CHAPTER I

INTRODUCTION

Science is life, and life is science. It is an integral part of life. The aim of education is to help learners make sense of the world and, simultaneously, make sense of their roles as 'players' in the world (Kincheloe & Steinberg 1998, 2). Therefore, science education should help learners in developing knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world (National Science Education Standards 1996, 23). In order to do so, teaching science should be done in such a way so that learners become active participants of learning. This study proposes a framework for teaching science communicatively based on a case study of Collaborative Project-Based Learning (CPBL).

This chapter covers the background of the study, the statement of the problem, the purposes of the study and four research questions about the case study used in this research. The scope of the study, the significance of the study and the thesis overview are also included in this chapter.

1.1 Background of the study

In today's globalized and interconnected world, English is naturally regarded as a global lingua franca – a language used to communicate among different people from different countries – with estimated figures of 375 million English as first language speakers, 750 million English as

second language speakers, 70 countries that put English either as an official or special language and 50% of the internet content is produced in English (Reddy 2016, 179). A global language earns its status from a special role that is recognized in every country. In countries where English is not a mother tongue, this can be achieved in two main ways, i.e. making English as an official language by using it as a medium of communication in areas, such as government, law, media and education, and making English as a priority in a country's foreign language teaching (Crystal 1997, 3-4). When English is used as the instructional language at schools, it may create an additional encumbrance for learners in countries where English is not the mother tongue nor the second language.

In the latter case, Indonesia serves as an example of a country that puts English as the first priority in its foreign language teaching. At schools in big cities, English is not only taught as a foreign language, but it is also used as the instructional language in most or some subjects to meet the market demands, and science is usually among these subjects. Nowadays, many parents have developed a global vision for their children's futures. They possess more than sufficient resources to send their children abroad for higher education, and English happens to be the medium of instruction in universities and higher education institutes around the world. Learning English as a second language (L2) has; therefore, become inevitable for many Indonesian students. Moreover, second language skills will further enable a person to perform the twenty-first century skills, known as the Four Cs, i.e. Critical Thinking and Problem Solving, Communication,

Collaboration, and Creativity and Innovation (National Education Association 2010, 5).

Science is one of the core subjects taught in the primary level. As it is heavy with knowledge content, science can become a significant obstacle for young learners in this level, especially when it is delivered in traditional instruction that misrepresents science as a body of facts to be memorized. Expository, or informational, text conveying information about the natural and social world (Duke & Armistead 2003, 22) found in science textbooks can be quite challenging for young learners to read and comprehend as they often deal with abstract, unfamiliar concepts as stated by Nickelsen (2003, 5). A part of the challenges in reading such a text is due to unfamiliar science vocabulary. Nickelsen (2003, 6) includes limited vocabulary knowledge as one of the barriers to comprehension. This lack of vocabulary knowledge then leads to difficulties in grasping complex and often abstract science concepts. Lee and VanPatten (2003, 26-27) describe two general characteristics of useful input for language learners – comprehensible and meaning-bearing – in order to allow the building up of form-meaning connections, that lead to acquisition. In the context of science learning, it presages that learners must be able to figure out what the speaker (or reading text) is saying to build form-meaning connections, and they also understand the message communicated through the language – the science language.

Science has always been a language of its own – a foreign language with terms that are unlikely to be found in everyday situations, and words

with scientific meanings that are different from everyday usage (Elliott 2010, 2). Therefore, learning science means learning the language of science (Wellington & Osborne 2001, 1). Words in science contexts may have different meanings and uses (Elliott 2010, 2). These words are actually the key to concepts, and that makes them the key words. Key words are vital in learning science. Without understanding this specific science vocabulary, confusion may arise (Elliott 2010, 2). This will create obstacles in grasping the concepts of science. Nonetheless, understanding the meanings of science vocabulary will not occur if the vocabulary is isolated from its science contexts. Therefore, learning science in a traditional method where words are often presented in isolation, without meaningful contexts or applications to concepts, will not contribute to the conceptual development. Teachers should aim at the conceptual development in learning science, i.e. students understand the science concepts by understanding and applying the science vocabulary in their communication as they explore the world around them in the same way that scientists pursue their work.

Younger English language learners (ELL), who mostly still struggle in understanding and using English in everyday situations, will find English texts in science textbooks overwhelming and demotivating. Haynes and Zacarian (2010, 27) propose some distinct challenges faced by ELLs in learning science: lack of familiarity of hands-on practice, prediction and conclusion formulation, science vocabulary, comprehension of multiple-step directions and complex sentence structures in science textbooks. The

less motivated the learners are, the more difficult the lesson seems, the longer the understanding falls into place. From the L2 learning psychological point of view, motivation is an essential determiner of learners' efforts that lead to proficiency level (Saville-Troike 2006, 85-86). Learning science in English definitely requires a higher level of learner's motivation.

