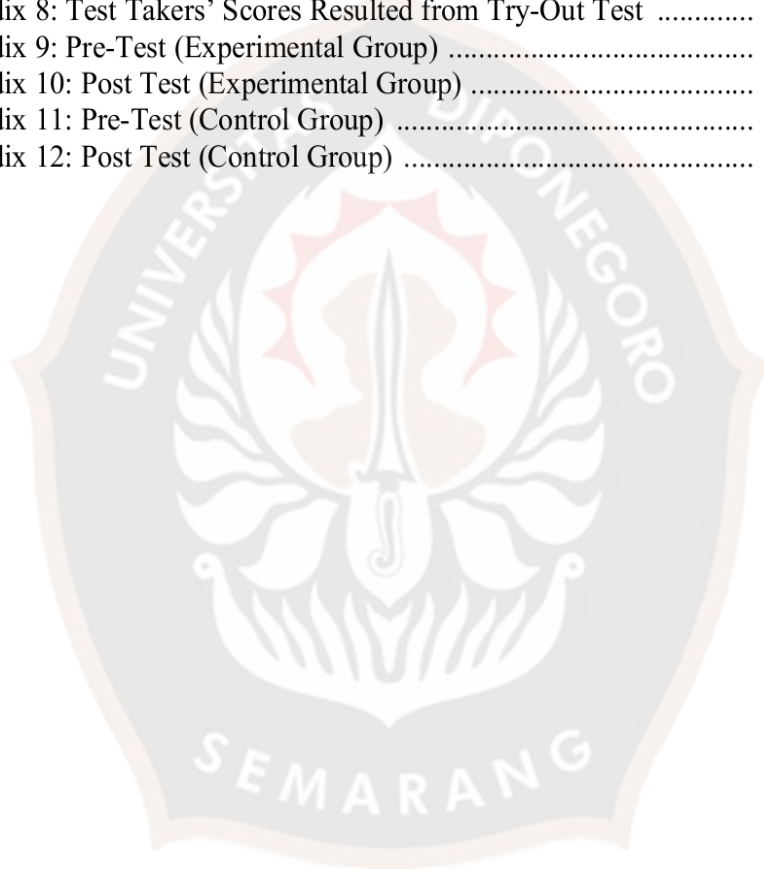
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ABSTRACT

This study is to investigate: (1) the extent of reading competence when students were taught with and (2) without Web-Based Collaborative Inquiry Learning (WBCIL), also (3) whether there is a significant difference between the students taught with and without WBCIL. At the first stage, a reading test try out was administered two times to measure how proper the test to be good instrumentation. The value of good test was measured through item difficulty, item discrimination, the validity and reliability of the first and second try-out test. After the test was determined to be proper instrumentation, the samples of the study were selected. They were 91 students of Mechanical Engineering Department majoring Education of Automotive Engineering. The third stage was deciding experimental and control class to have pre-test. Yet both of the class did not receive the same model of English teaching. The experimental class experienced WBCIL while the control class received common teaching model. Both of them were taught for 8 effective meetings. Post Test was conducted at the last meeting (the 8th meeting) after review session. There were two indicators to measure the effectiveness of WBCIL model applied in this study. The indicators were the result of Independent Samples T-Test and Two-Way-Analysis of Variance. The result of Independent Samples T-Test indicated higher t_{value} compared to t_{table} which showed a significant difference between two groups. The t_{value} was 4.077 and the t_{table} was 1.662. Two-Way-ANOVA also yielded valid output interpretations such as Test of between Subjects-Effects, Multiple Comparisons, and Profile Plots of Estimated Marginal Mean Score between groups and test achievers. Both control and experimental groups achieved improvement at Post Test, but only experimental groups achieved better improvement with 8.37 points higher. By applying WBCIL model, slow and medium achievers got better Post Test scores in experimental group, but it was less than optimal for the high achievers. The high achievers in experimental group achieved lower score compare to control group. Obviously, collaborative group work used in WBCIL model brought benefit to slow and medium achievers, but weakened the achievement of high achievers.

Key Words : web-based collaborative inquiry learning, mechanical engineering

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Reading competence supports mechanical engineering students' professional skills that deal with technicality and communication. The ability to read English materials will help mechanical engineering students understand how to operate, repair and maintain machines. Hopefully, they will be able to explain and describe drawings, dimensions or precision of a particular machine, tools or devices to the users, clients or employers at work place. Having good reading competence, engineers might be able to accomplish their tasks professionally. It is because most manuals, handbooks or descriptions of machine are written in English.

Apparently, good reading competence seems to be a serious issue for Mechanical Engineering students at the State University of Semarang (UNNES). Firstly, the students' mid semester score for Material Engineering subject (Appendix 1), was lower than their daily performance. The mid semester test material of Material Engineering subject was taken from students' English handbook which they had received at the beginning of the lecture. Secondly, there was an English lecture in Mechanical Engineering Department, however the terminal objective (represented through '*Standar Kompetensi*') was not aimed to

communicatively support the students' professional skill dealing with engineering (Appendix 2).

English for Specific Purposes (ESP) framework should have been applied in the English curriculum or syllabus. ESP is simply described as the definite teaching of English for particular purpose. It can also be defined as the teaching of English used in academic studies or the teaching of English for professional purposes. Observing the main materials for English learning found in the syllabus, from the total 16 effective meetings of 100 minutes, there were only 3 meetings (18,75%) that fulfilled professional purposes for mechanical engineering students (under the theme of “Vocabulary in Mechanical Field and Its Pronunciation”, “Let's Write in English about The Plan of Future Machine” and “Reading Mechanical Text”). Meanwhile, the rest of the meetings focused on general English and gave more attention to basic grammar and English drama.

Seemingly, the syllabus represented less suitable English teaching practice in Mechanical Engineering Department. In fact, some of mechanical engineering subjects, such as Material Engineering, Corrosion, Composite, Material Characterization, Mechanical Vibration, Maintenance and Repair Engineering, Machine Elements, and Finite Elements Method, used English handbooks. Some lecturers used the handbook as the main source where students got the ultimate knowledge dealing with those subjects. The final tests given at the end of the lecture were also taken from the handbooks, so if the students were not able to understand the handbook, they would certainly get unsatisfying final scores or even lead to failure.

The portion of reading text found in mechanical engineering handbooks was abundant. Therefore, the syllabus of English teaching in Mechanical Engineering Department, should also give more ration to the teaching of reading. Harmer (2004:68) points out the important job for teachers in the teaching of reading,

Reading texts also provide opportunities to study language: vocabulary, grammar, punctuation, and the way we construct sentences, paragraphs and texts. Lastly, good reading texts can introduce interesting topics, stimulate discussion, excite imaginative responses and be the springboard for well-rounded, fascinating lessons.

Obviously, it is not only because reading texts were the most frequent material faced by mechanical engineering students, but also it is because of the comprehensive opportunities of language study that could be obtained through reading.

Since reading was the initial skill that mechanical engineering students need to master, it is necessary to draft syllabus that uses reading material as the main material in English teaching before it is expanded to four English skills (Reading, Listening, Speaking, and Writing). The English teaching may start by discussing a particular text for example: “5 Speed Bench Drill Press with Work Light’s Manual and Safety Instructions” then reading comprehension skill is introduced to the students (as the activation of reading skill). The activity may also be continued by doing listening practice for instance, the students listen to the manual directly through video or recording (as the activation of listening skill). To activate writing skill, the students can write simple outline of the manual. Then they may present the manual (as the activation of speaking skill) at the end of their learning.

English language teaching in the classroom should have shown how the teacher helps the learner acquire English by involving some factors such as the teaching strategies, the materials, and the learning activities provided in the classroom (Chapelle, 2008:1-2). Teachers should not only persuade students of the advantages of skimming and scanning, but also should make them see that the way they read is crucially vital (Harmer, 2004: 69).

Adults or university students need meaningful and purposeful learning activities which make them engage in an active learning to then support their learning success (Sockalingam, 2012). Brown (2000: 83-84) states that to support meaningful learning, English language pedagogy needs to create “a process of relating and anchoring new material to relevant established entities in cognitive structure”. Consequently, when the meaningful and purposeful learning activities are working in the classroom, the learners will automatically experience a range of thought processes, or in other words, they need to ‘think’. One of teaching strategies that makes the learners think is an inquiry-based learning.

“Inquiry-based learning is a type of learning achieved through the process of searching for information, knowledge and truth by questioning” (Borich et.al, 2006: 29) that stimulates students’ involvement in problem solving (Arauz, 2013: 482) moreover when it is conducted collaboratively (Johnson & Holubec, 1984 in Borich et.al, 2006:50). Collaborative inquiry learning involves both students’ creativity to investigate problem individually and their ability to work and share ideas or accept friends’ arguments in groups.

World Wide Web is also one of the popular media that supports inquiry-based learning. It is an integration of computer technologies which may provide a critical tool for achieving the inquiry-based learning goals because of its huge amounts of information and resources. “One reason why Web inquiry is beneficial is the opportunity for questions to be tied both to standards of learning and real-life events, problems, resources, and data” (Coffman, 2009: 59). Web inquiry activity could provide students with meaningful opportunities to use raw data—which have not been filtered—so they can both manipulate and interpret data to create meaning and discover possible solutions.

This study concerns the urgency of reading skill as a suitable skill needed by mechanical engineering students. Reading skill supports mechanical engineering students’ professional skill especially after they have graduated from the university and face the employment. This study also proposes a teaching model called Web-Based Collaborative Inquiry Learning (WBCIL) to enhance students’ reading skill under ESP framework. Reading materials that were discussed in this study were also specific because mechanical engineering field uses specific English which defines a lot of machines’ parts, operation and mechanical terms. The advantages or challenges in applying WBCIL become the main discussion at the end of the study.

1.2 Statement of the Problems

Initially, Web-Based Collaborative Inquiry Learning (WBCIL) is applied to improve mechanical engineering students’ reading skill. Gradually, the reading

skill must yield reading competence. Therefore the relation and influence of WBCIL to students' reading competence must be seen from the following points:

1. To what extent is the students' reading competence when they are taught with Web-Based Collaborative Inquiry Learning (WBCIL)?
2. To what extent is the students' reading competence when they are taught without Web-Based Collaborative Inquiry Learning (WBCIL)?
3. Is there any significant difference between the students taught with Web-Based Collaborative Inquiry Learning (WBCIL) and those taught without Web-Based Collaborative Inquiry Learning (WBCIL)?

1.3 Purposes of the Study

Due to the points of problem that are mentioned earlier, this study is aimed to:

1. find out students' reading competence when they are taught with Web-based collaborative inquiry learning,
2. find out students' reading competence when they are taught without Web-based collaborative inquiry learning,
3. determine whether there is a significant difference between the students taught with web-based collaborative inquiry learning and those taught without web-based collaborative inquiry learning.

1.4 Significance of the Study

The key to success of applying WBCIL model in the teaching of reading is the comprehensive preparation prior to the teaching. Previously, some crucial factors need to be prepared such as reading material, the way instructions are delivered, the way three elements called ESA (Engage, Study and Activate) as proposed by Harmer (2004: 27) and how the class is managed. Those factors must be integrated well.

Besides, Web-Based Collaborative Inquiry Learning (WBCIL) facilitates learners' autonomy and involvement. Besides, World Wide Web apparently becomes a suitable tool that makes inquiry-based learning relevant. At the end of WBCIL application, this study will give some benefits as the following:

1. students will be better motivated since they are given the power to control their own learning pace,
2. learning could become more interesting because students are involved in the social process during group investigation,
3. a successful and effective language teaching could be achieved because of some nurturing effects such as interpersonal warmth, trust, respect for negotiated rules and policies, independence learning and dignity of others.
4. this model of learning could stimulate students' critical and creative thinking.
5. teachers could evaluate or correct their initial formulation of inquiry, if missing inquiry phases or cycles are found.

1.5 Scope of the Study

Reading competence is the main concern that is figured out in this study. Students' reading competence is measured from the students' reading test score prior and after the study is conducted. Some extensive reading activities such as creating mind map, making summary, re-constructing text, individual and group presentation from the given reading text, could be possibly considered as reading competence. However, those activities are not graded and are not decided as the measurement of students' reading competence in this study.

Since the only measurement is students' reading test scores, some external factors may influence the genuine reading competence. Some factors like students' stamina, focus, classroom situation, personal problem, time management problem during the reading test, may influence students' concentration then directly affect the scores. In this case, there are at least four possibilities where the scores become something relative to be measured in certain situation and particular period of time in this study, other studies, or future studies.

First, some excellent students may obtain less optimal scores compared to well-prepared students who are not too excellent previously. Second, some poor students may obtain better scores because they have better condition or even preparation prior to the test. Third, some excellent students may still be well-prepared so they could still obtain excellent scores or even perfect scores. Fourth, some poor students could be still in their skepticism, so they still got low scores or even the worst.

This study limits on investigating how Web-Based Collaborative Inquiry Learning supports teaching reading for mechanical engineering students at The State University of Semarang (UNNES). Since the samples were selected purposively, it may not be generalized for any other mechanical engineering students at any other universities. Other mechanical engineering students could probably have different competence, characteristics or problems to be investigated.

1.6 The Organization of Writing

This study covers five chapters which consist of Introduction, Review of Related Literatures, Research Methods, Findings and Discussion and Conclusions and Suggestions. The first chapter, Introduction, focuses on Background of the Study, Statements of Problem, Purpose of the Study, Significance of the Study, Scope of the Study and Writing Outline.

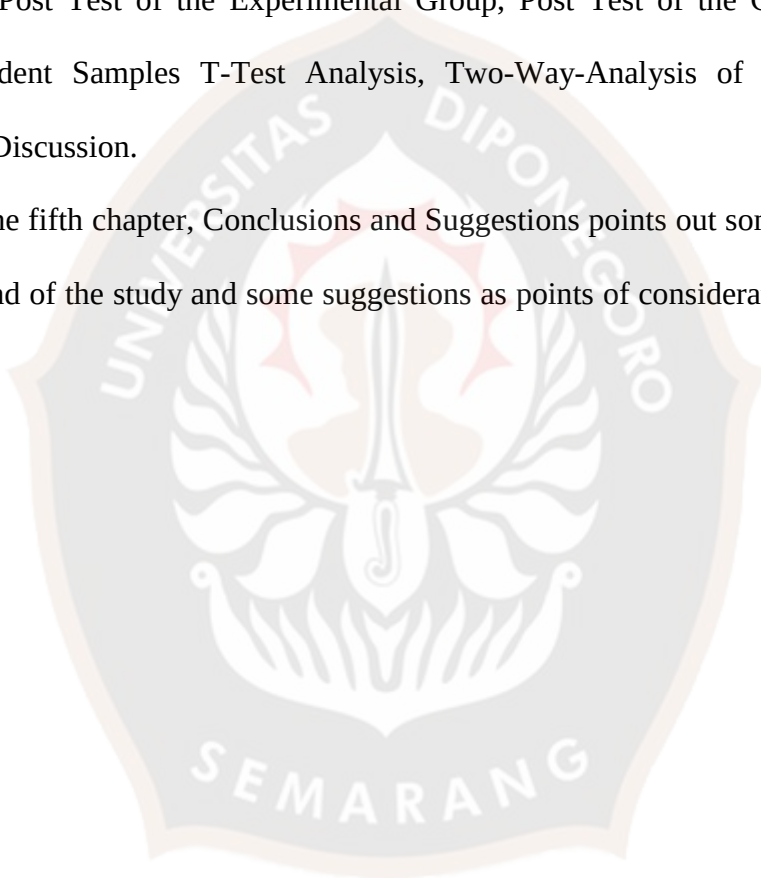
The second chapter, Review of Related Literature, discusses Terms and Definition, Web-Based Inquiry Learning, Inquiry-Based Learning Model, Structured Approach to Web-Based Collaborative Inquiry Learning, Collaborative Inquiry Learning, Levels of Inquiry, Web Access Citation by the Students on Notepads, and the Teaching of Reading.

The third chapter, Research Methods, describes Research Design, Population and Sample, Instrumentation that covers Test and Observation, Test Analysis which contains: Item Difficulty, Item Discrimination, Validity and Reliability of the Test, then Procedures of Collecting Data, Data Analysis that

includes the description of Independent Sample T-Test and Two-Way-Analysis of Variance.

The fourth chapter, Findings and Discussion, discusses the result of the Validity and Reliability of the Test, Pre-Test of the Experimental Group, Pre-Test of the Control Group, Teaching and Learning in the Experimental and Control Group, Post Test of the Experimental Group, Post Test of the Control Group, Independent Samples T-Test Analysis, Two-Way-Analysis of Variance, and further Discussion.

The fifth chapter, Conclusions and Suggestions points out some conclusions at the end of the study and some suggestions as points of consideration for further study.



CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Previous Studies

The applications of inquiry-based learning have been investigated by some researchers such as Harasim, et.al (1995), Chang et.al (2003), Rustaman (2005), Kaniawati (2006), Woo & Reeves (2007), Symaiou (2012), Rooney (2012) as well as Raes & Tammy (2012). Those researchers have yielded several outputs dealing with inquiry-based learning model.

Harasim, et.al (1995) initiated to create text-based archives or transcripts of interactions during online learning (Harasim, Hiltz, Teles, & Turoff, 1995 in Woo & Reeves, 2007:22). Chang et al. (2003) proposed concept mapping in his web-based inquiry model to teach extensive reading for his information science department of Taiwanese students through web-based collaborative inquiry learning (Chang et al., 2003: 66). Smyrnaïou (2012) designed inquiry-based mobile learning model using PDA (Personal Digital Assistants) to teach social science to Greek children and found it more effective despite technology barrier that became the main problem for the teachers (Smyrnaïou, 2012: 236). Rooney (2012) also found that her EFL students achieved “sufficient in-depth understanding of statistical concepts” in mathematics (Rooney, 2012:108). Raes & Tammy (2012) suggested that web-based collaborative inquiry in science classrooms did not always support good quality motivation for their students’

science learning (Raes & Tammy, 2012: 1332). Obviously, those researchers have reported the benefit of inquiry-based learning model to succeed learning.

Inquiry-based learning model proves to be the appropriate model: (1) to proceed information at science class (Rustaman, 2005), (2) to build concept at physics class (Kaniawati, 2006), (3) to encourage higher order of thinking at mathematics (Rooney, 2012), and (4) to arise students' autonomous motivation in learning science (Raes & Tammy, 2012). The involvement of computer and internet, that supports the application of Inquiry-Based Learning model and as another source of information besides library, has also indicated as an appropriate companion of inquiry-based learning model. Computer Support Collaborative Learning (CSCL) program well assists the modelling of game activities for complex scientific phenomena (Smymaiou, 2012). Word wide web also verifies to be a good assistant for students to build concept map in extensive reading comprehension (Chang et.al ,2003). Web-based learning, thus, gives important contribution to meaningful learning as direct influence of learners' intellectual growth. Meaningful interaction itself is found to be strongly related to learning theories behind Web-Based Learning (Woo & Reeves, 2007).

Meanwhile, Arauz (2013) and Lee (2014) contributed positive findings in terms of inquiry-based learning model in language learning. For her EFL students, Arauz (2013) found that linguistic skills are stimulated to understand topic's perspectives and different cultural aspects. Those skills are also developed to cope with social skills after inquiry-based learning model is integrated to the learning curriculum (Arauz, 2013: 479).

Lee (2014) strengthened the consensus among language educators that inquiry-based learning emphasized the enhancement of students' communication skills and the importance of interaction in the classroom in a second or foreign language (L2) teaching. Interactive information exchanges, through question and answer strategy during inquiry learning, stimulated students to actively engage in cognitive and discovery learning activities instead of learning passively (Lee, 2014: 1236). Apparently both Arauz (2013) and Lee (2014) activated more communicative skill through speaking by applying inquiry-based learning model in language pedagogy.

