



A COMPARATIVE STUDY OF STUDENT MOTIVATION AND ACADEMIC  
ACHIEVEMENT IN GRADE 8 SCIENCE UNDER TEACHER-CENTERED AND  
STUDENT-CENTERED INSTRUCTIONAL METHODS AT TRIAMUDOMSUKSA  
PATTANAKARN SCHOOL, THAILAND

Priya Upadhya

A Thesis Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
MASTER OF EDUCATION  
in Curriculum and Instruction  
Graduate School of Human Sciences  
ASSUMPTION UNIVERSITY OF THAILAND

2017



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**By:** PRIYA UPADHYA

**Field of Study:** CURRICULUM AND INSTRUCTION

**Thesis Advisor:** ASST.PROF.DR. RICHARD LYNCH

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**Accepted by the Graduate School of Human Sciences, Assumption University in**  
**Partial Fulfillment of the Requirements for the Master Degree in Education**

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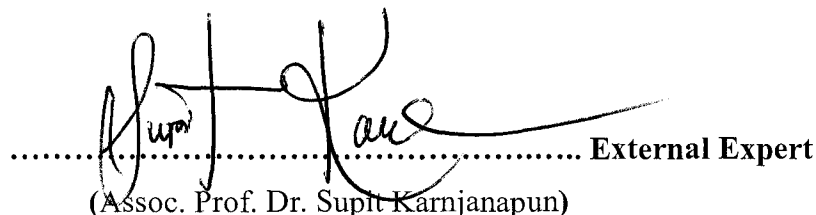
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## ABSTRACT

**I.D. No.:** 5729478

**Key Words:** TEACHER-CENTERED INSTRUCTION, STUDENT-CENTERED INSTRUCTION, STUDENT MOTIVATION, ACADEMIC ACHIEVEMENT, SCIENCE, GRADE EIGHT, BANGKOK, THAILAND, TRIAMUDOMSUKSA PATTANAKARN SCHOOL

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The Thai Ministry of Education encourages collaborative learning instructional method in schools. The National Education Act of B.E.2542 (1999) made student-centered learning of great importance to teachers and schools in Thailand in order to increase the capacity of Thai people to meet the standards of the changing and upgrading society. But not all schools in Thailand are able to adopt student-centered instructional methods. This comparative study compared academic achievement and student motivation under teacher-centered and student-centered instructional methods in science grade eight at Triamudomsuksa Pattanakarn School, a government school located in Bangkok, Thailand. A total of 59 students took part in this study over a period of seven weeks. The research involved six objectives. Objectives 1

and 2 were to determine student motivation under teacher centered and student-centered instructional methods. Objectives 3 and 4 were to determine student academic achievement under teacher centered and student-centered instructional methods. Objective 5 was to compare student motivation between the two instructional methods. Finally, Objective 6 was to compare student academic achievement under the two instructional methods. The findings of the study suggested that the instructional methods did not differ significantly to student achievement. Student motivation was higher for the student-centered group than the teacher-centered group. Recommendations for school administrators, teachers and future researcher are also given.



**Field of Study:** Curriculum and Instruction

**Student's signature**.....

**Graduate School of Human Sciences**

**Advisor's signature** .....

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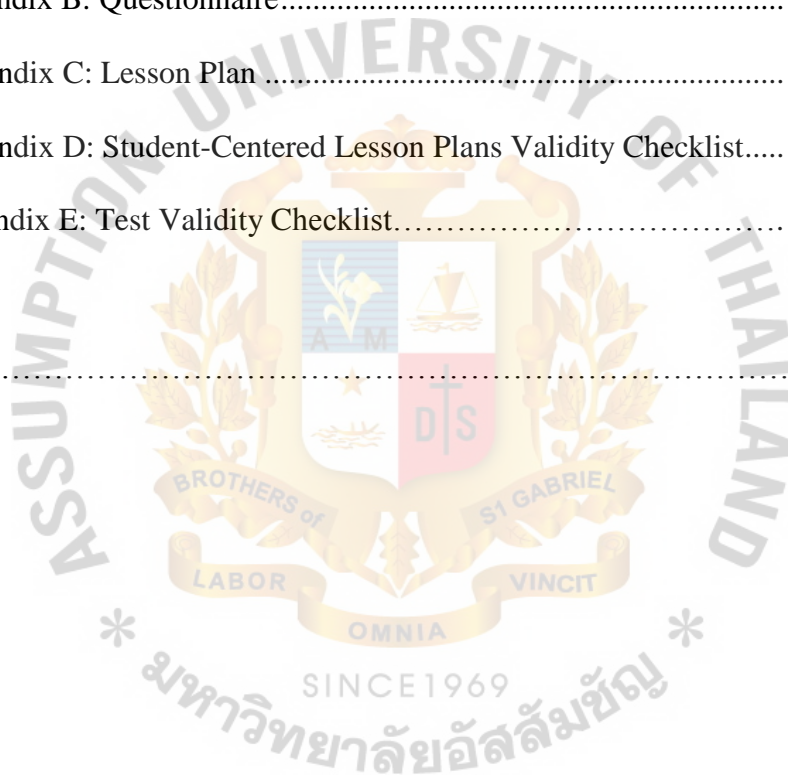
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# CHAPTER I