Wellington and Osborne (2001, 2) state that "learning the language of science is a major part (if not the major part) of science education" and "language is a major barrier (if not the major barrier) to most pupils in learning science." To solve the twofold problems in learning science in English – the content and the language, the Communicative Language Teaching (CLT) can be applied as a suitable methodology in the context of science teaching to make learning science in English more interesting so that learners' motivation level can be increased as the CLT focuses more on the ideas or concepts of the content that learners attempt to communicate, and not on the grammar-based accuracy of their discourse, with corrections being ancillary to content instruction (Jarrett 1999, 19). Besides, "students should be encouraged to experiment with their new English-language skills without fear of embarrassment" (Anstrom & Lynch 1998; Fathman et al. 1992; Kessler et al. 1992; Lockwood, 1998 as cited in Jarrett 1999, 19).

The CLT gives ample opportunities for students to learn science in English through meaningful and purposeful interactions by means of language (Richards 2006, 4). After all, science is all around us, and; therefore, the goal of science education is to teach learners to communicate

meanings through science thematic patterns and to solve science related problems through "talking science" both in written or verbal formats. As Wellington and Osborne (2001) point out, "science teachers are (among other things) language teachers." By applying the CLT strategies, teachers can help all learners get engaged in the language of science.

In the current trends in curriculum development, the emphasis of science learning is no longer merely on the content itself but also on the process skills, such as observing, inferring, classifying, predicting, measuring, questioning, interpreting and analysing data to prepare learners for scientific enquiry which then combines these process skills with scientific knowledge, scientific reasoning and critical thinking to develop scientific knowledge (Lederman, Lederman & Antink 2013, 142-143). Even, the Cambridge Primary Science Curriculum framework puts more emphasis on competency or skills. The scientific enquiry according to this framework is about "considering ideas, evaluating evidence, planning investigative work and recording and analysing data." These process and/or scientific enquiry skills are definitely an integral part of the science curriculum as shown in some Grade 5 Primary level science textbooks taken as examples: My Pals Are Here (International Edition) Science 5A Teacher's Guide published in Singapore (See Appendix A), Collins International Primary Science Teacher's Guide 5 published in the United Kingdom (See Appendix B), and Curriculum 2013 Integrated Theme Book: Theme 8 Ecosystem – Teacher's Guide for Grade 5 Primary published in Indonesia (See Appendix C).

From these examples of science learning competency expected in the science curriculums from three different countries, namely: Singapore, the United Kingdom, and Indonesia, it is palpable that communication skills are embedded in the process skills and/or scientific inquiry skills in and become an integral part in science learning activities. Science content is no longer considered as passive knowledge to be kept by oneself, but it is knowledge to be shared and developed through communication.

According to West and Turner (2007), communication is a social process where individuals interact by using symbols to create and interpret meanings in their surroundings. There are five general purposes of communication, i.e. to discover, to help, to persuade, and to play. These purposes are served in different forms of human communication, such as intrapersonal, interpersonal, interviewing, small group, organizational, public, computer-mediated and mass communication (Devito, 2009). As science is a "language" and a language is used for communication, the CLT offers abundant opportunities for the communication purposes and forms to take place as well as process and/or scientific enquiry skills to flourish. Aiming at the communicative competence, the CLT will enable learners to use language for a range of different purposes and functions according to the settings and the participants, to produce and understand different types of texts, and to maintain communication despite having limitations in one's language knowledge by utilizing communication strategies (Richards 2006, 3). Integrating the CLT into science learning will not only make science learning more interesting, meaningful and thus motivating, but it will also

prepare students to be contributing global citizens with their twenty-first century skills which involve interactions, collaborations and negotiations.

Haynes and Zacarian (2010, 39) believe that group work is helpful for teaching ELLs because learning is best achieved when learners have frequent opportunities to participate and interact with others (Cohen 1994; Echevarria et al. 2008; Faltis & Hudelson 1998, as cited in Haynes & Zacarian 2010, 19). The Collaborative Project-Based learning (CPBL) as proposed by Donnelly and Fitzmaurice (2005, 87) is a learning strategy that adopts Project-Based Learning which has gained its popularity in science education over the last three decades (Egenrieder 2007, as cited in Çakici & Türkmen 2013, 9). It offers a suitable format for the manifestation of science and CLT integration where learners work collaboratively, reflect their own learning, have personal autonomy and be actively engaged (Egenrieder 2007, as cited in Çakici & Türkmen 2013, 9). The CPBL let learners design, plan, carry out the plan and produce a product or a presentation (Patton 2012, 13) while bestowing increase in motivation (Kucharski, Rust, & Ring 2005; Papastergiou 2005; Gulbahar & Tinmaz 2006, as cited in Çakici & Türkmen 2013, 10), improvement in achievement, and positive learning experiences and authentic problem-solving opportunities (Gulbahar & Tinmaz 2006, as cited in Çakici & Türkmen 2013, 10). Thus, the CPBL will serve well as an effective and motivating strategy for learners to learn science communicatively.