The studies have investigated the application of Inquiry-Based Learning model in some areas of learning and some learners' language background. The model has well supported the learning of physics, science and mathematics with some particular learners of both EFL—Rustaman (2005), Kaniawati (2006) and Chang et.al (2003) and ESL learners—Smymaiou (2012), Rooney (2012) and Raes & Tammy (2012) also in language pedagogy as (Arauz, 2013) and Lee (2014) have investigated. However, there is little information available on applying Web-Based Collaborative Inquiry Learning model under ESP framework and in language pedagogy setting for mechanical engineering learning for EFL learners to activate reading skill.

The differences between this study and previous studies are on the object and framework of the study. Some studies have investigated some Asian and European students who attended social science, science, mathematics and information science. The students used English as their second language and

foreign language. However, this study concerns on Indonesian students who use English as their foreign language to learn mechanical engineering at university and involves internet to support inquiry activities. Kurniawati (2006) and Rustaman (2005) only discussed inquiry learning at elementary school up to senior high school who attended science and physics classes in Indonesia. Inquiry learning applied in the previous studies was to support science and physics lessons but this study uses inquiry learning to support English lesson to then support other mechanical engineering subjects that use English handbooks.

2.2 Terms and Definition

2.2.1 Web-Based Inquiry Learning

World Wide Web which is combined with information technologies has become an educational tool that provides learners and educators a wider range of new interesting learning experiences as well as teaching environments which are not possible in traditional class education (Khan, 1997 in Nam & Smith, 2007: 23).

Computer technologies help students explore questions and ideas in nonlinear ways by consulting diverse resources through different types of technologies. In inquiry-based learning, technology is used as a cognitive tool to help students represent, share and communicate ideas. Technology helps to make learning more authentic, and offer many opportunities for creative synthesis and presentation of research findings (Borich et.al, 2006 :40-41).

The term Web-based collaborative learning is used since this particular kind of learning uses “world wide web (www) as a source of knowledge exploration, and provides exploratory problems to guide students to think and explore” (Chang et al., 2003: 56).

Therefore, Web-Based Inquiry Learning is defined as a model of learning that investigates certain problem and uses world wide web or internet as the source of information to find evidences, knowledge and explanations dealing with the given problem.

2.2.2 Inquiry-Based Learning Model

Borich et.al outlines Inquiry-Based Learning as a type of learning reached through the process of looking up information, knowledge or evidences by questioning (Borich et.al, 2006: 29). This model of learning is included in the social family of learning models because it involves a social process where students are equipped as self-observers by interacting with and by observing the reaction of others (Joyce & Weil, 2000: 46). Since inquiry-based learning involves questioning in searching of information, knowledge or truth, therefore Bruner tries to simplify his view using the following model—that is drawn in Figure 1 below (Bruner, 1995 in Borich et.al, 2006:32). This type of learning involves four processes of; (1) asking, (2) investigating, (3) creating, (4) discussing, and (5) reflecting.

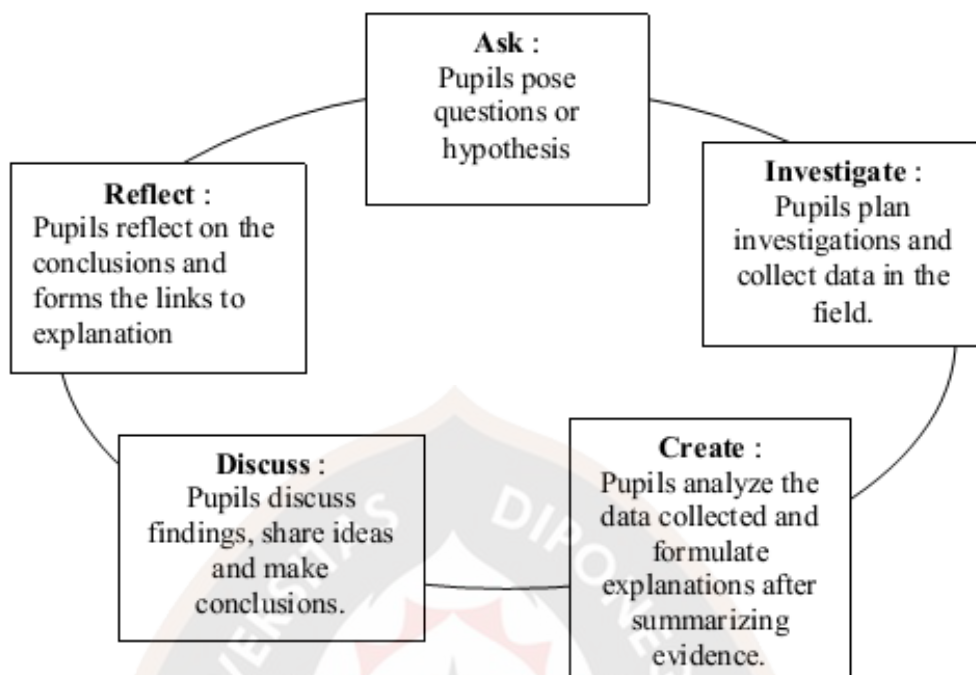


Diagram1:
Bruner's Inquiry-Based Learning Model
(Bruner, 1995 in Borich et.al, 2006:32)

Inquiry-based learning is frequently delivered in groups. It is possible to combine individual student assessment with an evaluation group performance and each group member's contribution to maintain actual collaborative interactions (Johnson, Johnson & Holubec, 1984 in Borich et.al, 2006:50). Borich further describes Bruner's inquiry-based cycle into some instructional strategies in detail as seen on Appendix 3. Apparently, Bruner's inquiry-based cycle involved basic to complex processes of thought which are not always suitable for any levels of inquiry (Table 1). One or some stages could be hard to be realized in some level of inquiry like 'confirmation inquiry', 'structured inquiry' and 'guided inquiry' (Banchi & Bell, 2008: 26-28) because of conditioned or given questions or procedures which are intentionally prepared by the teacher.

There are three key activities following a deep understanding of subject matter. These activities are identifying preconceptions, relating new factual information to a conceptual framework, and monitoring and assessing learning, all of which are parts of inquiry-based learning (A National Research Council study: *How People Learn: Brain, Mind, Experience and School* in Borich et.al, 2006:32). Inquiry-based learning happens when students use their own experiences and prior knowledge to develop ideas, using resources outside of the classroom that turn their ideas into questions that can be tested. The integration of computer technologies into the inquiry process can provide a critical tool for achieving these goals.

2.2.3 Structured Approach to Web-Based Collaborative Inquiry Learning

The structured approach to inquiry-based learning, where world wide web is used as a primary information resource, at least follows 8 steps of process. They are; (1) asking the essential question, (2) writing foundation questions, (3) developing a search strategy, (4) locating information, (5) filter, distill and cross-referencing, (6) evaluate the amount of information, (7) develop the answer to the essential question, and (8) develop a product to represent the answer (Jakes, 2006).

First, it is the phase of asking the essential question. It is how students use the Web by asking or framing an essential question. This question requires students to make a decision or plan a course of action such as “What is...” questions or questions which involve decision making, such as “Should we use

(this) to do (that)?" or "What are the impacts of (X)?"'. Those kinds of questions require students to engage in critical thinking and knowledge building. Then at the second step (writing foundation questions), students formulate foundation question by generating the essential questions through mind map.

Second, it is the phase of developing a search strategy. This includes keywords identification, and the development of a search syntax, and search tools. Students need to develop a correct search syntax by locating keywords in Web search tools (e.g. Google, Clusty, Yahoo, Soople, Vivisimo, A9, Teoma, Mamma, Singingfish, Kartoo, Grokker, Technorati) to find the necessary information resources.

Then students will go to the next overwhelming task, the fourth step. At this step, the students locate information from over one billion pages or as high as 550 billion pages.

Fifth, it is the phase of filtering, distilling and cross-referencing. The students determine which of the information at the Web site is related to their essential question and useful for answering their foundation questions. Sixth, students need to cross-reference information between Web sites and each foundation question. They must answer all foundation questions based on their sites collection and compare them in the cross-referencing process before evaluating the amount of information at the sixth step.

The seventh step is to develop the answer to the essential question from the abundant of information that the students get previously. Finally, the eighth step is developing a product to represent the answer. At this point, students must

integrate the information into a new insight in the form of product representing their knowledge about the essential question. The product can be like an essay or an online document that represents their answer.

An open-ended question is the best Web inquiry activity that makes students explore many possibilities or hypotheses to discover solution on the whole problem (Coffman, 2009: 61). Therefore, guidelines are vital in a Web inquiry-oriented activity.

2.2.4 Collaborative Inquiry Learning

Collaborative inquiry learning is described as the process of investigating certain problems together with group. After the process of individual inquiry accomplishes, a student needs to confirm his finding to his peers, to see whether his finding is worth shared to others or his finding could replace others' initial assumption—of course after the finding is proved to be true or reasonable and it is supported by some related facts or scientific evidences.

Collaborative inquiry learning involves not only students' creativity to investigate problem individually but also their ability to work and share ideas or accept friends' arguments in groups. There are at least four phases in collaborative inquiry learning; anchoring and planning, individual inquiry, collaborative inquiry and concluding group's results (Chang et al., 2003: 58-59). During the first phase (anchoring and planning), students read given materials, they reflect problem, form hypotheses and present evidences to support their own hypotheses by creating concept maps.

This activity acquainted the learners with the process of ‘familiarizing with the topic’. The processes of familiarizing materials and identifying problems are viewed as the anchoring stage.

(Chang et al., 2003: 59)

At the second phase, individual inquiry, students search sources, look for evidences or some related information on the Web then record or compile their new information on a notepad. The notepad also becomes a product of this phase to trace students’ inquiry process.

The third phase, collaborative inquiry, happens when students conduct interactive processes among learners by sharing data, product or idea—in the form of concept maps. When the group fails to reach consensus in sharing their ideas, data and products, they are allowed to revise their ideas by questioning, debating and explaining.

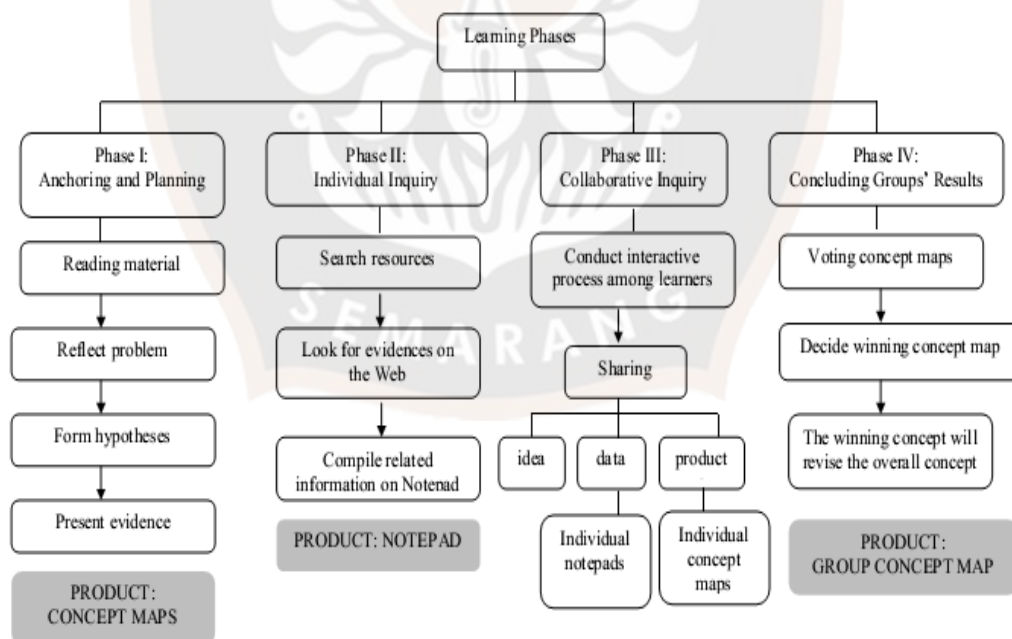


Diagram 2:
Collaborative Inquiry Learning Phases
(Chang et al. 2003:58- 59)

Then students will come to the fourth phase. This is the phase of concluding group's results. The students have to vote their concept maps to find the winning concept. The owner of the winning concept then has to revise the overall concept to become group concept map to be presented, while others will give personal feedback after the concept is announced or published.

2.3 Applying Inquiry Learning

2.3.1 Levels of Inquiry

There are at least four levels of inquiry: confirmation, structured, guided and open inquiry (Banchi & Bell, 2008: 26-28). During confirmation inquiry, students are provided with the question and procedures where the results are known in advance, and confirmation of the results is the object of the inquiry. Confirmation inquiry is useful to reinforce a previously learned idea, to experience investigation processes or to practice a specific inquiry skill, such as collecting and recording data.

During structured inquiry, students are provided with the question and procedures to generate an explanation that is supported by the evidence collected in the procedure.

During guided inquiry, students are provided with only the research question, and the task is to design the procedure and to test the question and the resulting explanations. Because this kind of inquiry is more open than a confirmation or structured inquiry, it is most successful when students have had

numerous opportunities to learn and practice different ways to plan experiments and record data.

Finally, during open inquiry, students form questions, design procedures for carrying out an inquiry, and communicate their results. Table 1 shows the availability of procedure designed by the teacher during each inquiry level. Based on table 2 below, guided inquiry and open inquiry are considered the advance level of inquiry learning. At those levels, the students are more autonomous and they have high interaction toward their peers and the learning.

Table 1: Levels of Inquiry

Inquiry Level	Question	Procedure	Solution
1–Confirmation Inquiry <i>Students confirm a principle through an activity when the results are known in advance.</i>	✓	✓	✓
2–Structured Inquiry <i>Students investigate a teacher-presented question through a prescribed procedure.</i>	✓	✓	
3–Guided Inquiry <i>Students investigate a teacher-presented question using student designed/selected procedures.</i>	✓		
4–Open Inquiry <i>Students investigate questions that are student formulated through student designed/selected procedures.</i>			

2.3.2 About Guided Inquiry

Students gain competence by being guided through an inquiry process by teachers and librarians at each grade level. As Banchi & Bell (2008: 26-28) mentions that during guided inquiry, students are provided with only the research question, then they are able to design the procedure, test the question and the resulting explanations by their own. In guided inquiry, some teachers who use the KWL frame work (Ogle, 1986 in Kuhlthau, 2007:4), could have their students

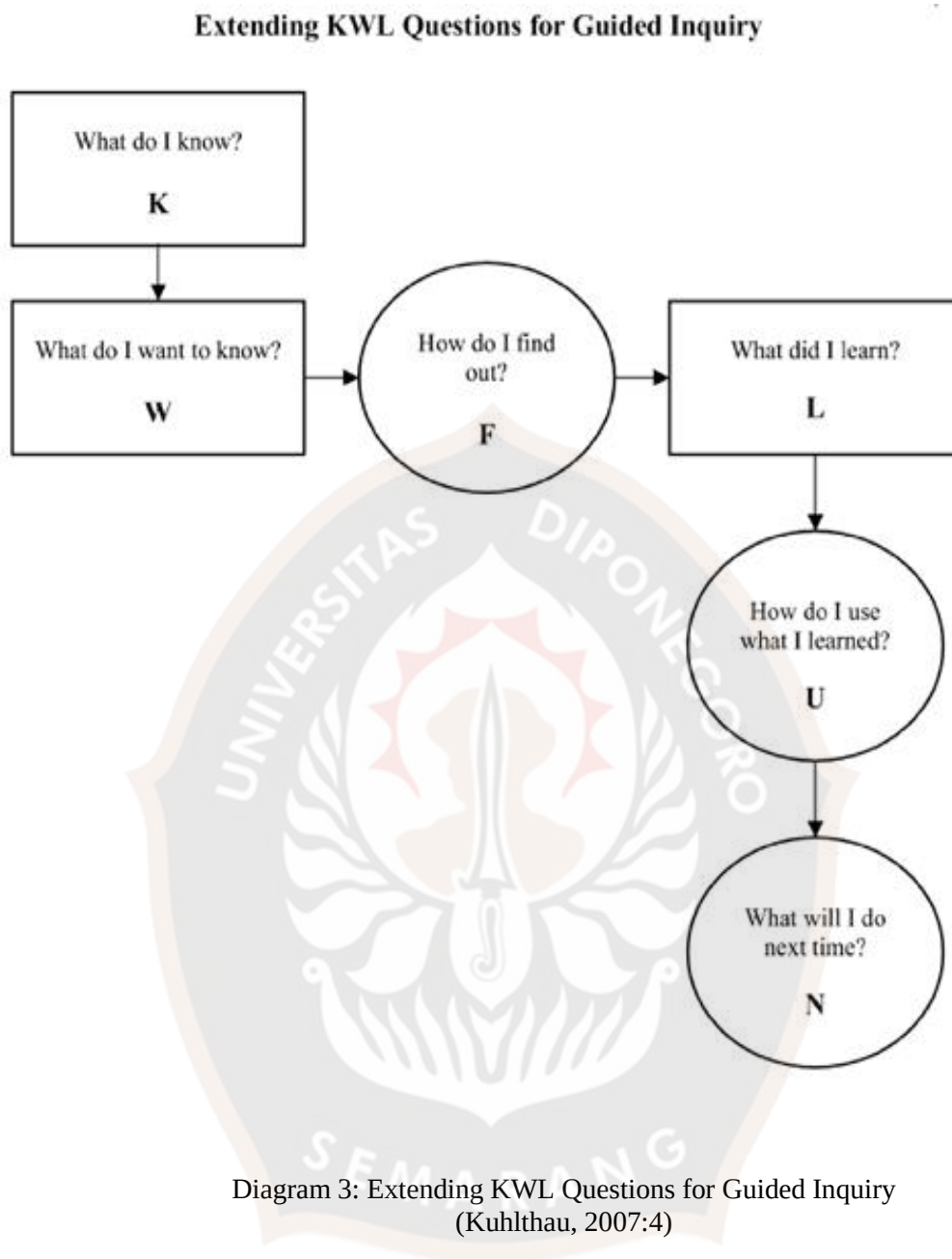
ask, “What do I know?” (K); “What do I want to learn?” (W); and “What did I learn?” (L) then extend the KWL framework as seen on Figure 3.

By concerning informative interventions at every inquiry process’ stages, the students are assisted to more advance level of thinking and learning in guided inquiry. The instructional team focuses on students’ thoughts, feeling and activity during learning session. Naturally, the final output becomes a habit to share their learning with others in the students’ learning community (Kuhlthau, 2007: 4).

Furthermore, Kulthau also points out six principles that must be found in guided inquiry learning. The principles are: (1) the students must be actively engaged in and reflecting on an experience (2) they learn by building their prior knowledge, (3) they grow higher-order of thinking through teacher’s supervision in the learning process, (4) different ways and modes of learning are accepted, (5) students learn by having social interaction with others, and (6) they learn through instruction and experience consistent with their cognitive development.

2.4 Web Access and Citation by the Students on Notepads

The form “Web access and citation by students” is used to measure how individual inquiry phase occurs (Chang et al. 2003:61). At this phase, students go to on the Web to find evidence that supported their hypothesis. The observation form includes; number of Web pages visited and number of Web quotes in the notepad.



2.5 The Teaching of Reading

2.5.1 Extensive and Intensive Reading

By involving in both extensive and intensive reading, students could obtain maximum advantage of reading. It is because when the students are doing both extensive and intensive reading, they develop some specific receptive skills. The

skills are reading for gist (or general understanding often called skimming), reading for specific information (often called scanning), reading for detailed comprehension or reading for inference and attitude.

When the students are doing extensive reading, they read more than they should read. Harmer (2007: 283) suggests that to create successful extensive reading activities, the teacher has to offer the students appropriate materials, guidance, and tasks facilities like suitable library or books. The students also need to be encouraged or persuaded the benefits of extensive reading program.

To Harmer (2007: 286), intensive reading deals with how to get students to read enthusiastically in class. It is necessary to provide interesting topics and tasks. The teacher is: an organizer (who tells the students for how long they have to do the tasks), an observer (who gives more opportunities or additional time for the students to do the tasks and observes their progress), and a feedback organizer (who manages feedbacks, compares answers and provokes detailed study about the text).