## INTRODUCTION

This chapter presents the background of study, statement of problem, research questions, research objectives, research hypotheses, theoretical framework, conceptual framework, scope of the study, definitions of terms and significance of the study.

### Background of the Study

The Thai National Education Act B.E. 2542 (1999) Section 22 states that the provision of education should be based on the principle that all students are capable of learning and developing themselves. Teachers providing education should promote all students to be able to develop themselves naturally at their best level. Unfortunately, the teacher-centered or teacher-directed orientation has been the main focus of Thai education for centuries.

The main focus in schools in Thailand has always been on rote learning or memorization rather than allowing students to develop their own thinking skills (Thamraksa, 2003). Active learning model involves learning activities which gives the learner a chance to experience and talk to each other (Fink, 2002).

Science allows learners to develop their thinking skills creatively, critically, logically and analytically (The Basic Education Core Curriculum, 2008).

Education is based on learners who will participate and involve themselves in education. The student-centered approach consists of the idea of self-education which requires teachers to facilitate not deliver, create teaching materials not just use teaching material for providing learners constructive self-learning (Nonkukhetkhong, 2006).

### **Statement of the Problem**

Triamudomsuksa Pattanakarn School is a government school in Bangkok, Thailand with approximately 200 teachers and around 5000 students. The researcher will concentrate only on English program Grade 8 students for the science classes. Each class has 30 to 29 students.

Most of the teachers generally follow the typical Thai method of teaching and instruction which is the teacher-centered instructional method. As a result, students are not able to experience any peer work, group interaction or group discussion in their classes. A highly teacher-centered instructional method is used throughout the school with maximum teacher talk time. Traditional teaching methods are not able to motivate the low achieving students.

Traditionally, most of the instructional method is usually conveyed using teacher centered approach. Students sit in pairs on hard wooden chairs with no exposure to outside. Resources are usually whiteboard, projector and power point slides presented in classroom.

With high level of curiosity, the students are active but at times due to adolescence period they lack concentration and experience mood swings in class due to which the class gets slow.

The main research problem is to experiment teacher-centered instructional method with the students. The main problem is students have been into the teacher-centered classroom for years in Thailand. This research would like to find out how can students deal with and work in student-centered classrooms.



### Research Questions

The following questions were investigated in this study.

1. What is the level of student motivation under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School?
2. What is the level of student motivation under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School?
3. What is the level of student academic achievement under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School?
4. What is the level of student academic achievement under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School?
5. Is there a significant difference in the level of student motivation between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School?
6. Is there a significant difference in the level of student academic achievement between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School?

### Research Objectives

What follows are the specific research objectives addressed by this study.

1. To determine the level of student motivation under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School.
2. To determine the level of student motivation under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School.
3. To determine the level of student academic achievement under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School.

4. To determine the level of student academic achievement under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School.
5. To determine if there is a significant difference of student motivation between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School.
6. To determine if there is a significant difference of student academic achievement between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School.

### **Research Hypotheses**

What follows are the specific research hypothesis addressed by this study.

1. There is a significant difference of Grade 8 students' level of motivation in learning science according to the use of student-centered and teacher-centered instructional methods at Triamudomsuksa Pattanakarn School, at a level of .05.
2. There is a significant difference of Grade 8 students' level of achievement in science according to the use of student-centered and teacher-centered instructional methods at Triamudomsuksa Pattanakarn School, at a level of .05.

### **Theoretical Framework**

Four theories provide the framework for this study.