1.2 Statement of the Problem

Teaching science requires a strategy that develops not only process and/or scientific inquiry skills but also literacy because "learning science is learning the language of science" (Wellington & Osborne 2001, 1). Wellington and Osborne (2001, 2) also state that "learning the language of science is a major part (if not the major part) of science education" and "language is a major barrier (if not the major barrier) to most pupils in learning science." Moreover, when teaching science is done in English as the instructional language, young English language learners will have to face another challenge, i.e. using English to gain science knowledge and concepts.

1.3 Purpose of the Study

The purpose of this case study is to find out how the Communicative Language Teaching (CLT) is integrated in science teaching and learning activities through the Collaborative Project-Based Learning (CPBL) called the annual project in the primary school level so that science can be taught communicatively in order to solve the problems stated above.

1.4 Research Questions

This case study observes how the CLT is integrated in science teaching and learning activities through the Collaborative Project-Based Learning called the annual project in Grade 5 Primary school classes at a private school in Serpong, Tangerang. The four research questions about the case study are as follows:

1. Does the CPBL case meet the criteria of teaching science communicatively based on the conceptual framework?
2. What are the steps implemented in the integration of science teaching and communicative teaching in the CPBL case in order to teach science communicatively?
3. What are the problems identified during the execution of the CPBL case?
4. What are the teachers' and students' perceptions about the CPBL case and their satisfaction levels about the results?

1.5 Scope of this Study

This case study covered a single case, i.e. the Grade 5 annual project in the academic year of 2016-2017 conducted in February to March 2017. Science is always the anchor subject that provides the big theme and the other core subjects (math, English and Bahasa Indonesia) will adopt this theme in their respective projects. Therefore, students always have to do

four different subject projects in groups during each annual project. The theme has to be based on the units that have been learnt by students, so they have the background knowledge to support them in performing the tasks. The title of the annual project in this case study is "Sail Away". The theme is based on the latest unit learnt – energy conversion – with the prerequisite knowledge of convection currents. The students had learnt about the types of heat transfer (convection, conduction and radiation) in the previous unit before they carried out the project. The objective of the project is to make and move a boat using convection currents. During the process of moving the boat, the students analysed the energy conversions that took place along the process – starting from the chemical potential energy in the candle to the heat energy in the flame to the heat energy in the air to the kinetic energy in the air to the kinetic energy in the boat. Before performing the boat experiment, the students also planned and did an experiment about convection currents called "The Squirming Spiral Experiment" where they applied their background knowledge. They formulated a hypothesis based on a given research question, decided on the materials and tools needed, fabricated the experiment set-up, performed the experiment, took notes during the observation and drew a conclusion based on the observation results. This case study only focused on the science part of the annual project as the purpose of this study is to find out if the annual project as the CPBL case can be implemented to teach science communicatively.

1.6 Significance of the Study

Based on the findings of this case study, it is hoped that a theoretically grounded framework can be established to provide a valid foundation for future annual projects conducted at the school as a part of the curriculum. The school management will be able to equip the teachers with a standard manual of how to conduct the annual project to maintain consistency across grade levels. The teachers will be able to design and conduct the annual project with clear directions in mind, and the framework will help them set suitable learning objectives and related activities. The students will reap the benefits of well-prepared and meaningful projects to perform, and they will develop a higher level of enthusiasm and motivation. These are the seeds that will grow and help them become life-long learners. The parents will witness significant improvement in their children's academic and non-academic areas. The non-academic areas include, for example, social skills, public speaking skills, Information-Communication-Technology (ICT) skills and art-related skills. These are the skills practiced along the process of performing the annual project. Considering all of the potentials above, this study has a vital role in the curriculum development. The results of the study can be applied not only to the particular school where this study was conducted, but also to all schools in general.

1.7 Definitions of Terms

The important terms used in this paper are explained as follows:

1) Communicative Language Teaching (CLT)

   It is "a set of principles about the goals of language teaching, how learners learn a language, the kinds of classroom activities that best facilitate learning, and the roles of teachers and learners in the classroom" (Richards 2006, 2) aiming at "the teaching of communicative competence" (Richards 2006, 2). Communicative competence means "being able to use the language for meaningful communication" (Richards 2006, 3).

2) Collaborative Project-Based Learning (CPBL)

   It is a learning strategy that adopts "a multidisciplinary, project-based approach using real world problems to bringing together knowledge and skills" (Donnelly & Fitzmaurice 2005, 89). "Project-Based Learning is an individual or group activity that goes on over a period of time, resulting in a product, presentation, or performance" (Donnelly & Fitzmaurice 2005, 88).

3) Scientific Inquiry (SI)

   "Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the

evidence derived from their work. Inquiry also refers to the activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world." (National Science Education Standards 1996, 23).

1.8 Thesis Overview

This thesis is divided into five chapters. Chapter One deals with the reasons why the current trends in education demand a more communicative approach of teaching science in English. Chapter two introduces the theories that support the strategy to teach science communicatively. Chapter Three presents the methodology applied in this case study. Chapter Four discusses the findings of the case study that provide answers to the research questions. Chapter Five provides the conclusion and recommendations to improve the implementation of the proposed strategy.