2.5.2 Collaborative Strategies to Teach Reading

Collaboration is about how people work together and it is not about what they do. It is a lively and interactive process among equal partners who strive together to reach the same goal. Collaborative learning activity can be designed since the planning, during the implementation, and assessment stages of teaching. It all starts by designing the partnership itself. However, it is not only group of

students that need to be collaborated, but teaching strategies also need to be collaborated even in collaborative learning.

Moreillon (2007:19) proposes 7 collaborated strategies to teach reading as shown in figure 1 below. First, it is necessary to understand the importance of background knowledge to reading comprehension. The students connect new information with prior knowledge before they integrate and organize the new information. Introducing lesson by eliciting brain-storming questions and questions about what prior ideas and information the students possess on particular topics are an essential component of lesson design.

Second, sensory experiences are significant to background knowledge, because sensory imagery shapes our schemas. “When we think about our sensory experiences, we are creating representations of those experiences in our memories” (Marzano, 2004:35 in Moreillon, 2007: 40). This strategy works well in children class. Sometimes, writers use literary devices, such as similes and metaphors, to shape sensory experience of a text and to connect readers’ senses and language. Many picture book authors offer powerful similes that attach sensory experiences to a particular time period, landscape, culture, or emotion that is perhaps unfamiliar to a young reader.

Third, it is the use of questioning strategies to teach reading comprehension. At this moment, teachers must support students’ critical thinking by modeling questions that stretches readers beyond the facts found “on the line” (in the print or illustrations), to think between the lines, to think through and beyond the text (Moreillon, 2007:59). In this process, students learn that how to learn is as urgent

as what to learn. Tactical questions elicited throughout a reading and at the end of a literacy experience help learners focus on learning how to learn.

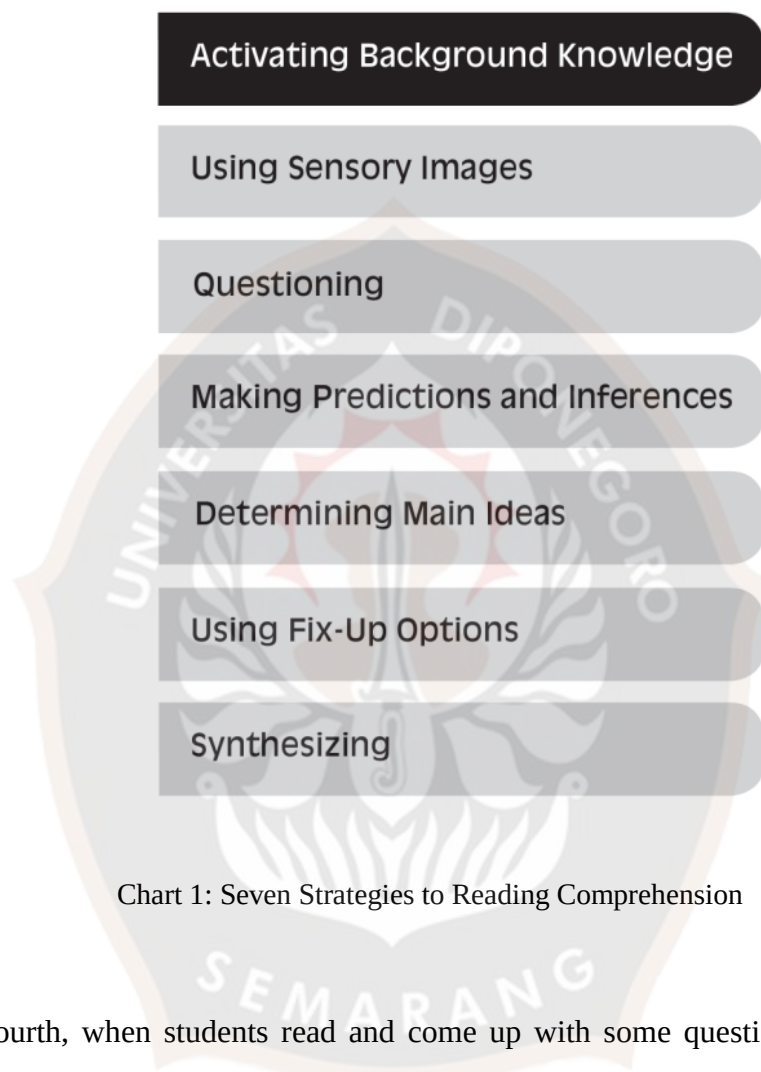


Chart 1: Seven Strategies to Reading Comprehension

Fourth, when students read and come up with some questions, they often figure out their own questions by making predictions or inferences about what will happen next based on author's creations. The "on the line" and "between the lines" strategy of predicting and inferring, motivate fast readers to go through the page to find out whether their hypotheses are correct. Predictions involve readers' background knowledge. While inferences make readers go beyond literal meaning by activating the print and illustrations and their prior knowledge and experience

to interpret the text. “Readers who make predictions and inferences before, during, and after they read are actively engaged in the meaning-making process” (Moreillon, 2007:76).

Fifth, students could infer and learn the meaning of new vocabulary while determining main ideas at the sentence level. At the paragraph level, students could learn about the academic English discourse pattern where the topic sentence presents the main idea and the concluding sentence restates it. By practicing sentence level and paragraph level strategies, students can separate main ideas from supporting details. Moreillon (2007: 98) mentions few key questions to determine main ideas:

- What was my purpose for reading?
- What new ideas or facts did I learn?
- What do I want to remember from this text?
- What will I do with this information?

Sixth, the inability of determining most important part of the text is a signal that comprehension is lost. It happens when readers cannot differentiate main ideas from supporting details. Fix-up option is the strategy that can be used to overcome this issue. It means that readers re-read the whole text more carefully. Teachers must be prepared to recognize the symptoms comprehension loss then provide students with tools for fixing up their meaning-making. There are some indicators to identify comprehension loss according to Moreillon (2007: 116):

Seventh, synthesizing means putting it all together but it is not similar to making a summary. Indeed, synthesis goes a step farther. After gathering and filtering the

information in the text using his own imagination, the reader then makes a selection. Information + Response = Synthesis

This strategy is mostly used in classroom-library collaboration. Synthesizing allows readers to determine main ideas from multiple bases, summarize information, and then add their own interpretations. The following is some indicators to identify how synthesizing process goes (Moreillon, 2007:135):

Am I Still Actively Reading?
Questions to Monitor Comprehension

Am I making connections?
Am I visualizing and using all my senses as I read?
Am I asking questions?
Am I making predictions and inferring as I read?
Am I determining main ideas?
Can I summarize what I'm reading?
If you cannot answer "yes" to these questions,
then you may have lost comprehension.
What can you do?
Use fix-up options and get your comprehension
back on track!

2.6 Parameters in Language Research

Second language research investigates multiple perspectives. It then involves some complicated parameters. Tarigan (1993) mentions that there are at least four parameters in second language research: (1) the first parameter deals with the research approach, whether it is synthetic or analytical, (2) the second parameter views the purpose of the study, whether it is heuristically or deductively decided, (3) the third parameter concerns the research context which

can be controlled or manipulated, and (4) the fourth parameter covers data and how the data are collected (Tarigan, 1993: 29).

According to Tarigan (1993), there are two crucial factors that a researcher should find out: (1) what are the appropriate data in a language research—if it is L1 or L2, and (2) how to collect and analyze data. Meanwhile, some data sources vary based on the level of explicitness in providing accurate evidence (Tarigan, 1993: 137).



If a research is heuristically aimed, then the researcher may observe and record some aspects or contexts in L2. The data are gathered to cover as many contextual information as possible then to be categorized or analyzed descriptively. Meanwhile, in a deductive research, the researcher goes from hypotheses which are derived from observations in heuristic phase or any hypotheses from L2 theories. Then the researcher narrows the research focus and investigates L2 phenomena systematically.

CHAPTER III

RESEARCH METHODS

3.1 Research Design

This study used quasi experimental design as a variant of true experiment design (Cohen et al, 2007: 283). This is a kind of field experiment which applies on ‘the pretest-post-test non-equivalent group design’ where the experimental and control groups have not been equated by randomization.

<i>Experimental</i>	O_1	X	O_2
<i>Control</i>	O_3	-----	O_4

where; O_1 and O_3 are the pre-test, X is the treatment (web-based collaborative inquiry learning) and O_2 and O_4 are the post test.

In this design, the experimental Group A and the control Group B take pre-test and post test and only the experimental group received the treatment (Creswell, 1994: 132). By the end of the experiment, the result of pre-test and post test will be analyzed to see if there is significant difference between the two groups.

3.2 Population and Sample

Population is a generalization area where subjects or objects of a research with certain quantity or characteristics are found while sample is a part of those characteristics belonged to the population (Sugiyono, 2013:62). In this study, the population was all the 247 students at their 1st semester in Mechanical

Engineering Department of The State University of Semarang who attended English lecture. The students learned English only at the first semester of their study. They attended English lecture for 16 meetings of 100 minutes including final test session.

Table 2:
Population of the Study

No. of Class	Major	Number of Students
1	Education of Automotive Engineering Group 1 (PTO 01)	43
2	Education of Automotive Engineering Group 2 (PTO 02)	48
3	Education of Mechanical Engineering Group 1 (PTM 01)	42
4	Education of Mechanical Engineering Group 2 (PTM 02)	48
5	Mechanical Engineering Group 1 (TM 01)	37
6	Mechanical Engineering Group 2 (TM 02)	29
Total		247

Meanwhile, the size of sample and the selection of sample should follow the following considerations: sampling error level, the availability of respondents, time and research fund (Sugiyono, 2003: 67). Sampling error level in this study was 5% from the total population of 247. About the size of sample, usually the size of sample are derived from Isaac and Michael formula below:

$$s = \frac{\lambda^2 \cdot N \cdot P \cdot Q}{d^2 (N - 1) + \lambda^2 \cdot P \cdot Q}$$

S = the number of sample

λ^2 = Chi square which depends on sampling error and degree of freedom (df), Chi value for 5% error is 3.841

N = the number of population

P = correct possibility

Q = incorrect possibility

d = the difference of sample average and population average

(Sugiyono, 2013: 67)

By inserting Isaac and Michael formula in deciding sample size, with the population of 247, the sample should have been 150 students in Mechanical

Engineering Department. However, due to the time, room and respondents' availability, there were only 91 students from the same department (Education of Automotive Engineering or PTO) chosen as the sample in this study. The selection was based on the following considerations: (1) to show equal characteristics, (2) the samples were from the same department, (3) they attended the same English teaching, (4) they were at their first semester and (5) they were from the same learning group (*Rombongan Belajar*), PTO 01 and PTO 02. Therefore based on the reason above, 91 students were the appropriate number used as sample in this study.

The samples were divided into 2 groups called PTO 01 and PTO 02. There were 43 students from PTO 01 who were selected as experimental group and 48 students from PTO 02 who were selected as control group.

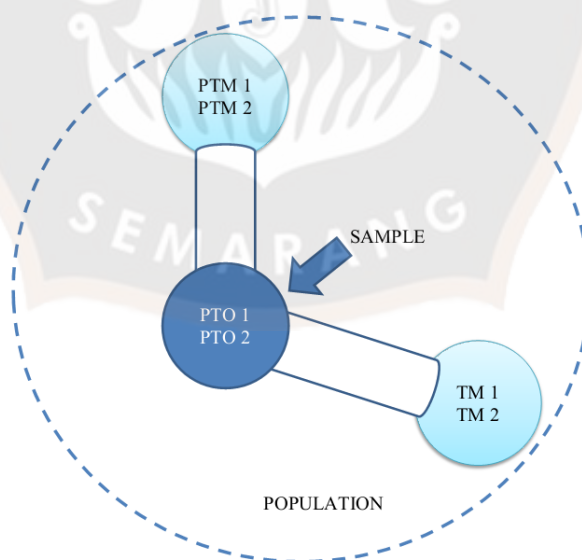


Chart 2: Sample and Population

3.3 Instrumentation

3.3.1 Test

Reading Test was the instrument used in this study. It was given before and after Web-Based Collaborative Inquiry Learning (WBCIL) was applied. Reading test was used to measure the students' reading competence as the main concern in this study. Some comprehension questions were drafted at easy to medium level that would be proved through test items' analysis.

The test presented short reading text in mechanical engineering context bringing the theme of "how technology works". There were some mechanical engineering vocabularies found in the text. The reading text was taken from "Cambridge English for Engineering" handbook entitled "Space Elevator" and "Solar Tower" (Ibbotson, 2008: 8 & 80) and "English in Focus: English in Mechanical Engineering" handbook (Glendinning, 1974: 1 & 12). Reading comprehension test covered multiple choice questions as well as term and definition matching (Appendix 4).

3.3.2 Observation

An observation was conducted to report what students experienced during Web-Based Inquiry Learning (WBCIL). Generally, there were three activities which were observed: (1) how students formulated personal notepads, (2) how they worked and conducted group discussion and (3) how they conducted 'reflect' phase through Group Presentation. Some indicators that needed to be achieved during observation are described in the following chart.

One's inquiry process could be mapped or tracked through student's personal notepad. The number of web pages that the students visited and web quotes had to be noted in their personal notepad. This record was also as the evidence to support their hypothesis.

Group discussion became the key success of WBCIL. This model of learning was not only aimed to stimulate students' critical thinking but also the way the students formulate ideas to their peers. This includes arguing, persisting ideas, receiving and delivering ideas in a group. Through 'students-students interaction', hopefully the learning may be more dynamic and living.

Group presentation was the statement of group's idea. It was to declare group decision to other groups then to observe the similarities and differences from other groups. The overall activities were design to support Web-Based Collaborative Inquiry Learning model which, at the end, should yield benefits for both students and the teacher.

The purpose of the overall observation was to see if the principles of guided inquiry (Kuhlthau, 2007: 4) from WBCIL model were well applied. The principles dealt with the students' active engagement, knowledge building, their thinking order, interaction and their cognitive development. Then how those principles influenced students' reading competence.

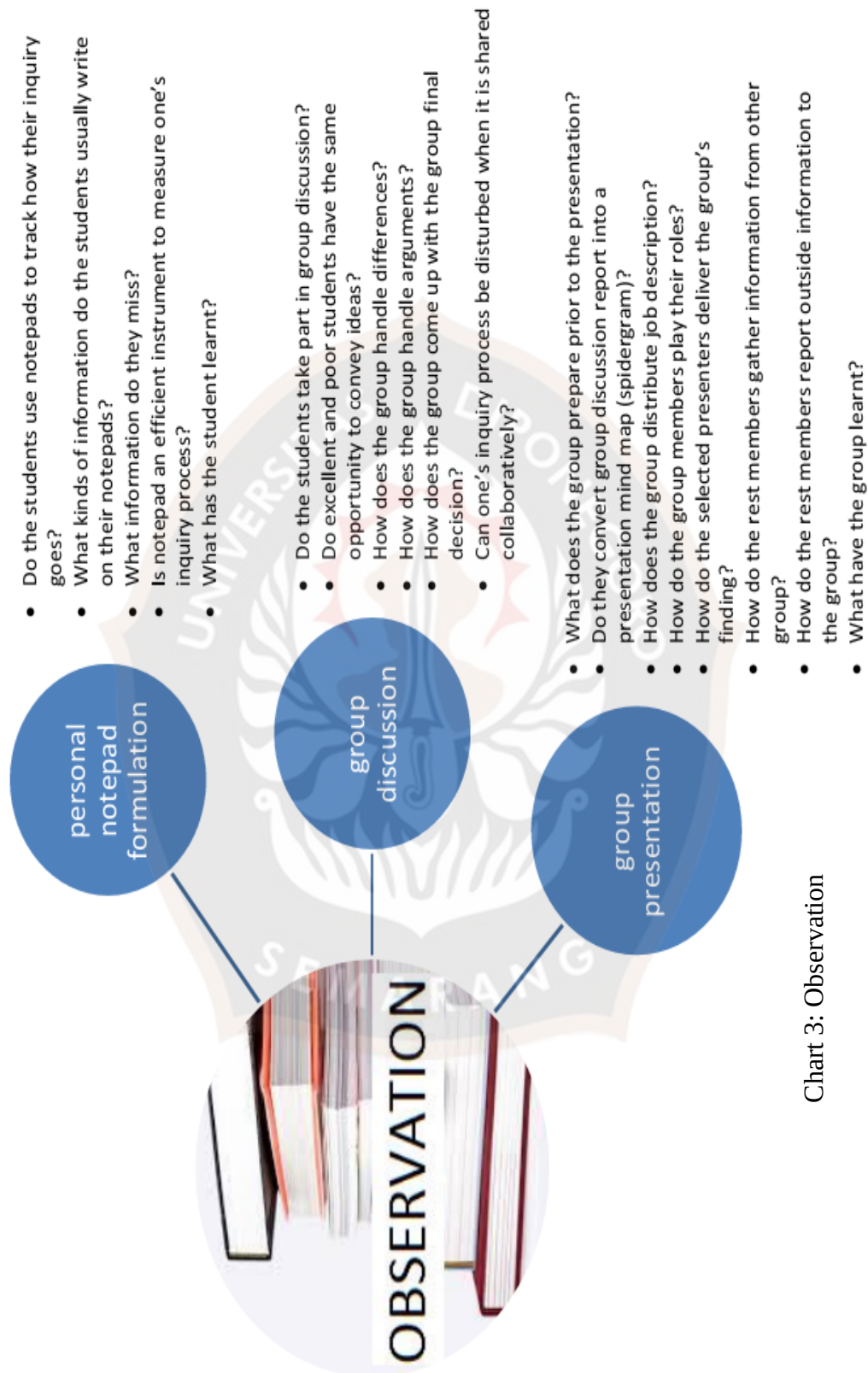


Chart 3: Observation

3.4 Test Analysis

Reading test was the instrument used in this study to measure the students' reading competence. Reading test had to meet some factors to be considered as a good instrument of measurement. Some elements that measured the quality of reading test were in terms of test items analysis, validity and reliability.

Test items analysis discussed two important elements: item difficulty and item discrimination. The term validity referred to the ability of the test to measure what it claimed to measure. Brown (2004: 22) states that "a valid test of reading ability actually measures reading ability". Meanwhile reliability had to do with the consistency, or reproducibility, or an examinee's performance on the test. When the test was given in different occasions, it should yield similar results.

2.4.1 Test Item Difficulty

It was to know how difficult or how easy the test was. The item difficulty was counted by comparing the test takers who provided correct answers and those who gave incorrect answers. Basically, the more correct answers the easier the test was. The simple formula below was used to examine item difficulty of a test;

$$p = \frac{\text{the number of correct answers (CA)}}{\text{the number of test takers (N)}}$$

Various implementations occurred in terms of deciding difficulty scale. Generally the scale ranged between 0.10 (difficult), 0.50 (medium), and 0.90

(easy). The resulted scale out of those scales (like 0.00 or 0.1) could be interpreted that the given test was considered to be ineffective (Djiwandono, 2011: 225).

2.4.2 Item Discrimination

Items discrimination value (D) was the ability of the test items to differentiate capable test takers from incapable test takers in answering test items or doing well in the test (Djiwandono, 2011: 227). Test items were considered good, if the high (H) achievers group (R_H) who could answer almost all items correctly were bigger than low (L) achievers group (R_L) from the total test takers (T). Item discrimination was examined using the following formula;

$$D = \frac{R_H - R_L}{\frac{1}{2}T}$$

Item discrimination ranged between +1.00 and -1.00, 0.00 which signified no discrimination and it had to be avoided, while negative result occurred when L group had more correct answers than H group.