First, the social constructivist theory of mind, and learning motivation where self-efficacy acts as a base of motivation in humans. It is in this sense that self-efficacy facilitates the cognitive involvement of students in class (Pajares, 2004). In social learning, new styles of behavior can be learned through direct experience or by observing the behavior of others. In social learning theory, reinforcement serves as a motivation and informative function. To a large extent actions are controlled by expected outcomes. A

person's cognitive skill provides the potential of awareness and planning for the future (Bandura, 1971).

Second, collaborative learning happens when students work in teams and it can result in better understanding of topics, greater motivation, better self-esteem and higher achievement (Educational Broadcasting Corporation [EBC], 2004).

Third, experiential learning theory which states that learning is created through experience and is based on four stages of the learning cycle which are experience, observation, conceptualization and testing which will further lead to new experiences (Clark, 2011).

Fourth, social cognitive theory which is a method to learn from surrounding experience. Children observe people around them and try to learn and be like them such as parents, siblings, friends, relatives. Children pay careful attention to some of the people and remember their behavior and later at some point of time copy that particular behavior. The people around can respond through rewarding or punishing the child (McLeod, 2016).

### Conceptual Framework

The conceptual framework of this study is illustrated in the Figure 1.

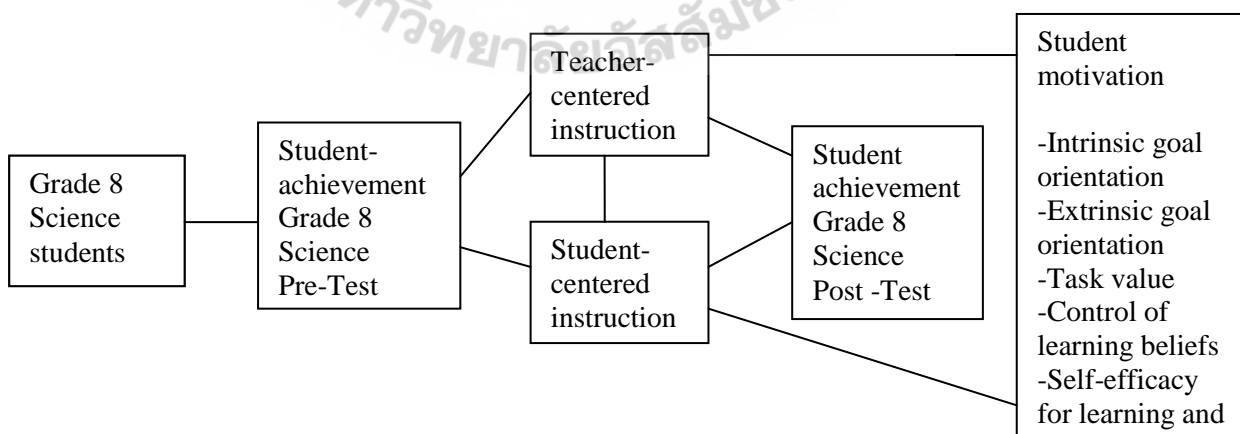


Figure 1. Conceptual framework.

The conceptual framework displays the instructional methods used with the Grade 8 students throughout this study. The independent variables are teacher-centered and student-centered instructional methods. The dependent variables are student achievement and student motivation, which will be measured independently for the two instructional methods at the end of the teaching and learning period.

### **Scope of the Study**

This research is limited to science subject and also by time and the materials used in teaching. Also the researcher will exclusively focus on only Grade 8 English program students. The students are majority Thai nationals with good English reading, listening and writing skills. The sample of students used for this study will be Grade 8 students at Triamudomsuksa Pattanakarn School in English program for the subject science. Grade 8 English program has two sections each consisting of 30 and 29 students. The population tested will consist of 59 students of both genders between ages 13 and 14.

This research was for the science subject in English program only. This study focus on three main theories which are constructivism (social and cognitive), experiential learning and social cognitive learning theory (SCLT). This research also study about the student motivation including intrinsic and extrinsic motivation, task value, control of learning beliefs and self- efficacy for learning and performance.

### **Definitions of Terms**

**Academic achievement:** refers to the numeric grade of Triamudomsuksa Pattanakarn school English program student's Grade 8 as recorded on a student's individual report issued quarterly. The main focus will be on knowledge which is Blooms lower order



thinking skills. To prepare students with the basic knowledge to be able to apply it in real life skills for the future see chapter 3.

**Collaborative learning instruction:** An instructional process based on group work.

Students help and discuss with each other with no or minimal directions given from teacher in class.

**Constructivism:** An educational theory based on the principle that people construct meaning according to their personal experiences.