2.4.3 The Validity and Reliability of the Test

Reliability and validity were major considerations when a test was used as the instrumentation to gather the data. The validity of a test was the extent to which it measured what it was supposed to measure. In a 'test-re-test design', the correlation coefficient resulted from the first and second test can be used to measure the validity of a test (Djiwandono, 2011: 230). Pearson Product Moment Correlation formula was used to find out the validity coefficient. Pearson

correlation coefficient for sample data was denoted by r (McCallister, 2016). The formula for Pearson correlation coefficient r was given by:

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

Where:

- N = number of pairs of scores
- $\sum xy$ = sum of the products of paired scores
- $\sum x$ = sum of x scores
- $\sum y$ = sum of y scores
- $\sum x^2$ = sum of squared x scores
- $\sum y^2$ = sum of squared y scores

This study used ‘test-re-test reliability’ type. It was to measure reliability obtained by administering the same test twice over a period of time to a group of students from Education of Mechanical Engineering (PTM). The scores from Time 1 and Time 2 could then be correlated in order to evaluate the test for stability over time. One formula that was commonly used to measure reliability coefficient was Cronbach’s Alpha formula (Djiwandono, 2011: 230). If the reliability coefficient was positive and high, the test was reliable. Cronbach’s Alpha formula derived from the following equation:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}}$$

Here “ N is equal to the number of items, $\bar{c}$ is the average inter-item covariance among the items and $\bar{v}$ equals the average variance” (Bruin, 2006).

Based on the formula, it was found out that if the number of test items was increased then Cronbach's alpha coefficient would also increase. Additionally, if

the average inter-item correlation was low, alpha coefficient would be low. As the average inter-item correlation increased, Cronbach's alpha increased as well (holding the number of items constant). To operate Pearson correlation and Cronbach's alpha formula, this study utilized the assistance of SPSS 17.0 software.

3.5 Procedures of Collecting Data

3.5.1 Try-Out Test

Initially, the researcher proposed legal permission to conduct study in Mechanical Engineering Department of UNNES. When the legal permission was obtained, the researcher started to draft a try-out test. Try-out test was administered at the first place to assure the quality of reading test as the proper tool to measure reading comprehension. The following 'upward arrow' describes the procedure of try-out test which was conducted at the beginning of this study:

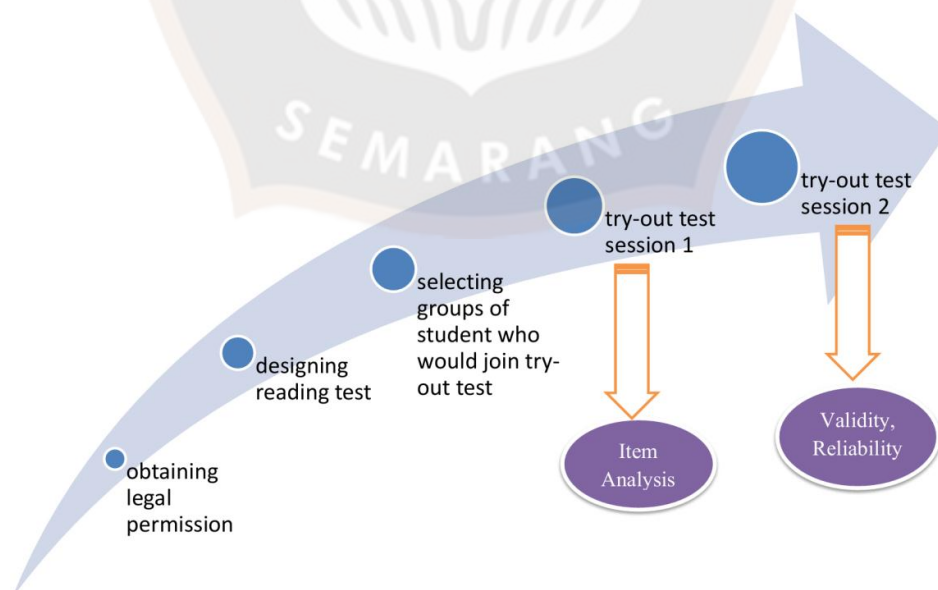


Chart 4: Try-Out Test Procedures

There were 90 students from Education of Mechanical Engineering Department (PTM) were chosen as the test takers. Try-out test was administered for two times. The first session of the test was to analyze the test in terms of its difficulty and discrimination.

After the first session accomplished, the test items were analyzed further using item difficulty and item discrimination formula to see its validity and reliability. The second session of the test was held a week after the first session. Having determined the validity and the reliability, some bad test items were removed and only good test items were used.

When the test had been ready to be proper instrument that measured reading competence, the next step of the study was conducted. It was selecting purposive sample to be the participants in this study.

3.5.2 Selecting Experimental and Control Group

As Cohen et al (2007: 283) stated that in pretest-post-test non-equivalent group design, “the experimental and control groups have not been equated by randomization”. Therefore, the participants in this study, who were selected as experimental and control group, were purposefully decided based on the following reasons: (1) they came from the same department—Education of Automotive Engineering (PTO), (2) they attended English lesson, (3) they were all at their first semester, (4) they had wider time availability to participate in this study.

Practically, the English teaching uses WBCIL—as proposed in this study, could not be inserted into the regular English teaching. Since, the regular English class already had fixed lesson plan for the whole semester. Therefore, the researcher offered to separate the regular English class from the ‘Extra English Class’—the English teaching uses WBCIL. It was based on the following considerations: (1) this study may not disturb the teaching and learning activity which had already occurred, (2) basically the researcher wanted to have sincere and joyful participants without adding their study load, (3) the skill given in WBCIL model hopefully could give more knowledge to the students and support the regular English class, (4) the participants in this study were promoted to obtain additional score to make up their final test score.

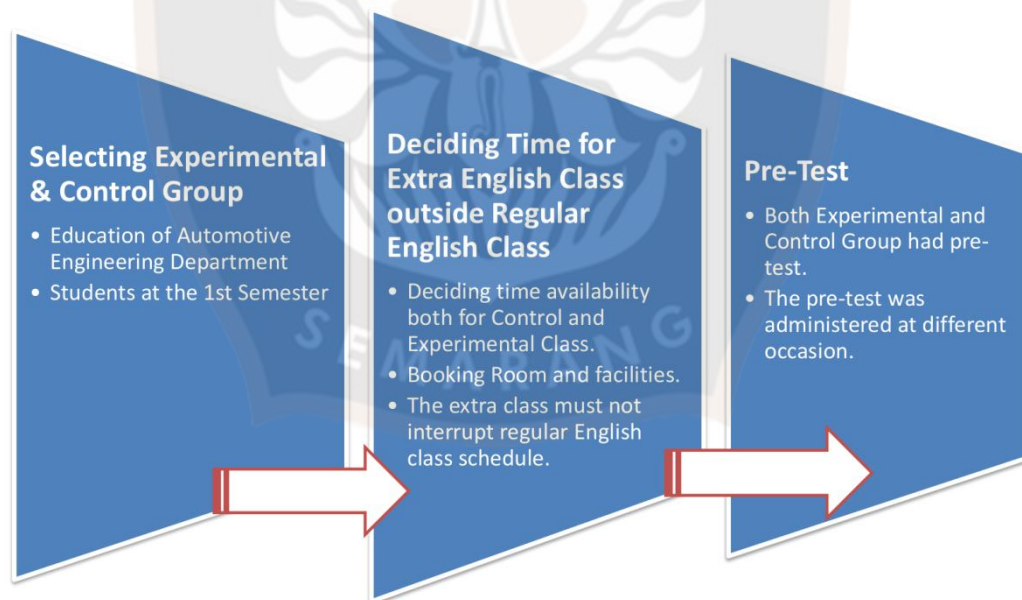


Chart 5: Experimental and Control Class

Time and room availability became the main concern in this study. Fortunately, one room, for night-extra-English class, was set. The following table describes the fixed schedule:

Table 3: Experimental and Control Class Schedule

Group	Date of the Meetings (November 2014)							
	Pre-Test/1	2	3	4	5	6	7	Post Test/8
Control	12	13	14	17	18	19	20	21
Experimental	17	18	19	20	24	25	26	27

The duration for every meeting was 100 minutes, started from 7pm to 9pm. The study was conducted from November 12 to 27, 2014. WBCIL model was applied in the total 8 meetings in experimental group, while control group experienced common reading comprehension drilling.

3.5.3 Designing the Teaching of Reading

To yield satisfying results, it was necessary to design the teaching of reading in both classes. Experimental class had to receive the optimum application of WBCIL model and control class also had the right to experience well managed class although there would be no particular model applied. Designing the teaching techniques prior to the study, led to research effectiveness and apparent measurement.

Experimental class would experience more ‘student-student interaction’ and less ‘teacher-student interaction’. It was because in WBCIL model, teacher did not have more chance to dominate the learning. The teacher’s role was as facilitator in WBCIL then he or she was to lead autonomous learning.

In experimental class, the students would not only obtain reading skills but also an exposure to extensive reading. They would deal with the 'hypertext temptation' on the web that would make them read a lot. Apparently, the students would have abundant information as they explored the web. Therefore, group sharing session was needed by the time the students accomplished their reading.

Group sharing session was given three times, at the 3rd, 5th and 7th meeting. By doing so, the students were expected: (1) to have the pattern of inquiry and (2) to collaborate their inquiry with their friends' inquiry. The students only got one chance of group presentation, at the 7th meeting. Group presentation was given almost at the end of the learning, because the students were expected to have a habit of web-inquiry, and they became more confident to share their knowledge to the whole class.

Unlike experimental class which tended to be more living, control class was designed to have only 'teacher-students interaction'. Purposefully, it was to see whether group work really brought implication toward students' performance, and whether individual reflection could be enough to solve reading problem.

In control class, the teacher would give more focus on the reading skill and left the extensive reading, although the reading materials were the same as in experimental class. The discussion session happened between the teacher and students, and there were not any opportunities to have peer discussion.

3.6 Data Analysis

3.6.1 Independent Samples T-Test

Independent Samples T-Test was used to compare the means between two unrelated groups (control and experimental groups). The calculation compared the resulted amount of (t_{value}) and (t_{table}) with the condition that if the $t_{value} > t_{table}$, then there would be significant difference after a particular treatment was given (Dougherty, 2002). There are many types of t-test: (1) *the one-sample t-test*, used to compare the mean of a population with a theoretical value, (2) *the unpaired two sample t-test*, used to compare the mean of two independent samples, and (3) *the paired t-test*, used to compare the means between two related groups of samples.

This study used *the one-sample t-test* that compared the mean of two groups. The groups were as one set of sample dependently. Manually, t-ratio was generated from the following formula:

$$t = \frac{M_x - M_y}{\sqrt{\left[\frac{\left(\sum X^2 - \frac{(\sum X)^2}{N_x} \right) + \left(\sum Y^2 - \frac{(\sum Y)^2}{N_y} \right)}{N_x + N_y - 2} \right] \cdot \left[\frac{1}{N_x} + \frac{1}{N_y} \right]}}$$

Where,

$\sum$ = sum the following scores

M_x = mean for Group A

M_y = mean for Group B

X = score in Group 1

Y = score in Group 2

N_x = number of scores in Group 1

N_y = number of scores in Group 2

A plus or minus t-ratio at the end, indicated the direction of the difference between the means (Group B had a higher mean than Group A).

The independent-samples t-test was also to see whether Web-Based Collaborative Inquiry Learning is proven to significantly distinguish mean scores of experimental from control group. In this study, t-ratio was calculated with the assistance of SPSS 17.0 software.

3.6.2 Two Way Analysis of Variance (ANOVA)

Analysis of variance (ANOVA) is to analyze variation of a variable (continuous random variable) measured under conditions defined by discrete factors (such as classification variables, often with nominal levels). Regularly, ANOVA is to test equality among several means by comparing variance among groups relative to variance within groups (Larson, 2015). Meanwhile, Two-way ANOVA or factorial ANOVA was used to measure two factors of measurement or when there was one measurement variable and two nominal variables (McDonald, 2014). Simply it could be assumed that some variables, from different measurement or point of view from the same data, would be seen. The points of view were (1) control and experimental group and (2) the three levels of test achievers (High, Medium and Low) from each group. This analysis was to accurately measure the effect of the treatment (Web-Based Collaborative Inquiry Learning) toward certain class or levels of students (High, Medium or Low achievers) and to see whether certain level of students could effectively receive Web-Based Collaborative Learning to enhance their reading competence.

CHAPTER IV

FINDINGS AND DISCUSSION

4.1 Test Analysis

4.1.1 Test Item Difficulty

Test item analysis was generated from the result of try-out test at the first session. The test takers were 90 students from Education of Mechanical Engineering (PTM). Test item difficulty was divided into four levels: easy, medium, difficult and ineffective item. To find out test item difficulty value (p), the total correct answer of a particular item (CA) must be divided by the number of test takers (N) then the result of the calculation decided the value of p . The value of p ranged from the lowest 0.0 and the highest 1, where 0.0-0.1 was categorized as ineffective (I) items, 0.2-0.4 was difficult (D), 0.5-0.7 was medium (M), and 0.8-1 was easy (E).

The number of questions given in the reading test try-out was 30 items. The questions consisted of reading short texts and matching. The reading texts given in the test were mostly at easy level and they were selected because of several considerations. Since the test takers were 1st semester students of Mechanical Engineering Department who experienced minimum acquaintance of English, the given reading text had to concern: (1) the students' understanding in English vocabularies thus it also considered (2) the length of the paragraph and (3) the duration of the test so that the students had enough time to think and understand

the given questions. The following table describes how difficult the test was according to the division of correct answers and the number of test takers:

Table 4: Test Item Difficulty

Test-1	Space Elevator Text					Matching					Solar Tower Text					Matching				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correct Answers (CA)	76	55	52	50	47	58	54	62	79	55	70	67	50	32	57	64	63	64	63	64
PTM 01 & PTM 02 (N)	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
$p = CA / N$	0,844	0,611	0,578	0,556	0,522	0,644	0,6	0,689	0,878	0,611	0,778	0,744	0,556	0,356	0,633	0,711	0,7	0,711	0,7	0,711
Category	E	M	M	M	M	M	M	M	E	M	M	M	M	D	M	M	M	M	M	M

Test-1	Materials Text				Matching Description-Picture					
	21	22	23	24	25	26	27	28	29	30
Correct Answers (CA)	35	33	30	28	55	52	54	49	66	55
PTM 01 & PTM 02 (N)	90	90	90	90	90	90	90	90	90	90
$p = CA / N$	0,389	0,367	0,333	0,311	0,611	0,578	0,6	0,544	0,733	0,611
Category	D	D	D	D	M	M	M	M	E	M

Remarks:

0,0-0,1 : Ineffective (I)

0,2-0,4 : Difficult (D)= 5 items

0,5-0,7 : Medium (M) = 15 items

0,8-1 : Easy (E) = 20 items

(Djiwandono, 2011: 224-225)

Based on Table 7, there were 15 test items were at medium category and 20 items are at easy category. There are only 5 items in difficult category and there is not any ineffective test item. It is simply assumed that the test items were mostly at tolerable difficulty level. Therefore, the test was considered as easy test and proper to be given to the 1st semester students of Mechanical Engineering Department.

4.1.2 Test Item Discrimination

Test item discrimination was to find out whether each multiple choice option could discriminate easy option to difficult option and it was to see whether

the question was well structured. For instance, the question might be easy to answer but the multiple choices did not support the answer then this kind of question may be considered as 'not good item'. If the multiple choice and questions did not match or difficult to understand, it could also be considered as 'bad test item' then it needed to be discarded. Djiwandono (2011:224-225) suggested that in 'good enough' to 'not so good' category even the test item needed to be revised.

Test item discrimination (D) was generated from the division of high and low scores difference ($R_H - R_L$) and half of the total test takers ($\frac{1}{2}N$). There are four categories to decide the quality of item discrimination (Djiwandono, 2011: 224-225). If the D value was less than 0.19 then the items were considered as 'bad' items, 0.20 to 0.29 was 'not so good' items, 0.30 to 0.39 was 'good enough' and above 0.4 was considered as 'excellent' items.

There were some steps before ($R_H - R_L$) was found out. First, the 90 list of scores were put into order from the lowest to the highest. Second, after the scores were in order, the list was divided into three groups (L=low, M=medium and H=high) equally. If the test takers were 90, then the group division was 30 of L group, 30 of M group and 30 of H group (Appendix 4,5,6). Third, the total correct answer of each test item (from item number 1 to 30) in L and H group were calculated. Then the resulted amount was ready to be inserted in item discrimination as seen on table 8.

From the total 30 questions, there were 5 items were considered 'not good' items, 5 'good enough' items and 4 'bad' items. The researcher decided not to

revise some ‘good enough’ questions because those items were still tolerable to the test takers. It was based on the ($R_H - R_L$) results which were not too low. Yet the researcher gave more attention to ‘not good’ and ‘bad’ categories. The following table identifies how each item in the test discriminates one another:

Table 5: Item Discrimination

Item Discrimination (D)

Test	Space Elevator Text					Matching					Solar Tower Text					Matching				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Correct Answers (H)	30	28	30	30	25	26	20	24	29	24	30	30	26	25	30	29	30	30	30	29
Correct Answers (L)	17	4	4	1	1	15	12	18	20	9	13	12	1	1	2	8	3	6	4	11
H - L	13	24	26	29	24	11	8	6	9	15	17	18	25	24	28	21	27	24	26	18
½N	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
Item Discrimination (D)	0,29	0,53	0,58	0,64	0,53	0,24	0,18	0,13	0,2	0,33	0,38	0,4	0,56	0,53	0,62	0,47	0,6	0,53	0,58	0,4
Quality	NG	E	E	E	E	NG	B	B	NG	GE	GE	E	E	E	E	E	E	E	E	E

Test-1	Kinds of Materials					Matching Description-Picture				
	21	22	23	24	25	26	27	28	29	30
Correct Answers (H)	22	18	18	13	29	24	26	23	30	28
Correct Answers (L)	2	2	1	5	10	6	11	6	14	10
H - L	20	16	17	8	19	18	15	17	16	18
½N	45	45	45	45	45	45	45	45	45	45
Item Discrimination (D)	0,44	0,36	0,38	0,18	0,42	0,4	0,33	0,38	0,36	0,4
Quality	E	GE	GE	B	3	E	GE	GE	E	E

Remarks

>0,4

Excellent (E)

0,30-0,39

Good Enough (GE), a revision is needed

0,20 - 0,29

Not so Good (NG), a revision is needed

0,19>

Bad (B), a revision is needed or the item could be discarded

There were 2 ‘bad items’ (question number 7 and 8). Both of the questions dealt with matching definition ‘transport’ and ‘lightweight cable’ (Appendix 3) under the reading text entitled “Space Elevator”. The questions were in bad category because they were quite difficult for the test takers. The ($R_H - R_L$) was very low and it was less than 0.19. There were few test takers gave correct answers for these items. For item number 7, there were 20 students in H group answered correctly and only 12 students answered correctly in L group. Most

students could not interpret the definition of the word ‘transport’ and ‘lightweight cable’. It was probably because of minimum English vocabularies that they had.

Meanwhile, there were three items (question number 1,6 and 9) which were in ‘not good’ category and the (R_H-R_L) was less than 0.30. Question 1 was about the reading text “Space Elevator”, the rest questions were matching definition and they still related to number 7 and 8. Apparently, matching definition for the test takers were serious issue. From this condition, obviously, the students of Mechanical Engineering Department were unable to solve guess the meaning problem from reading test.

The answer is by using an incredibly **strong** and **lightweight cable**, **strong** enough to **support** its own **weight** and **heavy** load. The design of such a cable is still largely theoretical. This would be **attached** to a base station on earth at one and a satellite in geostationary orbit (fixed above a point on the equator) at the other. Lift vehicles would then ascend and descend the cable, powered by **electromagnetic force** and controlled remotely.

(Ibbotson , 2008: 8)

II. Please match the words at the left with their definition at the right! (see the example)

Connecting	[d]	a. carry objects
6. Raise	[]	b. not heavy cable
7. Transport	[]	c. the pressure caused by electromagnetic power
8. Lightweight cable	[]	d. joining
9. Electromagnetic force	[]	e. fix
10. Attach	[]	f. lift something

Picture 1: The Text in Reading Test (Item Number 8)

Guessing the meaning skill is needed to solve reading comprehension question. To master this skill, sufficient reading practice is needed. For the test takers—who were mostly able to understand English at a very basic level, they

needed to be assisted by providing some gist in the reading text. Unfortunately the text given for them provided minimum gist. Therefore it could not help the basic-level-reader understand the meaning.

Test item number 8 asks the test takers to find the definition or synonym of 'lightweight cable'. The students probably looked for the reading passage and found the word 'lightweight cable'. They would also find some keywords before and after the word 'lightweight cable', such as the word '*strong*', '*support*', *weight* and '*heavy*'. This may lead the test takers to think of heavy thing, instead of choosing the intended option 'not heavy cable' at the right.

There were almost half number of test takers gave wrong answer for item number 8, while the remaining 48 students answered correctly. Those 48 students may get better understanding, better vocabulary mastery or better technique by looking at the gist 'cable' (marked in red) in the matching question and in the matching answer box.

4.1.3 The Validity and Reliability of the Test

Re-test was conducted to the 90 test takers a week after the first test to analyze the validity and reliability of the test. The validity and reliability of the test were found out through test and re-test outputs. The first test results were compared to the second test. With the assistance of SPSS 17.0 software, Pearson Product Moment Correlation formula was to find out validity and Cronbach Alpha formula was to determine reliability of the test.

Table 6: Correlation (r) between Test 1 and Re-test

		Test 1	Re-test
Test 1	Pearson Correlation	1	.956**
	Sig. (2-tailed)		.000
	N	90	90
Re-test	Pearson Correlation	.956**	1
	Sig. (2-tailed)	.000	
	N	90	90

** . Correlation is significant at the 0.01 level (2-tailed).

It was found that the correlation (r), between test 1 and test 2 (re-test) scores, was 0.956 ($r_{value} = 0.956 > r_{table} = 0.283$, df 88) which was significant and very strong (Sujarweni and Endaryanto, 2012: 61). Therefore it was proved that the test was valid.

Cronbach Alpha (α) coefficient ranged between the weakest (< 0.50) to the strongest (> 0.90). Table 10 shows that from the 90 test takers (cases), the data are 100% valid and nothing was excluded. The (α) value of the total 30 test items is 0.943 which means that all test items are reliable.

Table 7: Reliability Outputs

(1) Case Processing Summary

		N	%
Cases	Valid	90	100.0
	Excluded ^a	0	.0
	Total	90	100.0

a. Listwise deletion based on all variables in the procedure.

(2) Reliability Statistics

Cronbach's Alpha	N of Items
.943	30

Based on the test analysis results that covered: (1) test item difficulty, (2) test item discrimination, (3) the validity of the test and (4) the reliability of the test, the researcher decided to sustain the test content and to use the test as the tool

to measure students' reading competence in this study. The main concern to sustain the test design was because of the validity and reliability results that were quite satisfying. Although there were some imperfect test items in the test items analysis, a number of bad items were still tolerable level. It was based on the assumption that bad items could be relatively caused by the condition and competence of the test takers from Education of Automotive Engineering Department, however the participants of this study—from Education of Mechanical Engineering students could be different. Besides, minimum skill of guessing the meaning in understanding reading passage could be improved during teaching process prior to the post test.

4.2 Pre-Test

4.2.1 Pre-Test of the Experimental Group

Pre-test was given to the experimental group before Web-Based Collaborative Inquiry Learning was applied. Table 5 (Appendix 8) shows Pre-Test result in experimental group. The experimental group's mean score was 72.39 prior to the treatment. Based on the data as seen on Appendix 11, the students' scores were divided into 5 categories of score range below (Diagram 1).

From the total number of 43 students, 16 students were at category 3 (66 to 75), and 13 students were at category 4 (76 to 85), 9 students were at category 2 (56 to 65), 3 students were below or equal to 55 and 2 students were at category 5 (86 to 95). The above distribution shows that most students (37.20%) got 'unsatisfying to good' scores and this number was close to 'good to very good'

group (30.23%). Interestingly, two extreme groups; the lowest (6.97%) and the excellent students (4.65%) were also close in a smaller number. Prior to the treatment, it appeared that the students in experimental group were not too excellent in general.

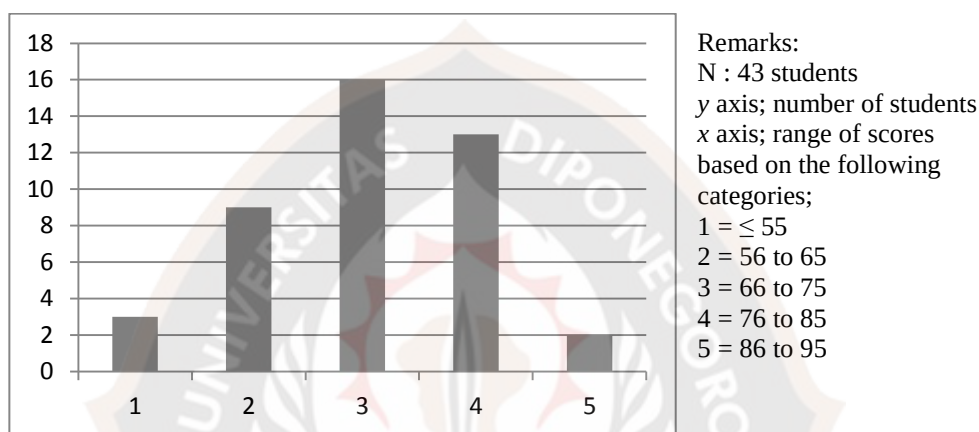


Diagram 4:
Pre-Test Score Distribution of the Experimental Group

4.2.2 Pre-Test of the Control Group

The students' mean score in control group was 72.66 (Appendix 10). Apparently, this mean score was little bit higher than experimental group, Diagram 2 below shows pre-test score distribution in control group. There were 48 students in control group. Two tall bars represent two significant categories (category 2 and 4) with quite big number of students. There were 14 students (29.16%) who got 56 to 65 and 14 students (29.16%) who got 76 to 85. Score distribution in both of the categories signifies that the students in control group were mostly 'unsatisfying to good' condition and mostly 'good to excellent' condition.

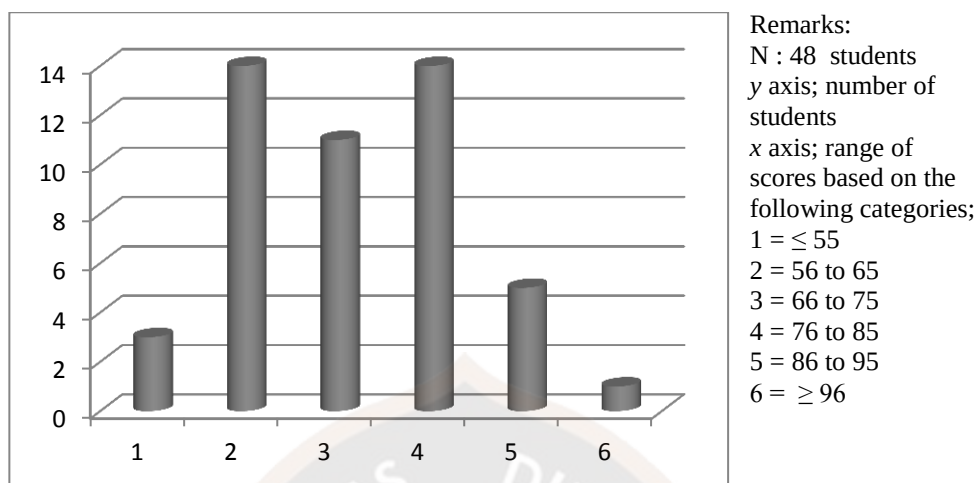


Diagram 5:
Pre-Test Score Distribution of the Control Group

There were only few of the students in control group who were at category 1 (≤ 55) or it was 6.25% only from the total number. Apparently, the students in control group were excellent in general.

4.3 Teaching and Learning in Experimental and Control Groups

Teaching process applied in both groups were planned as seen on Table 1 below. Both groups received two reading texts, but in experimental group, group sharing and inquiry learning took places more often compared to control group. There was limited time when group sharing was conducted, therefore the teacher decided to bring it as homework. The students in experimental group did not understand the instruction given by the teacher. Therefore, the inquiry learning did not run well.

Unlike experimental group, the teaching process applied in control group ran smoothly. It was because the group discussion was not conducted and the teacher only gave power point presentation as common lecturing. Apparently, the class was not too dynamic, since the atmosphere was less ease. Discussion sessions were between students and the teacher, so it hampered slow learners or apprehensive students to build communication with the teacher. Fortunately, based on Diagram 2 above, the students chosen as control group were good raw material. It was almost no difficulty in delivering reading material to control group, since they learned well.

4.4 Post Test

4.4.1 Post-Test of the Experimental Group

Appendix 9 shows the result of experimental group Post Test. Web-based collaborative inquiry learning was applied. The students also got involved in personal inquiry phase and more groups' sharing during 7 meetings. By the end of the treatment, the students' mean score was 86.16 or it was 13.77 point higher than the pre-test score. A number of excellent students, with the scores ranging between 80 to 100, were also increased up to 74.41%. Surprisingly, there were 6 students who got perfect score (100) for their reading Post Test.

Table 8:
The Difference of Pre-Test and Post Test Score
in Experimental Group (N=43)

Pre-Test			Post Test		
Score Range	Number of Students	%	Score Range	Number of Students	%
≤ 55	3	6.97 %	≤ 55	0	
56 - 65	9	20.93%	56 - 65	2	4.65%
66 - 75	16	37.20%	66 - 75	5	11.62%
76 - 85	13	30.23%	76 - 85	12	27.90%
86 - 95	2	4.65%	86 - 95	14	32.55%
≥ 96	0		≥ 96	10	23.25%
Mean: 72.39			Mean: 86.16		

From table 8 above, it is not only the mean score that changes, but the score distribution also changes. Prior to the treatment, no one got 96 points above and few students got 55 and below 55. However, after WBCIL was applied, 10 students reached 96 points above and none of the students got 55 and below 55.

4.4.2 Post-Test of the Control Group

There is no significant difference between pre-test and Post Test in control group. The post test result (Appendix 11) shows that the students' mean score was 77.79. The mean score seems to improve 5.13 points higher than before. However, Table 2 below indicates more detail score distribution that occurs in control group.

Surprisingly, the number of bright students decreased from 2.08% to 0%. Yet, no more students got below or equal to 55. Table 2 tells that the largest distribution is at category 4 (76 to 85). It means that there are more students at 76 to 85 score range compared to the previous condition.

Table 9:
The Difference of Pre-Test and Post Test Score in
Control Group (N=48)

Pre-Test			Post Test		
Score Range	Number of Students	%	Score Range	Number of Students	%
≤ 55	3	6.25%	≤ 55	0	
56 - 65	14	29.16%	56 - 65	4	8.33%
66 - 75	11	22.91%	66 - 75	16	33.3%
76 - 85	14	29.16%	76 - 85	20	41.66%
86 - 95	5	10.41%	86 - 95	8	16.6%
≥ 96	1	2.08%	≥ 96	0	
Mean: 72.66			Mean: 77.79		

It seems that there is no such extreme group (that is significantly poor or significantly excellent) in control group. Most students have almost common score ranging between 76 to 85, indeed their number is bigger than before.

4.3 Independent Samples T-Test Analysis

The comparison of the means of Post Test between experimental (1) and control (2) groups is shown in Table 13 below;

Table 10: Group Statistics T-Test

1 Exp, 1 Control		N	Mean	Std. Deviation	Std. Error Mean
Score	1	43	86.16	10.639	1.622
	2	48	77.79	8.939	1.290

The experimental group has bigger standard deviation (10.639) of scores between the students compared to the students in control group (8.939). It means that some students in experimental group have experienced significant score's difference and almost unequal capability while some students in control group almost had

few differences and apparently the students' competence in control group is almost equal.

Meanwhile, the t-test calculation between two groups is shown in Table 14 below. The SPSS 17 output below defines that the t_{value} of assumed equal variances is $4,077 > t_{\text{table}} = 1,662$ (Dougherty, 2002), with the degree of freedom (df) is 89 ($N-2$). This means that web-based collaborative inquiry learning had brought difference between experimental and control group's learning. Table 14 also indicates that the difference is significant since the significance value is $0.00 < 0.05$. Therefore it confirms that H_0 is rejected.

Table 11: Independent Sample T-Test Output

	t-test for Equality of Means					
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Diff.	95% confidence interval of the difference
						Lower Upper
Equal variances assumed	4.077	89	.000	8.371	2.053	4.291 12.451
Equal variances not assumed	4.038	82.454	.000	8.371	2.073	4.248 12.495

The result shows that there is significant difference between the students taught with web-based collaborative inquiry learning and those taught without web-based collaborative inquiry learning.

4.4 Two-Way-Analysis of Variance (ANOVA)

Two-Way-ANOVA SPSS output below (Table 15) figures out how Web-based collaborative inquiry learning effected control and experimental group and the three levels of test achievers (High, Medium and Low) from each group. Univariate analysis or factorial analysis or Two-Way-ANOVA of SPSS 17 at least

yields four outputs: ‘Test of between Subjects-Effects’, ‘Multiple Comparisons’, ‘Profile Plots of Estimated Marginal Means of Score between Groups’ and ‘Profile Plots of Estimated Marginal Means of Score between Levels of Test Achievers’. Table 5 describes the subjects (experimental group, control group, high achievers, medium achievers, low achievers, and post test score). Table 5 shows that the influence of all independent variables toward dependent variable (shown by ‘Corrected Model’ row) is significant (Sig.) $0.000 < 0.05$ (5%). This means that the Two-Way ANOVA model is good and valid as an analysis tool to interpret all factors.

Table 12: Test of between Subjects-Effects
Dependent Variable: Post Test Score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5628.906 ^a	5	1125.781	21.406	.000
Intercept	606973.413	1	606973.413	11541.274	.000
Group	1666.703	1	1666.703	31.691	.000
Category	1205.914	2	602.957	11.465	.000
Group * Category	2698.478	2	1349.239	25.655	.000
Error	4470.281	85	52.592		
Total	618217.000	91			
Corrected Total	10099.187	90			

a. R Squared = ,557 (Adjusted R Squared = ,531)

‘Intercept’ (Sig. = $0.00 < 0.05$) explains that the dependent variable could significantly have different value even without the influence of independent variable. ‘Group*Category’ explains that the independent variables of the two groups (control and experiment) and levels of test achievers (high, medium and low) have significantly influenced the dependent variable (post test score) at Sig.=

0.00 < 0.05. The 'Error' value is 4470.281 is smaller than 'Intercept' and 'Corrected Model' value. It signifies that the model is good, since the smaller the 'Error' value the better the model is (Hidayat, 2012). R Squared (0.557) indicates that there is a strong correlation between two variables (Sujarweni & Endrayanto, 2012:61). Meanwhile, Table 13 shows multiple comparisons to figure out which variables (category and group) have the significant difference.

Table 13: Multiple Comparisons

Score LSD		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
(I) 1 High, 2 Medium, 3 Low	(J) 1 High, 2 Medium, 3 Low				Lower Bound	Upper Bound
1	2	8.53*	1.859	.000	4.83	12.23
	3	7.31*	1.843	.000	3.64	10.97
2	1	-8.53*	1.859	.000	-12.23	-4.83
	3	-1.22	1.889	.519	-4.98	2.53
3	1	-7.31*	1.843	.000	-10.97	-3.64
	2	1.22	1.889	.519	-2.53	4.98

Based on observed means.

The error term is Mean Square(Error) = 52,592.

*. The mean difference is significant at the 0,05 level.

Based on Table 13 above, the significant difference is marked using (*) and all categories' differences are significant. The categories which are compared are group and levels of test achievers. Profile plots (Diagram 3) below describe whether there is interaction effect between experimental and control group.

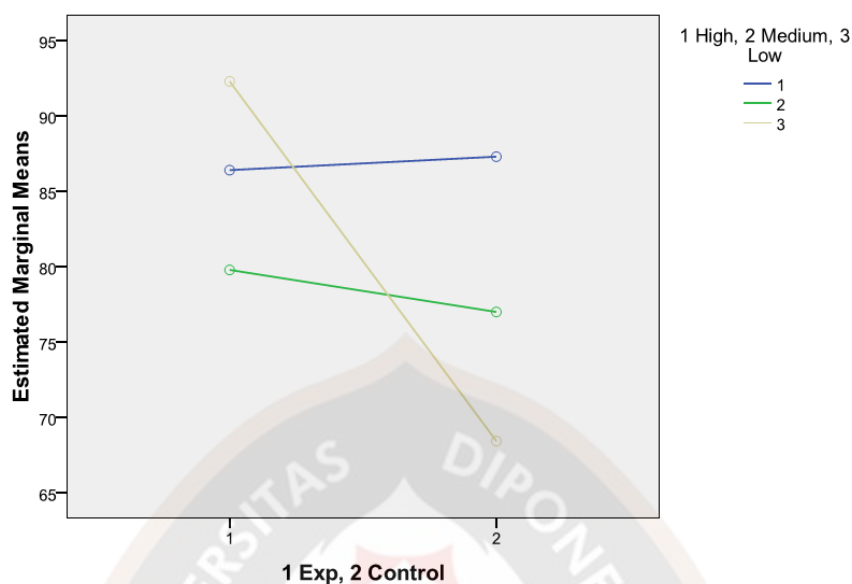


Diagram 6: Profile Plots of Estimated Marginal Mean of Scores between Groups

The plots show that the scores of low achievers in experimental group improve significantly higher than low achievers in control group compared to other levels (medium and high achievers). Medium achievers also improve quite high but it is not as significant as low achievers. Ironically the high achievers in experimental group get lower scores compared to the high achievers in control group, although the reduction is not too significant.

The finding shows that Web-Based Collaborative Inquiry Learning model really boosted the slow and medium learners through group sharing and group work in collaborative setting. Yet, the model could not help the fast learners. Apparently, the fast learners or high achievers were more comfortable to study reading individually than collaboratively. Since high achievers in control group perceive higher learning output than those in experimental group (Diagram 3).

Meanwhile, Diagram 4 below describes the estimated marginal mean of scores between test achievers.

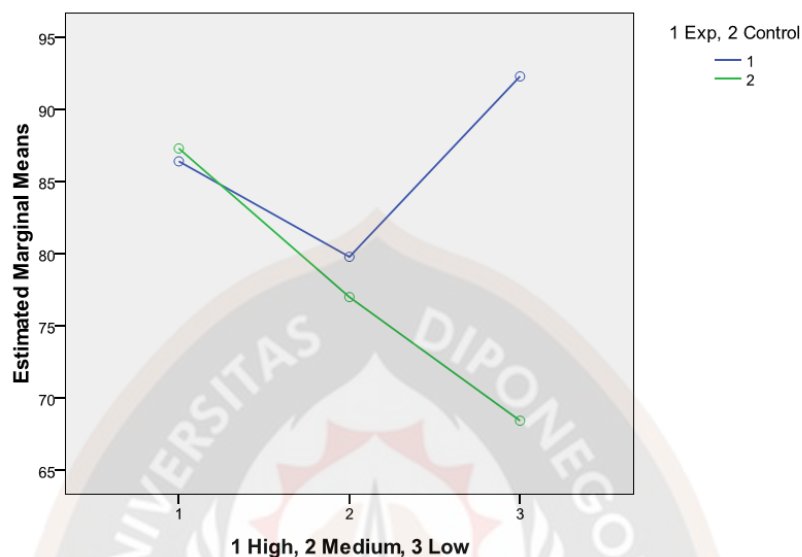


Diagram 7: Estimated Marginal Mean Of Scores between Test Achievers

There is significant improvement of low achievers in experimental group (blue) which is slightly narrowing up as seen on Diagram 4. The condition is very contradictive to the low achievers in control group which is slightly narrowing down. The interaction effect does not extremely happen for medium and high achievers, since the dots are quite balance or equal in position. This finding also confirms that Web-Based Collaborative Inquiry Learning model has distinguished both groups (experiment and control) in terms of boosting low achievers reading competence.