**Student Motivation:** Academic motivation in terms of self-efficacy, the encouragement of students to study in class using different instructional processes using Banduras MSLQ questionnaire.

- **Intrinsic motivation:** Students curiosity and interest to learn under the instruction method.
- **Extrinsic motivation:** Students interest in passing the subject and achieving the Grade in science.
- **Task value:** Students evaluation of how important or useful the subject is.
- **Control of learning beliefs:** Students belief that their efforts will result in positive outcomes.
- **Self-efficacy for learning and performance:** Students performance expectations and their judgment about themselves to accomplish a task

**Student-centered instruction:** A set of teaching methods in which all the focus is shifted from the teacher to the student point of view.

**Achievement Test:** Test will be prepared, one for the control group consisting of match the following, multiple choice, true or false and same test will be given to the experimental group.

- **Pre-Test:** Test given before the learning of science Grade 8 at Triamudomsuksa Pattanakarn School.
- **Post-Test:** Test given after the instruction period of science grade 8 at Triamudomsuksa Pattanakarn School.

**Traditional instruction:** A mainly teacher-centered instructional process based on Power Point slides, whiteboard, textbook and workbook in class provided by the teacher and school. It is the instructional method used in Triamudomsuksa Pattanakarn School. Limited discussion and full teacher talk time.

### Significance of the Study

This research can give the students an opportunity to collaborate with friends and learn to work as a team not just individual work or through teacher-centered instructional method.

Students will get an opportunity to collaborate with friends and learn new concepts. They will also get an opportunity to construct their knowledge as a team through collaboration.

This will give other teachers the chance to apply student-centered instructional methods in their classes in order to let students work together and develop better understanding with each other.

Finally, applying the curriculum using new instructional method will benefit the student, as it will allow them to experience new style in learning as well. This research can guide teachers at Triamudomsuksa Pattanakarn School in adapting new teaching instructional methods in their lessons to improve their teaching.

## **CHAPTER II**

### **REVIEW OF RELATED LITERATURE**

This chapter contains the literature related to this study. The educational regulations in Thailand are mentioned in this chapter. The importance of science, which the researcher teaches is also described. The details of teacher-centered instruction and student-centered instruction are also explained in this chapter. This chapter will also describe about some related previous research which will support this study. A brief introduction of the school in which the study will be conducted, i.e., Triamudomsuksa Pattanakarn School and the English Program, is explained in this chapter.

#### **The Thai Education System**

This section will explain about the Thai education system and the national education act along with the basic core curriculum of Thailand and science subject in the curriculum.

#### **The National Education Act of B.E. 2542 (1999)**

The National Education Act of B.E. 2542 (NEA, 1999) was an educational reform act for the future development of people in Thailand. The National Education Act stated in chapter 4, section 8 focused on providing education to people for a lifetime, allowing people to participate in sharing and educating each other and also continually learning and developing. Section 22 emphasizes that education is based on the principle that all students can develop themselves and are able to learn. The teachers' instruction should allow the students to develop to their best potential.

Section 24 emphasizes that teachers should organize activities for students to learn from real experiences, through applying knowledge, to be able to think and perform and

to boost their thinking process overall. Teachers should be able to teach by integrating various topics together in a proper balance. Section 26 states that learning is established when the students are evaluated by considering their active participation and examination scores. Also, section 30 emphasizes that schools should develop effective ways for teaching and learning (Office of The National Education Commission, 1999).

The education system in Thailand consists of 12 years of education which is divided into six years of primary education, three years of lower secondary and three years of higher secondary. Education is compulsory and free up to the first 9 years. Grades 1 to 6 are called Prathom 1 to 6 and grades 7 to 12 are called Mattayom 1 to 6. Ordinary national educational test (O-NET) given to students at the end of grades 3, 6 and 9 based on subjects such as Thai, science, English and social studies. Schools are linked to the universities; students sit entrance examinations in order to compete with each other to enter different universities (Clark, 2014).

### **The Basic Education Core Curriculum**

The Basic Education Core Curriculum B.E. 2551 (2008) serves as a core curriculum for national education at schools in Thailand. It provides a framework for improving the lives of learners. Furthermore, the Basic Education Core Curriculum B.E. 2551 (2008) has a vision to bring a balanced development for learners in all aspects and to increase the capacity of learning in students. Student-centered instruction is supported based on the idea that learners are capable of developing themselves and learning to their top capacity. Good quality education is provided to all the Thai students with the proper knowledge and skills in order to live in the changing society. The curriculum aims for students to achieve knowledge for lifelong development. Teachers should be able to understand the curriculum and design learning strategies and methods based on them in order for students to achieve the main objectives of the curriculum. The basic education core curriculum 2008 aimed to



provide all Thai children with good quality education, knowledge and skills required to live in a changing society and for life-long learning (Thai Ministry of Education, 2008).