4.5 Discussion

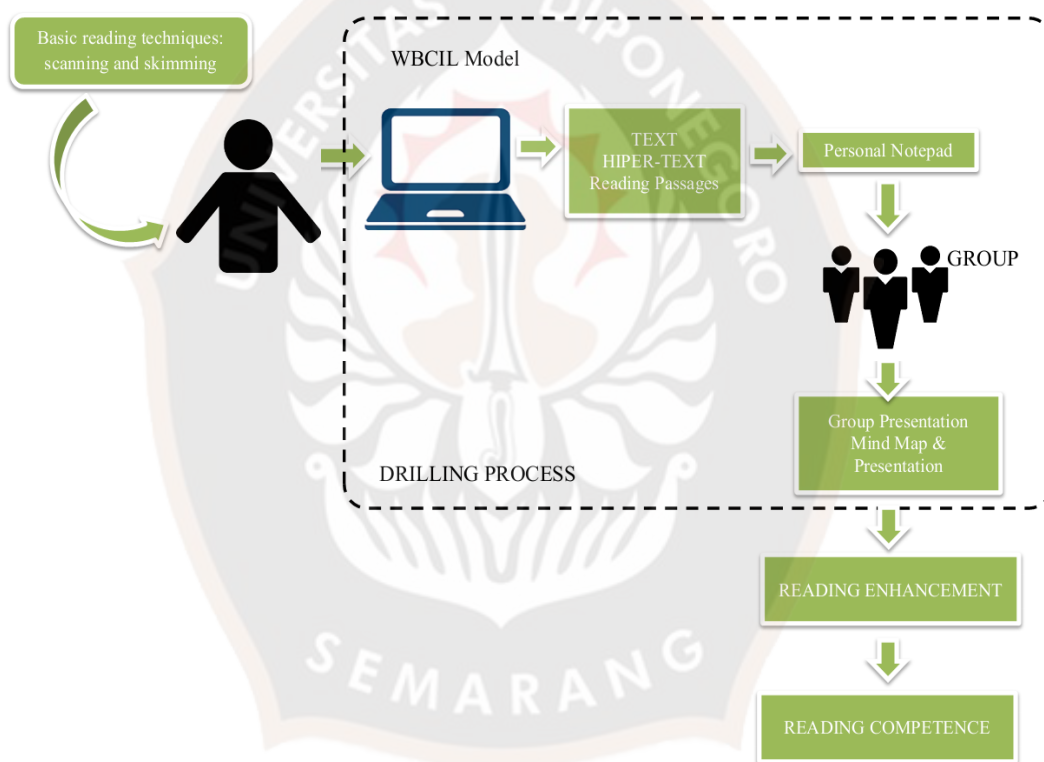
4.5.1 How Web-Based Collaborative Inquiry Learning Model Improves Students Reading Competence

Web-Based Collaborative Inquiry Learning model applied in this study was aimed to accelerate students reading competence by encouraging students to have better preference to reading activity, at the first place. In relation to reading preference, the encouragement given by WBCIL model could bring these following conditions: (1) WBCIL activated inquiry as the process to gain knowledge and to learn comprehensively in terms of finding word meaning in a reading process, (2) WBCIL also stimulated autonomous learning since the students are able to experience more opportunity to control their own phase of learning, (3) since the students obtained more opportunity to control their own learning, they could practice to read more and use the given reading techniques to understand a reading passage. Picture 2 describes the process of how WBCIL supports reading competence.

At the beginning, basic reading techniques (scanning and skimming) were given to the students. Scanning focused on how students found gist or specific information and skimming focused on how students recognized the main idea of a passage. Meanwhile, higher reading task as making inference and drawing conclusion were not targeted in this study due to their basic English competence.

Then, the students explored the internet and found text and hypertext in the form of abundant reading passages. They were asked to read and make some notes

in their personal notepads based on keywords or phrases. For low achievers, they copied and pasted some sentences they thought as important information about a certain problem. By doing so, they were practicing scanning and skimming as well as learning some English vocabularies although at their initial phase of learning they looked up the word meaning in *Bahasa* with the assistance of online translator machine.



Picture 2: WBCIL and Reading Competence

After completing their personal notepad, the students went to group work. In the group they shared information and ideas. This activity helped low achievers to check whether their reading techniques application worked well or not. Some high

achievers in experimental group could convince the other members of the group to accept their findings. At this moment low achievers learned better from their peers through sharing session. Even there were two small groups where the group presentation was conducted by low achievers. Overall, those activities were part of drilling process to train students' reading techniques.

At a very basic level, those activities above indirectly expanded students' reading activity and gradually gained students' reading competence. Although eight meetings of treatment could not prove extremely significant improvement of reading competence, at least there was drilling process occurred. Finally, the students' reading competence was tested through the result of Post Test which was higher compared to control class.

Based on observation, there were three products generated from students' individual phase and group phase: (1) students' personal notepad, (2) group discussion and (3) group presentation. Those products became minor consideration to measure how they understand English reading text that they found during inquiry process. This also indicated that the students practiced reading and indirectly applied some reading techniques (skimming and scanning) by the time they were doing inquiry phases.

4.5.2 Personal Notepad Formulation

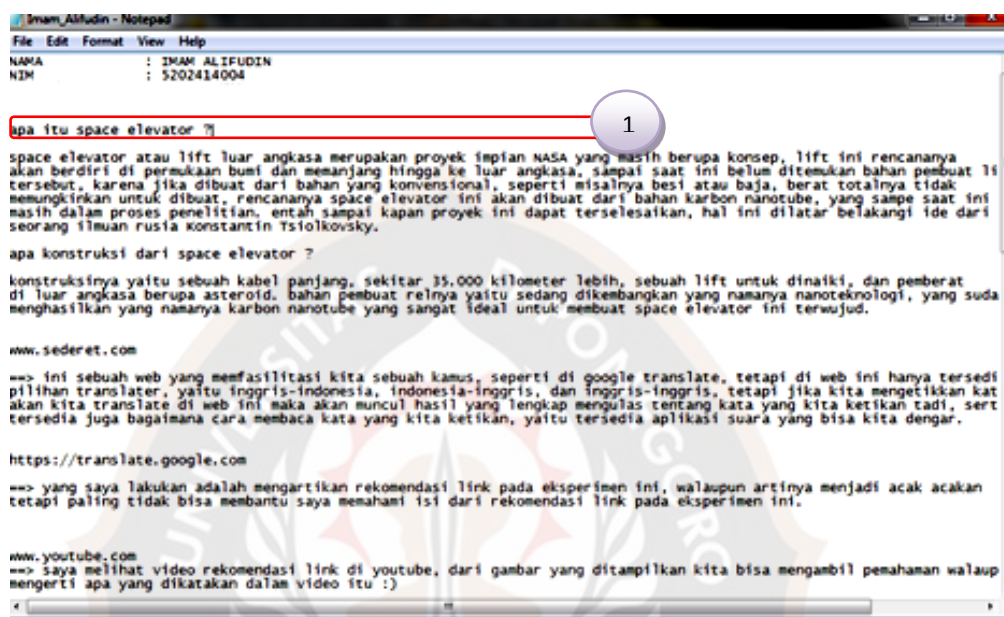
Notepad—as one program in Window was used as a tool to measure the process of inquiry which the students experienced. It was by tracking how the students' inquiry process occurred through students' note dealing with web

address, citation and learning activities that they did in a particular web address. The teacher urged them to elaborate their investigation by exploring more webs related to the given topic. Unfortunately, all of them missed the instruction. None of them investigated other web addresses but YouTube and Online Dictionaries. It could be mentioned that the students' inquiry process was still at structured inquiry where question and procedures were provided by the teacher (Banchi & Bell, 2008: 26-28). It also proves that Notepad has been an efficient instrument to see the process of inquiry.

Through personal Notepad formulation, the students learned several things. First, the students were stimulated to the teacher's critical question such as "What is space elevator?" "What were ideas found in the creation of space elevator?" and "How does the space elevator look like?" Those critical questions urged the students to explore or find out more information on the web. Second, the students got their own opportunity to convey their own idea and interpretation toward information. Personal Notepad was an individual product that caused students' various interpretation. Third, the students did not only provide various answers but also various actions toward a certain web address such as Google Translate, YouTube or Sederet.com. Some of them showed clear actions but the rest did not even do anything on the sites above.

The student personal notepad shows that he really found out the information about space elevator then wrote it using his own words. Unfortunately he did not mention the sites where he obtained the information. He used Google Translate to overcome difficult articles written in English. He admitted that Google Translate

barely translated the document and made bad translation but at least he could understand the main point of the translation. His understanding got better when he opened YouTube and watched the simulation of space elevator.



Picture 3: Student Personal Notepad

All information that were noted and cited on Notepad during individual phase would be shared to their friends in a group of 6 to 8 people. Each student had to be ready with their ideas, their information and their evidences before they worked in a group. Probably their friends had different understandings and evidences or even new information that he did not have it before. Because of this condition, few less excellent and less motivated students did not write much information on their Notepad. It seemed that they relied on their friends during group discussion later on.

4.5.3 Group Discussion

The aim of group discussion was to share information, argue evidences and find out new information that was not obtained before. The students were grouped and they were given enough time to have discussion with their friends. By doing this activity, the students could provide more complete and detail Notepad compared to the first Notepad that they made during individual phase.



Picture 4: Students Conducted Group Discussion

The students enjoyed group discussion and learned better from their friends. Each member of the group took part in the discussion. The students also became more confident to talk and share ideas. For less motivated students, they were stimulated to contribute in inquiry process by receiving information from their friends. For less excellent students, they also had the willingness to write their

Notepad, after their friends told them so. Interestingly it was found out that less excellent and less motivated students learned better because of their friends. Since they were adult learners, they could well manage arguments and differences by silence or asking question. They could also yield final decision which was quite fair for all members in the group. One's inquiry process was not disturbed when it was shared collaboratively, but it grew into more complex thought. The following picture is a student's notepad after group discussion.

After group discussion accomplished, the group pointed two representative members to be group presenter. The students would have another discussion to prepare group presentation dealing with space elevator extensive reading. Picture 5 describes the new content of student's personal Notepad after group discussion.

Based on student's Notepad (Picture 3), the information about space elevator became wider and more complete compared to the previous information. Moreover, the student also noted Wikipedia site to obtain more information about space elevator. The student's writing shows that the group discussion had brought a positive impact regarding his knowledge and his inquiry process. It was based on the more abundant words that he wrote in his Notepad.

NAMA : IMAM ALIFUDIN
NIM : 5202414004

apa itu space elevator ?
space elevator atau lift luar angkasa merupakan proyek impian NASA yang masih berupa konsep, lift ini rencananya akan berdiri di permukaan bumi dan memanjang hingga ke luar angkasa, sampai saat ini belum ditemukan bahan pembuat lift tersebut, karena jika dibuat dari bahan yang konvensional, seperti misalnya besi atau baja, berat totalnya tidak memungkinkan untuk dibuat, rencananya space elevator ini akan dibuat dari bahan karbon nanotube, yang sampe saat ini masih dalam proses penelitian. entah sampai kapan proyek ini dapat terselesaikan, hal ini dilatar belakangi ide dari seorang ilmuwan rusia Konstantin Tsiolkovsky.

apa konstruksi dari space elevator ?
konstruksinya yaitu sebuah kabel panjang, sekitar 35.000 kilometer lebih, sebuah lift untuk dinaiki, dan pemberat di luar angkasa berupa asteroid. bahan pembuat relnya yaitu sedang dikembangkan yang namanya nanoteknologi, yang sudah menghasilkan yang namanya karbon nanotube yang sangat ideal untuk membuat space elevator ini terwujud.

www.sederet.com
==> ini sebuah web yang memfasilitasi kita sebuah kamus, seperti di google translate, tetapi di web ini hanya tersedia 3 pilihan translator, yaitu inggris-indonesia, indonesia-inggris, dan inggris-inggris, tetapi jika kita mengetikkan kata yang akan kita translate di web ini maka akan muncul hasil yang lengkap mengulas tentang kata yang kita ketikkan tadi, serta tersedia juga bagaimana cara membaca kata yang kita ketikkan, yaitu tersedia aplikasi suara yang bisa kita dengar.

lintasan space elevator, yaitu carbon nanotube, tetapi untuk membuatnya sangat sulit, sekarang saja baru jadi 30 cm, sedangkan yang diperlukan adalah 35.000 kilometer lebih.

http://en.wikipedia.org/wiki/Space_elevator
==> intinya adalah disitu dijelaskan asal mula munculnya ide pembuatan space elevator yang terinspirasi dari menara effel yang kemudian dikembangkan oleh para ilmuwan mulai dari tahun 1960an, dari mereka banyak muncul konsep konsep mengenai space elevator ini. tetapi belum bisa diwujudkan, penelitian ini masih berlanjut sampai saat ini, hingga sekarang mulai menemukan titik terang yaitu ditemukannya sebuah material yang dinamakan carbon nanotube, yang ideal untuk membuat lintasan space elevator, yang mungkin bisa merubah konsep menjadi kenyataan.

www.google.com==> images

Picture 5: Student's Personal Notepad after Group Discussion

4.5.4 Group Presentation

Group presentation session was to strengthen students' understanding about a particular topic. This kind of activity could be suitable activity for extensive reading and inquiry learning, since the process of gaining knowledge still occurred during the preparation of group presentation. By conducting another discussion session, the students were well planned and the group could provide

strong opinion or idea about a particular topic—Space Elevator. Then the teacher formulated cooperative learning game as proposed by Jacobs et al (1997: 66-67) named the ‘One Stay and Two Stray’ game with variation using the following steps:

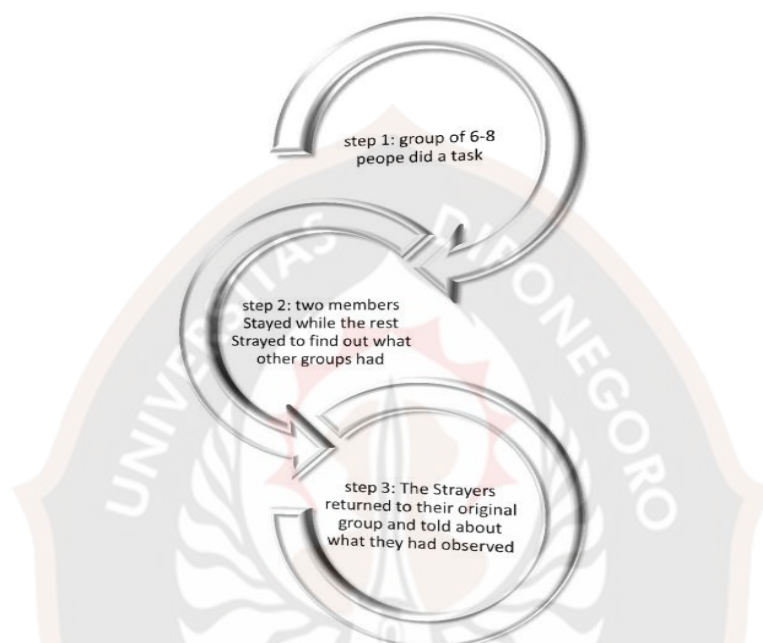
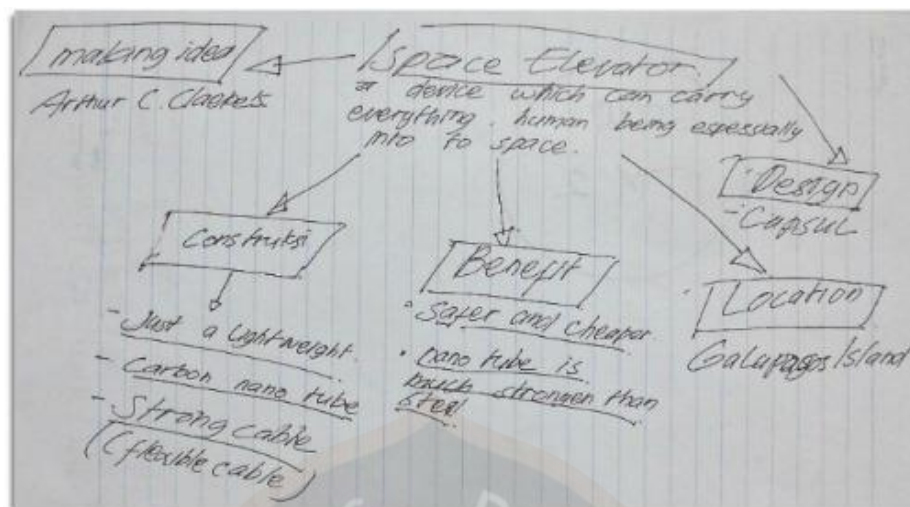


Chart 6: ‘One Stay and Two Stray’

Before the presenters performed the group discussion result, the group created presentation mind map. It was similar to writing mind map, but here the mind map was used to guide the flow of presentation so that the speech was well structured. It mapped their group findings—based on individual and group inquiry results about space elevator.



Picture 5: Group Presentation Mind Map

Based on the students' presentation mind map, the inquiry process could be obviously seen. When they had to find more information about 'Space Elevator' they got some findings such as (1) the detailed description of the Space Elevator including the, initiator, construction, benefit, length, location and design of the elevator, (2) other additional information which were also crucial, like; the reason why NASA asked engineers to create the Space Elevator including the benefits and purposes, (3) the drawbacks of Space Elevator that could possibly be found as mentioned by some experts.



Picture 6: Group Presentation

Picture 5 is an example of Group Presentation Mind Map. During their presentation, the presenters talked about the idea of space elevator, the construction, the benefit and the location of the space elevator. Both of the presenters could present the points together or in turn, while the Strayers from other groups watched, listened and evaluated their presentation. When the Strayers came back to their original group, they may inform the group about the new ideas or knowledge that their group may not perceive.

The language, used in learning during the production of presentation mind map and the presentation itself, was not 100% English. It was because the learning in this study was not to enhance English fluency in writing and speaking but it was to increase students' reading preference to English passage. Thus, it could enhance reading competence when the students solved reading Post Test.

The teaching and learning process occurred quite enthusiastically in experimental class. All students participated in the discussion, they were more confident toward themselves and they could appreciate themselves better. Less excellent and less motivated students were also affected by the atmosphere, so that finally they could adapt with the situation. Obviously, as Banchi & Bell (2008) proposed about levels of inquiry, this study uses the lowest inquiry level. At the beginning open inquiry level was applied at the first and second meetings then finally the teacher revised the technique and decided to apply web-based inquiry learning at confirmation and structured level collaboratively.

Group works occurred successfully as the media to accelerate students' participation, motivation and confidence then boost their learning. All students were actively involved including less excellent students. Interestingly, based on Two-Way-ANOVA outputs (Diagram 3 and 4), less excellent students could get significant improvement compared to excellent students. The plots show that low achievers in experimental group improve significantly higher than low achievers in control group. Meanwhile, high achievers in experimental group get lower scores compared to the high achievers in control group.

Group presentation may motivate less active students to move and mingle as they did the variation of "One Stay Two Stray" game. Initially, some less excellent students observed how their friends present their findings, then gradually they had willingness to ask questions to the presenters since the teacher allowed them to do so.

Overall, reading class in experimental class became more challenging and more fun, since they could get extensive reading together with the reading itself. The success of WBCIL model in the experimental group may be affected by some external factors. First, it was because the students experienced longer opportunity to learn English. They shared ideas and gathered friends' data outside the classroom to solve reading problems. Second, the teacher gave homework due to the limitation of time. Third, the teacher gave more reading passages so that the students could practice more.

However, the condition was different from control group. Control group students got good to excellent scores in Pre-Test, therefore the teacher considered that they were better raw material compared to the experimental group. Although the teacher taught them using lecturing and individual drilling method, the students understood better than experimental group. Therefore, they did not have any homework and this probably made their exposure to English less optimal.

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusions

Web-based Collaborative Inquiry Learning model given to the samples in Mechanical Engineering Department of UNNES was hopefully to follow the principles as proposed by Bruner and Chang which was first introduced in this study. However, due to the application of guided inquiry, the inquiry cycles did not occur as highlighted by Bruner. 'Asking' cycle did not come naturally from the students. In fact it was stimulated by the teacher. Even anchoring and planning phase as highlighted by Chang et.al was a challenging phase faced by the students.

Both control and experimental groups achieved improvement in Post Test, but only experimental groups achieved better improvement with 8.37 points higher. By applying WBCIL model, slow and medium achievers got better Post Test scores in experimental group, but it was less than optimal for the high achievers. Overall, this study brings some conclusions as the following:

1. Students' reading competence improved higher when they are taught with WBCIL. It is based on their achievement in Post Test that the students' mean score was 86.16 and previously in Pre-Test, the mean score was 72.39. It shows that the students' mean score in Post Test was 13.77 points higher compared to the students' mean score in Pre-Test.

2. Students' reading competence improved lower when they are taught without WBCIL. The students' mean score in control group also increased from 72.66 in Pre-Test to 77.79 in Post Test. However, the improvement was only 5.13 points higher compared to their Pre-Test. Still, the mean score difference in control group was lower compared to the mean score difference in experimental group.
3. There is a significant difference between students who are taught with WBCIL and without WBCIL. First, the significant difference was signified by the result of Independent Samples T-Test Analysis—where the t_{value} (4.077) is bigger than t_{table} (1.662), therefore it is claimed to be significant. Second, it is based on Two Way ANOVA outputs which are represented through some following outputs: Test of between Subjects-Effects, Multiple Comparison, Profile Plots of Estimated Marginal Mean Scores between Groups and Test Achievers. Those outputs confirm the strong interaction between experimental and control group to significantly differ from each other.

5.2 Suggestions

The main problems are solved with encouraging result, however there remain some limitations to consider. This study confirms what Chang et.al (2003) considers as the challenge of applying Web-Based Collaborative Inquiry Learning (WBCIL) to teach reading that: (1) during the production of presentation mind map, concept mapping is a challenging task for students, (2) some low achievers

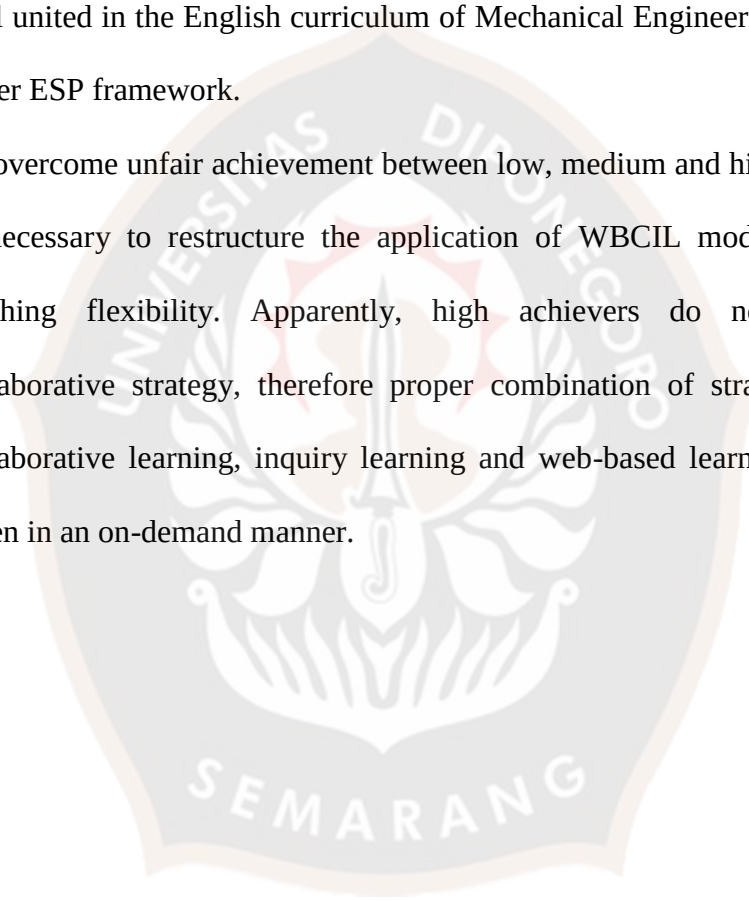
tend to spend less effort in organizing their reading into notepad and group sharing, indeed they often depended on medium and high achievers, and (3) due to time limitation, WBCIL model could not be applied in a full combination—between web study, inquiry learning and collaborative learning.

The level of inquiry found in Mechanical Engineering students were still at guided level (Banchi & Bell, 2008: 26-28), where questions and procedures were still provided by the teacher. It was reasonable due to their exposure toward English at their first semester and the English teaching concept that they had been receiving in regular class. The students need more exposure to inquiry learning to be able to yield guided and open inquiry as the advance level of inquiry.

Meanwhile, the strategies to reading comprehension (Marzano, 2004: 35 in Morellion, 2007: 40) had not been fully applied. Since inquiry and collaborative learning became the main concept in this study, the students mostly activated their background knowledge then determined main ideas in the text. Indirectly synthesizing process ($\text{Information} + \text{Response} = \text{Synthesis}$) could occur in web-library collaboration.

Based on profile plots in Diagram 6 and 7, WBCIL model applied in this study enhanced low and medium achievers more than high achievers. This also brings a new homework to find out the proper solution to overcome unfair achievement between low, medium and high achievers. Therefore, those limitations above lead to the following suggestions which are worth considered for further studies:

1. Further observation will be necessarily needed to see whether there is still any significant impact if the method is applied in longer meetings—for instance the whole semester and whether there is an impact if the method is applied in other departments or universities.
2. An effective Web-Based Collaborative Inquiry Learning practices should be well united in the English curriculum of Mechanical Engineering Department under ESP framework.
3. To overcome unfair achievement between low, medium and high achievers, it is necessary to restructure the application of WBCIL model in terms of teaching flexibility. Apparently, high achievers do not cope with collaborative strategy, therefore proper combination of strategies such as collaborative learning, inquiry learning and web-based learning need to be given in an on-demand manner.



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Appendix 1:
Students' Score for Material Engineering Subject

MK: BAHAN TEKNIK (2 SKS)/SEMESTER GASAL TAHUN 2014/2015/PTO-02

NO.	NIM	NAMA	RNH	UTS
		BOBOT	2	3
1	5202411022	BAYU SULISTYO	0	0
2	5202411030	RIPDIAN ENGGAR WAHYU SAPUTRA	0	0
3	5202414001	AJENG KURNIA LESTARI	86	58
4	5202414002	WILLY WIJAYA	98	70
5	5202414003	PIYAN FITRIYANTO	86	80
6	5202414004	IMAM ALIFUDIN	98	60
7	5202414005	LUKMAN HAKIM	90	35
8	5202414006	ELLFEBA SYAMSIDH PRATAMA	85	18
9	5202414007	NADYA ROZALINA ARBAIN	87	25
10	5202414008	DARMADI ANWAR	98	75
11	5202414009	EKO SUGIONO	88	80
12	5202414010	FARIZ IRHAM H	88	45
13	5202414011	DEA PITHALOKA ROSALIN	87	70
14	5202414012	FAJAR KHAKIKI	87	65
15	5202414013	EKO BUDI WIBOWO	96	65
16	5202414014	ANGGA ARDI HERMAWAN	85	26
17	5202414015	YUSUF FIRMANSYAH	87	40
18	5202414016	SINTIYA SELF LARASSARI	90	30
19	5202414017	EVAN SUSENO ANGGIT	85	30
20	5202414018	MUHAMMAD ZAKKI MULTAZAM	86	51
21	5202414019	ANDRI HIMAWAN	84	48
22	5202414020	SETYO NUGROHO	87	85
23	5202414021	DWI RAHMAD SETIYONO	87	80
24	5202414022	AZIS IMRON ROSADI	87	65
25	5202414023	HIDAYAT RESTU PURNAMA	86	28
26	5202414024	MOH. MA'RUF MUBASIR	86	80
27	5202414025	RIZKI HADI AMINUDIN	87	85
28	5202414026	MAHFUD FAUZI	86	85

Students' Score for Material Engineering Subject (2)

29	5202414027	FAJAR WIJANTO	86	80
30	5202414028	AZHAR PERMANA ALAM	86	40
31	5202414029	FAIZ AFIFUDIN	86	35
32	5202414030	MUHAMMAD ANDHI IRAWAN	98	50
33	5202414032	KIKI BAGUS SUDIROH	85	56
34	5202414033	RYO META OLYMPIA	86	70
35	5202414034	MUKHAMMAD IRFAN ZIDNI	88	61
36	5202414035	FERY ARIE SUSETYO	85	55
37	5202414036	INDORIANA PUTRI JAMARI	96	68
38	5202414037	SAKANA SAKINAN	90	85
39	5202414038	WISNU ADI WINOTO	91	10
40	5202414039	RIZKI NURYANTO	86	50
41	5202414040	ANANG PRASETIA	88	8
42	5202414041	TINO BARI	85	48
43	5202414042	ROY ASEP PRASTYO RINDIYANTO	90	90
44	5202414043	FEBRY DWI KURNIAWAN	97	26
45	5202414044	AGUS RINANTO	91	85
46	5202414045	SYAHDAN SIGIT MAULANA	90	80
47	5202414068	TRIMO	90	50
48	5202414096	KHOLIS SETIAWAN	97	53

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Keterangan:

Silahkan ganti bobot nilai untuk setiap komponen sesuai dengan kontrak perkuliahan

RNH=Rerata Nilai Harian (*Daily Score Average*), UTS=Ujian Tengah Semester (*Mid Semester Score*)

Appendix 2:

 UNIVERSITAS NEGERI SEMARANG	FORMULIR	No Dokumen	
	FORMAT SILABUS	No Revisi	
		Tanggal berlaku	September 2013
		Halaman	1 dari 1

SILABUS

Fakultas : Teknik
 Jurusan/Prodi : Teknik Mesin /PTM
 Mata Kuliah : Bahasa Inggris
 Kode Mata Kuliah : U0010010
 SKS : 2
 Standar Kompetensi : Mahasiswa menguasai tata bahasa (*grammar*) dan kosakata (*vocabulary*) dalam Bahasa Inggris untuk kemudian mengaplikasikannya secara lisan atau tulisan, sehingga setelah perkuliahan ini mahasiswa semakin fasih berbicara dengan Bahasa Inggris (*speaking*).

Kompetensi Dasar	Materi Pokok Pembelajaran	Kegiatan Pembelajaran	Indikator	Penilaian	Alokasi Waktu	Sumber Belajar
Mahasiswa fasih dan percaya diri untuk memperkenalkan dirinya sendiri atau mengenal orang lain	- <i>Introduction</i>	Menjelaskan cakupan materi & berdiskusi	Menjelaskan tata cara memperkenalkan diri atau mengenal orang lain & mempraktikkan tata cara tersebut dengan teman sekelas	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
Mahasiswa mampu memahami kembali penggunaan <i>part of speech</i> seperti <i>noun, pronoun, adjective, adverbs,</i>	- <i>Part of Speech</i> - <i>Tenses</i> - <i>Numbers</i>	Menjelaskan cakupan materi, berdiskusi & latihan soal	Mahasiswa dapat menjelaskan kembali tentang konsep <i>part of speech</i> seperti <i>noun, pronoun,</i>	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
<i>article</i> dan penggunaan <i>tenses</i> yang pernah diajarkan di semester sebelumnya serta mengetahui jenis-jenis <i>numbers</i> .			<i>adjective, adverbs, article</i> dan penggunaan <i>tenses</i> serta mengenal jenis-jenis <i>numbers</i> .			
Mahasiswa menguasai pola penyusunan kalimat pasif dalam <i>tenses</i> yang telah diajarkan.	<i>Passive Sentences</i>	Menjelaskan cakupan materi, berdiskusi & latihan soal	Mahasiswa dapat memahami pola penyusunan kalimat pasif dalam <i>tenses</i> yang telah diajarkan.	Tes tertulis, tes lisan & penugasan	200	Buku Panduan
Mahasiswa memahami <i>modals</i> beserta pola penyusunannya dalam kalimat aktif maupun pasif.	<i>Modals in Both Active and Passive Sentences</i>	Menjelaskan cakupan materi, berdiskusi & latihan soal	Mahasiswa mengerti tentang <i>modals</i> dan pola penyusunannya dalam kalimat aktif dan pasif.	Tes tertulis, tes lisan & penugasan	200	Buku Panduan
Mahasiswa mempresentasikan cara mengoperasikan atau menggunakan sebuah barang.	<i>How to Use or Operate It</i>	Menjelaskan cakupan materi, presentasi & latihan soal	Mahasiswa menerangkan prosedur penggunaan suatu barang	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
Mahasiswa menguasai <i>vocabulary</i> dalam dunia permesinan dan cara melafalkannya.	<i>Vocabulary in Mechanical Field and Its Pronunciation</i>	Menjelaskan cakupan materi, berdiskusi & latihan soal	Mahasiswa mengetahui <i>vocabulary</i> dalam dunia yang ditekuni mereka.	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
Mahasiswa dapat menguasai semua materi yang telah diberikan hingga	Semua materi selama tiga bulan pertama	Mengerjakan <i>mid-test</i>	Mengevaluasi penguasaan para mahasiswa mengenai semua	Tes tertulis & tes lisan	100	Buku Panduan

tengah semester			materi yang diberikan			
Mahasiswa mengetahui sekilas tentang pentingnya Bahasa Inggris dalam dunia kerja dan mengetahui bagaimanakah wawancara kerja dalam bahasa Inggris	- <i>English Working Hemisphere</i> - <i>English Job Interview</i>	Menjelaskan cakupan materi, praktik wawancara & diskusi	Mahasiswa menyadari pentingnya bahasa Inggris dalam karirnya kelak	Tes tertulis, tes lisan & penugasan	200	Buku Panduan
Mahasiswa memiliki kepercayaan diri dalam menuliskan ide-idenya dalam sebuah teks dengan menggunakan Bahasa Inggris.	<i>Let's Write in English about The Plan of Future Machine</i>	Menjelaskan cakupan materi, praktik <i>writing</i> & diskusi	Mahasiswa menghasilkan teks berbahasa Inggris dengan representasi konkrit ide-ide yang bercokol di benak mereka	Tes tertulis, tes lisan & penugasan	200	Buku Panduan
Mahasiswa meningkatkan kemampuan <i>reading</i> dengan pelafalan yang tepat.	<i>Reading Mechanical Text</i>	Menjelaskan cakupan materi, praktik <i>reading</i> & latihan soal	Mahasiswa dapat membaca teks mengenai nemesinan dengan pelafalan yang tepat.	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
Mahasiswa mampu menampilkan semua materi yang telah diajarkan dalam sebuah drama.	Drama Berbahasa Inggris dengan Beragam Tema (<i>English Drama with Various Themes</i>)	Menjelaskan cakupan materi & mempertontonkan drama	Mahasiswa dapat meningkatkan kepercayaan dirinya karena harus berhadapan dengan banyak orang.	Tes tertulis, tes lisan & penugasan	100	Buku Panduan
Mahasiswa dapat menjawab semua pertanyaan-pertanyaan yang berkaitan dengan materi yang sudah diberikan dengan baik	Semua materi selama tiga bulan terakhir	Mengerjakan <i>final test</i> (UAS)	Mahasiswa dapat menjelaskan kembali tentang materi pertemuan ke-9 sampai dengan ke-15 yang sudah diberikan selama setengah semester	Tes Tertulis & Tes lisan	100	Buku Panduan

Sumber Pustaka:

Buku Panduan merupakan ringkasan dari buku-buku berikut.

- Hornby, A.S. 1971. *A Guide to Patterns and Usage in English*. Great Britain: Oxford University Press
- Murphy, Raymond. 1985. *English Grammar in Use*. Cambridge: Cambridge University Press
- Simanjuntak, Herpinus. 2009. *Bahasa Inggris Sistem 52 M Jilid 1*. Jakarta: VISIPRO Divisi dari Kesaint Blanc
- Simanjuntak, Herpinus. 2009. *Bahasa Inggris Sistem 52 M Jilid 2*. Jakarta: VISIPRO Divisi dari Kesaint Blanc
- Wiratno, Tri. 2003. *Mencerna Buku Teks Bahasa Inggris Melalui Pemahaman Gramatika*. Yogyakarta: Pustaka Pelajar Offset

Appendix 3:

Inquiry State	Instructional Strategies
Ask	- To make questions meaningful to students, the teacher asks students to: - Solve contemporary world problems - Evaluate history - Create a product/project - Handle life realities - Trigger imagination The activities are used to encourage students to pursue answers to their own questions. Teachers try to catch the teachable moment. - Teacher and students reflect together on introductory material, talk about the parts that draw students' interest, and think together about ways to further explore unique perspectives on a subject. - After having students observe a thought-provoking demonstration or a teacher directed activity, the teacher helps students start the inquiry process with a 'What if' or 'I wonder' question.
Investigate	- Teacher allows sufficient time for students to search resources and information to raise and investigate their own questions. - Teacher students various data, charts or concept maps and ask them to describe the relationships and interconnections among concepts for a particular topic. - Teacher poses problems and encourages students to think aloud solutions, rather than to provide a final 'right' answer. - Teacher models possible answers to questions, and allows students to discuss those answers and to suggest alternatives. - Teacher helps students to identify an 'I think...' statement to test and help refine the questions that students care about. - Data are obtained from direct observation, primary text reading, simulations/games, fieldwork, problems, case studies, projects and instrumentation. - Students plan how to investigate their questions. Teacher may review the plan to see if any flaws exist, and provides hints/prompts to revise it. - Teacher provides worksheet and guidelines to facilitate students' investigation.
Create	- Teacher guides students to organize data. Teacher suggests students think aloud, draw concept maps in groups, and think critically and logically about the relationships between evidence and explanations. Teacher challenges students to determine the validity of their conclusions. - Teacher asks students to construct and analyze alternative explanations and to discuss their insights and conclusions. - Teacher provides format that facilitate recording their findings in journals, posters or documents. Teacher guides students to appropriate media to present their findings for discussion. Multimedia presentation may be more interesting, but content should be most important.
Discuss	- Teacher serves as a moderator and guide for students' discussion about their findings. Teacher sets up debate or discussion panel for students. The discussion topics include conclusions and sharing experiences. - Teacher provides students with guiding questions and discussion rules.
Reflect	Teacher suggests students think aloud or draw concept maps to reflect on their newfound knowledge.

READING TEST

Time: 90 minutes

- I. Please read the paragraphs carefully, then choose the best answer A, B, C or D!

Space Elevator

In his 1979 novel, *The Fountains of Paradise*, Arthur C. Clarke wrote about an elevator **connecting** the earth's surface to space. Three decades later, this science-fiction concept is preparing to take off in the real world. NASA has launched the Space Elevator Challenge, a competition with a generous prize fund, and several teams and companies are working on serious research projects aimed at winning it.

As its name suggests, a space elevator is designed to **raise** things into space. Satellites, components for space ships, supplies for astronauts in space stations, and even astronauts themselves are examples of payloads that could be **transported** into orbit without the need for explosive and environmentally unfriendly rockets. However, the altitude of orbital space—a colossal 35,790 km above the earth—is a measure of the challenge facing engineers. How could such a height be reached?

The answer is by using an incredibly strong and **lightweight cable**, strong enough to support its own weight and heavy load. The design of such a cable is still largely theoretical. This would be **attached** to a base station on earth at one end and a satellite in geostationary orbit (fixed above a point on the equator) at the other. Lift vehicles would then ascend and descend the cable, powered by **electromagnetic force** and controlled remotely.

(Ibbotson , 2008: 8)

1. What is the title of Arthur C. Clarke's novel?
 - A. The Fountains of Paradise
 - B. Space Elevator Challenge
 - C. Electromagnetic Force Power
 - D. The Mountains of Surprise

2. What is the challenge faced by engineer to create space elevator (line 13)?
 - A. The prize fund
 - B. The altitude of orbital space
 - C. The transportation fee
 - D. The astronauts

3. What kind of material used to create space elevator (line 15-16)?
 - A. heavy lift vehicles
 - B. Strong and lightweight cable
 - C. Heavy cable with electromagnetic force
 - D. High carbon steel

4. Space elevator is impossible to be true because there is.... (line 16-17)
- no heavy vehicle.
 - no such cable as needed.
 - no gravitation force.
 - no enough financial support.
5. Why does NASA want to make Clarke's novel "The Fountain of Paradise" come true?
- Clarke's idea on the construction of space elevator sounds logical.
 - The novel has become best seller.
 - NASA wants to make bombastic news.
 - Space elevator can save 95% budgets for space transportation.

II. Please match the words at the left with their definition at the right! (see the example)

Connecting	[d]	a. carry objects
6. Raise	[]	b. not heavy cable
7. Transport	[]	c. the pressure caused by electromagnetic power
8. Lightweight cable	[]	d. joining
9. Electromagnetic force	[]	e. fix
10. Attach	[]	f. lift something

III. Please read the paragraphs carefully, then choose the best answer A, B, C or D!

Solar Towers

The need to develop **renewable** energy is widely seen as a **futuristic** technological challenge. In reality, some of the most effective ways of harnessing horsepower from nature are based on concepts that have existed for donkey's years. The wind turbine is an obvious example. Another--less well known, but **conceived** almost a century ago--is the solar tower or solar chimney. And if the Australian company EnviroMission completes an ambitious solar tower project in the New South Wales desert, the technology could **capture** not just the sun's rays but the public's imagination worldwide. The firm is planning to construct a tower a colossal one kilometer high. If built, it will be the world's tallest structure by a huge margin.

How it works

A large glass enclosure is built, with a chimney at its centre. The sun heats the enclosure, causing expansion of the air inside. At the top of the **chimney**, the lower temperature and lower pressure due to the higher

altitude create a pressure differential known as stack effect. This causes air to flow up the chimney. Electricity is **generated** by turbines at the bottom of the chimney, which are driven by the flow of air. The bigger the area of glass and the taller the chimney, the greater the airflow and the higher the generating capacity.

(Ibbotson , 2008: 80)

11. What is the plan of EnviroMission?
 - A. To make wind turbine
 - B. To build solar tower
 - C. To change donkey years
 - D. To make news
12. Where is the solar tower project located?
 - A. In the New South Wales desert
 - B. At the New South Wales desert
 - C. On the New South Wales desert
 - D. In front of the New South Wales desert
13. What causes air expansion inside the chimney?
 - A. The large glass enclosure
 - B. The sun that heats the enclosure
 - C. The lower temperature
 - D. The lower pressure
14. What is 'stack effect' (line 16-17)?
 - A. Air that flows up to the chimney
 - B. Electricity generated from the turbines
 - C. Pressure differential created by lower temperature and lower pressure
 - D. The air flow driven by the chimney
15. The greater the higher the generating capacity (line 20).
 - A. The area of glass
 - B. The air flow
 - C. The chimney
 - D. The turbines

IV. Please match the words at the left with their definition at the right! (see the example)

Renewable	[c]
16. Futuristic	[]
17. Create	[]
18. Capture	[]
19. Chimney	[]
20. Generate	[]

- | | |
|----|--|
| a. | to make |
| b. | to catch |
| c. | restored by natural process |
| d. | the part of such a structure
extending above a roof |
| e. | to produce something |
| f. | very modern |

V. Please read the paragraphs carefully, then choose the best answer A, B, C or D!

¹Engineers have to know the best and most economical materials to use.

²Engineers must also understand the properties of these materials and how they can be worked. ³There are two kinds of materials used in engineering—metals and non-metals. ⁴We can divide metals into ferrous and non-ferrous metals.

⁵The former contain iron and the latter do not contain iron. ⁶Cast iron and steel, which are both alloys, and mixtures of iron and carbon, are the two most important ferrous metals. ⁷Steel contains a smaller proportion of carbon than cast iron contains. ⁸Certain elements can improve the properties of steel and are therefore added to it. ⁹For example, chromium may be included to resist corrosion and tungsten to increase hardness. ¹⁰Aluminum, copper, and the alloys, bronze and brass, are common non ferrous metals.

(Glendinning, 1974: 1)

21. Two kinds of metal materials used in engineering are
- A. Metals and non metals
 - B. Ferrous and non-ferrous
 - C. Iron and non-iron
 - D. Carbon and iron
22. Which one can resist corrosion?
- A. Aluminum
 - B. Copper
 - C. Bronze
 - D. Chromium
23. Which one is TRUE according to the passage?
- A. Non-metals are used by engineers
 - B. Cast iron contains more carbon than steel
 - C. Copper is ferrous metal
 - D. Bronze is an alloy
24. Tungsten can increase hardness (sentence 9). Tungsten is probably a....
- A. a tool to harden chemical element
 - B. a tool that can resist corrosion
 - C. a metallic chemical element or transition metals
 - D. a non-ferrous metal

VI. Match the following description of electrical plug and socket (at the left) and the picture (at the right)!

25. On this one, there are circular pins for live and neutral. There is no earth pin. This is quite a common format in Europe and Russia. It's also quite widely used in India.



a _____

26. Here, you've got circular slots for live and neutral. And the earth slot's got a flat base with one side rounded over to form a semi circle. This type's only used in a few places.



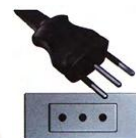
b _____

27. This one has rectangular blades for live, neutral and earth, in triangular configuration. This is the standard in the UK and Ireland, and a few other places, Malaysia and Singapore, for instance.



c _____

28. This plug has got circular pins for live and neutral, and it has a cylindrical slot to receive the earth pin. It's quite common in continental Europe, and in parts of Africa.



d _____

29. As you can see, there are circular pins for live, neutral and earth, and the pins are arranged in linear configuration. This is not very commonly used format.



e _____

30. This is the standard in North America, and quite common in Central and South America. Used in Japan, as well. There are flat blades for live and neutral, and a round pin for earth and they're laid out in triangular configuration. It's an extremely widely used format.



f _____

(Ibbotson , 2008: 22)

Appendix 5:
Try-Out Test Result (Low Achievers)

TRY OUT TEST RESULT; 1 (CORRECT), 0 (WRONG)/ LOW (L) ACHIEVERS																																			
Space Elevator					Matching					Solar Tower					Matching					Materials					Matching					Corr.					
Std.ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Items	Score	N	Category	
5201414058	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L		
5201414074	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5201414075	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5201414076	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5201414092	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5202414004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5202414005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	L	
5201414056	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	13	1	L
5201414057	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	16	1	L
5202414022	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	19	1	L	
5201414053	1	0	0	0	0	1	0	1	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	8	34	1	L	
5201414063	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	1	9	37	1	L	
5201414068	1	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	9	37	1	L	
5201414083	1	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	9	37	1	L	
5201414064	1	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	10	40	1	L	
5201414081	1	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	10	40	1	L	
5201414082	1	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	10	40	1	L	
5201414066	1	0	0	0	0	1	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	11	43	1	L	
5201414085	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	11	43	1	L	
5201414093	1	0	1	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	11	43	1	L	
5202414096	0	1	1	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	1	0	11	43	1	L	
5201414055	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	1	1	1	0	1	0	0	0	0	1	0	1	12	46	1	L	
5201414071	1	0	0	0	0	1	1	1	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	1	12	46	1	L	
5201414077	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	1	0	1	12	46	1	L	
5201414078	1	0	1	0	0	1	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	12	46	1	L	
5201414084	1	0	0	0	0	1	1	0	1	1	1	0	1	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	12	46	1	L	
5201414088	1	0	0	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0	13	49	1	L	
5201414091	1	0	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	13	49	1	L	
5201414046	1	0	0	0	0	1	1	1	1	0	1	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	1	0	14	52	1	L	
5201414062	0	1	0	0	0	1	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	14	52	1	L	
Corr-Answers	17	4	4	1	1	15	12	18	20	9	13	12	1	1	2	8	3	6	4	11	2	2	1	5	10	6	11	6	14	10			30		

Appendix 6:
Try-Out Test Result (Medium Achievers)

TRY OUT TEST RESULT; 1 (CORRECT), 0 (WRONG)/ MEDIUM (M) ACHIEVERS																																			
Space Elevator					Matching					Solar Tower					Matching					Materials					Matching					Corr.	Score	N	Category		
Std.ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30					
5201414067	1	0	1	0	0	0	1	1	1	0	0	1	0	1	0	1	1	0	1	0	0	1	1	0	0	0	0	0	1	0	1	14	52	1	M
5201414050	1	0	1	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	0	0	1	0	0	0	0	0	1	0	0	15	55	1	M
5201414051	1	0	1	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	1	0	0	15	55	1	M
5201414059	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0	0	15	55	1	M
5201414060	1	1	0	0	0	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	17	61	1	M
5201414061	1	1	0	0	1	1	0	1	1	0	1	1	1	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0	0	17	61	1	M
5201414072	1	1	0	0	0	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	1	1	0	1	1	0	1	18	64	1	M
5202414038	1	0	0	1	1	1	0	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	0	0	1	1	0	0	1	0	1	19	67	1	M
5201414065	1	1	0	1	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0	0	1	1	1	0	1	1	1	20	70	1	M
5202414016	1	0	1	0	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	0	20	70	1	M
5202414025	1	1	0	0	1	0	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	20	70	1	M
5201414073	1	1	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	0	0	0	1	1	0	1	21	73	1	M
5201414087	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	1	1	0	0	0	0	0	0	1	0	1	1	21	73	1	M
5202414018	1	1	1	1	1	0	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0	1	1	0	1	1	0	1	21	73	1	M
5202414069	0	0	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	21	73	1	M
5201414079	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	1	1	1	1	0	1	1	22	76	1	M
5202414017	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	1	0	22	76	1	M
5202414040	1	1	1	1	1	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	1	1	1	1	1	0	1	22	76	1	M
5202414042	1	1	0	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	22	76	1	M
5201414069	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	0	0	0	1	1	0	0	23	79	1	M	
5202414003	1	1	1	0	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	23	79	1	M
5201414047	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0	1	0	1	1	1	0	1	24	82	1	M
5201414049	1	1	0	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	24	82	1	M
5201414052	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	0	1	1	24	82	1	M
5201414080	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0	1	24	82	1	M
5201414090	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1	0	1	1	24	82	1	M
5201414094	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	1	0	1	0	1	1	1	24	82	1	M
5202414009	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	24	82	1	M
5202414015	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	24	82	1	M
5202414021	1	1	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	24	82	1	M
Corr. Answers	29	23	18	19	21	17	22	20	30	22	27	25	23	6	25	27	30	28	29	24	11	13	11	10	16	22	17	20	22	17	30				

Appendix 7:
Try-Out Test (High Achievers)

TRY OUT TEST RESULT; 1 (CORRECT), 0 (WRONG)/ HIGH (H) ACHIEVERS																																		
Std.ID	Space Elevator					Matching					Solar Tower					Matching					Materials					Corr.					N	Category		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			Items	Score
5202414027	1	1	1	1	0	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	24	82	1	H
5202414035	1	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	24	82	1	H
5202414043	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	1	0	1	1	1	1	1	0	1	24	82	1	H
5201414048	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	25	85	1	H
5201414089	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	25	85	1	H
5202414001	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	25	85	1	H
5202414024	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	25	85	1	H
5202414028	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1	25	85	1	H
5202414033	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	1	1	0	1	0	1	1	0	1	1	1	25	85	1	H
5202414037	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	25	85	1	H
5202414044	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1	1	1	1	1	0	1	25	85	1	H
5202414010	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	26	88	1	H
5202414011	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	26	88	1	H
5202414012	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	26	88	1	H
5202414019	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	26	88	1	H
5202414023	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	26	88	1	H
5202414026	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1	26	88	1	H
5202414030	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	26	88	1	H
5202414034	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	26	88	1	H
5202414039	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0	1	26	88	1	H
5202414041	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	26	88	1	H
5201414054	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	27	91	1	H
5202414002	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	27	91	1	H
5202414045	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	27	91	1	H
5201414095	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	28	94	1	H
5202414014	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	28	94	1	H
5202414032	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	28	94	1	H
5202414020	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	29	97	1	H
5202414006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30	100	1	H
5202414013	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	30	100	1	H
Corr:Answers	30	28	30	30	25	26	20	24	29	24	30	30	26	25	30	29	30	30	30	30	22	18	18	13	29	24	26	23	30	28		30		

Appendix 8: Test Takers' Scores Resulted from Try-Out Test

Test Takers: Education of Mechanical Engineering Students Group 1 (PTM 01) and Group 2 (PTM 02)

Number of Students: PTM 01 = 42, and PTM 02 = 48, Total = 90 test takers

Time = Test 1 : November 4, 2014 at 9am and 10.30am Test 2 : November 11, 2014 at 9am and 10.30am

No	Std. ID	Test 1	Re-Test	No	Std. ID	Test 1	Re-Test
1	5201414058	10	31	46	5201414079	76	79
2	5201414074	10	19	47	5202414017	76	76
3	5201414075	10	16	48	5202414040	76	79
4	5201414076	10	16	49	5202414042	76	70
5	5201414092	10	19	50	5201414069	79	82
6	5202414004	10	19	51	5202414003	79	82
7	5202414005	10	19	52	5201414047	82	82
8	5201414056	13	16	53	5201414049	82	85
9	5201414057	16	16	54	5201414052	82	82
10	5202414022	19	19	55	5201414080	82	88
11	5201414053	34	40	56	5201414090	82	85
12	5201414063	37	40	57	5201414094	82	76
13	5201414068	37	34	58	5202414009	82	82
14	5201414083	37	43	59	5202414015	82	82
15	5201414064	40	43	60	5202414021	82	79
16	5201414081	40	43	61	5202414027	82	76
17	5201414082	40	61	62	5202414035	82	85
18	5201414066	43	40	63	5202414043	82	85
19	5201414085	43	49	64	5201414048	85	85
20	5201414093	43	49	65	5201414089	85	88
21	5202414096	43	46	66	5202414001	85	91
22	5201414055	46	40	67	5202414024	85	82
23	5201414071	46	40	68	5202414028	85	76
24	5201414077	46	61	69	5202414033	85	82
25	5201414078	46	64	70	5202414037	85	88
26	5201414084	46	73	71	5202414044	85	85
27	5201414088	49	85	72	5202414010	88	88
28	5201414091	49	52	73	5202414011	88	91
29	5201414046	52	46	74	5202414012	88	85
30	5201414062	52	40	75	5202414019	88	94
31	5201414067	52	40	76	5202414023	88	91
32	5201414050	55	70	77	5202414026	88	94
33	5201414051	55	76	78	5202414030	88	94
34	5201414059	55	55	79	5202414034	88	82
35	5201414060	61	61	80	5202414039	88	88
36	5201414061	61	61	81	5202414041	88	88
37	5201414072	64	61	82	5201414054	91	94
38	5202414038	67	70	83	5202414002	91	94
39	5201414065	70	70	84	5202414045	91	100
40	5202414016	70	76	85	5201414095	94	100
41	5202414025	70	76	86	5202414014	94	97
42	5201414073	73	70	87	5202414032	94	88
43	5201414087	73	70	88	5202414020	97	100
44	5202414018	73	73	89	5202414006	100	100
45	5202414069	73	73	90	5202414013	100	100

Appendix 9:
Pre-Test (Experimental Group)

No	Student ID	Pre
1	5202411022	70
2	5202411030	85
3	5202414001	85
4	5202414002	82
5	5202414003	73
6	5202414004	73
7	5202414005	82
8	5202414006	88
9	5202414007	82
10	5202414008	73
11	5202414009	82
12	5202414010	73
13	5202414011	80
14	5202414012	70
15	5202414013	55
16	5202414014	82
17	5202414015	73
18	5202414016	52
19	5202414017	82
20	5202414018	73
21	5202414019	64
22	5202414020	67
23	5202414021	64
24	5202414022	64
25	5202414023	73
26	5202414024	70
27	5202414025	73
28	5202414026	61
29	5202414027	67
30	5202414028	73
31	5202414029	70
32	5202414030	73
33	5202414032	82
34	5202414033	85
35	5202414034	88
36	5202414035	61
37	5202414036	64
38	5202414045	64
39	5202414038	61
40	5202414039	55
41	5202414040	61
42	5202414041	76
43	5202414042	82
	Total Score	3113
	Average	72,3953488

Appendix 10:
Post Test (Experimental Group)

No	Student ID	Post
1	5202411022	88
2	5202411030	100
3	5202414001	97
4	5202414002	100
5	5202414003	88
6	5202414004	88
7	5202414005	91
8	5202414006	91
9	5202414007	97
10	5202414008	100
11	5202414009	91
12	5202414010	94
13	5202414011	85
14	5202414012	82
15	5202414013	73
16	5202414014	85
17	5202414015	88
18	5202414016	79
19	5202414017	88
20	5202414018	82
21	5202414019	66
22	5202414020	70
23	5202414021	76
24	5202414022	85
25	5202414023	94
26	5202414024	88
27	5202414025	79
28	5202414026	64
29	5202414027	60
30	5202414028	100
31	5202414029	76
32	5202414030	91
33	5202414032	97
34	5202414033	97
35	5202414034	91
36	5202414035	68
37	5202414036	85
38	5202414045	85
39	5202414038	85
40	5202414039	73
41	5202414040	88
42	5202414041	100
43	5202414042	100
	Total Score	3705
	Average	86,1627907

Appendix 11:
Pre-Test (Control Group)

No	Student ID	Pre
1	5202413093	91
2	5202414046	82
3	5202414047	91
4	5202414048	97
5	5202414049	82
6	5202414050	61
7	5202414051	82
8	5202414052	85
9	5202414053	85
10	5202414054	82
11	5202414055	91
12	5202414056	64
13	5202414057	60
14	5202414058	70
15	5202414059	85
16	5202414060	88
17	5202414061	76
18	5202414062	67
19	5202414063	85
20	5202414064	61
21	5202414065	73
22	5202414066	61
23	5202414067	70
24	5202414069	61
25	5202414070	64
26	5202414071	61
27	5202414072	67
28	5202414073	67
29	5202414074	85
30	5202414075	88
31	5202414076	79
32	5202414077	64
33	5202414078	82
34	5202414079	61
35	5202414080	67
36	5202414081	73
37	5202414082	73
38	5202414083	82
39	5202414084	64
40	5202414085	55
41	5202414086	61
42	5202414087	52
43	5202414088	70
44	5202414089	82
45	5202414090	58
46	5202414091	52
47	5202414092	70
48	5202414093	61
	Total Score	3488
	Average	72,66667

Appendix 12:

Post Test (Control Group)

No	Student ID	Post
1	5202413093	94
2	5202414046	82
3	5202414047	88
4	5202414048	85
5	5202414049	76
6	5202414050	76
7	5202414051	73
8	5202414052	85
9	5202414053	85
10	5202414054	73
11	5202414055	82
12	5202414056	67
13	5202414057	73
14	5202414058	88
15	5202414059	73
16	5202414060	76
17	5202414061	82
18	5202414062	73
19	5202414063	82
20	5202414064	67
21	5202414065	73
22	5202414066	64
23	5202414067	73
24	5202414069	88
25	5202414070	73
26	5202414071	67
27	5202414072	73
28	5202414073	64
29	5202414074	82
30	5202414075	60
31	5202414076	94
32	5202414077	76
33	5202414078	91
34	5202414079	79
35	5202414080	79
36	5202414081	85
37	5202414082	85
38	5202414083	94
39	5202414084	79
40	5202414085	73
41	5202414086	76
42	5202414087	73
43	5202414088	82
44	5202414089	94
45	5202414090	67
46	5202414091	61
47	5202414092	82
48	5202414093	67
	Total Score	3734
	Average	77,79167