According to Iemjinda (2007), many teachers have the belief that changes in the curriculum can negatively affect their quality of work. Teachers also do not have the confidence and support in the classroom to face changes. This hinders them from reaching for success. Curriculum changes should be implemented according to the needs of the society in order to assure a successful future for the students. The Thai education system, being a highly centralized top-down administrative structure, has made teachers very dependent and non-supportive of change because of their lack of any serious input into such change. Teachers who perform good work at school need sufficient time and support to adapt the changes in the curriculum. Teachers also need to be aware that these changes are not due to perceived defects in their teaching, but rather to the upcoming changes and needs for the 21<sup>st</sup> century future which they need to understand in order to prepare students for it (Iemjinda, 2007).

**Science and the Basic Education Core Curriculum.** The Basic Education Core Curriculum B.E. 2551 (2008) explains the importance of science as it is needed to understand nature and man-made technologies. Science is a broad subject which students need to learn from the start of their school years. It helps to uncover and answer several interesting questions which arise in daily living. Science also helps students to relate and understand other subjects much better (Beckett, 2013).

Therefore, students must learn to apply scientific concepts logically and creatively. Also, science is needed to prepare the learners for the knowledge-based society in the modern world. It aids in the development of the learners' thinking skills logically, creatively, critically and analytically (Thai Ministry of Education, 2008).

In this study, the topic related to substances and properties of substances will be taught to the students. Essential knowledge about substances, chemical reactions, forming

solutions, reasoning scientifically and application of scientific knowledge in real life will be taught. Students will learn about the properties of elements and compounds and study the periodic table. Students will also learn about various separation techniques and also be involved in practical work through experiments. Students will learn about chemical reactions and conduct experiments in laboratory (Thai Ministry of Education, 2008).

In Thailand, science education has been affected by the reform of the science curriculum from the United States. Thai science education for some students is the cause of many problems because many students, given their previous educational experiences, simply cannot relate to science. They believe it is far away from their daily lives. They feel that the content taught is not applicable to their lives (Chui, 2016). Students must learn that science helps to develop various new ways of thinking. It helps to prepare them for the world of work ahead. Science links with other subjects in the curriculum and also with the lives of the students (UNESCO, 2010).

### **Twenty-first Century Skills and Science Learning**

Science is the first term in the acronym in the related STEM subjects (Science, Technology, Engineering, Mathematics) and as such holds pride of place in the scheme of 21<sup>st</sup> century learning approaches (see next section as well). STEM subjects represent the particular skills required to prepare students for the world waiting for them ahead in the future. One of these important skill sets includes learning and innovation skills which require learners to think critically and creatively, communicate effectively, and solve problems collaboratively. These skills allow learners to share their ideas, be open to new ideas, learn from mistakes and keep innovating and creating new things. Learners of the 21<sup>st</sup> century should be able to guide others, use their problem solving skills to help others reach goals, show ethical behavior and be responsible towards others and for the community (Cleesuntorn, 2015).

Students need to learn the 21<sup>st</sup> century skills in order to prepare them for an updated, knowledge-based and technology driven society. The knowledge, skills, work habits and character traits related to the 21<sup>st</sup> century skills involve the ability to

- think critically,
- solve problems,
- be creative,
- innovate,
- plan,
- conduct research effectively,
- communicate effectively,
- listen effectively,
- collaborate effectively,
- use information and communication technologies effectively,
- apply ethical literacy,
- apply global awareness,
- apply multicultural literacy,
- apply health and safety literacy and
- apply environmental awareness.

For instance, in science students need to learn research methods and have computer literacy in order to apply it for searching about science content in class or also in other subjects. Schools need to modify and build new methods of teaching and learning that will show how the world is changing. Teaching students for only examinations is not sufficient for the changing world now (The Glossary of Education Reform, 2016).

According to P21 Partnership for 21st Century (2002), there should be efforts made to construct connections of real life with academic subjects and detailed knowledge of

subject content should be emphasized rather than just general, basic information of various subjects. Students should be given an opportunity to experience real materials, information and experts that they will face in future at university, in job or in life. Students should be engaged in solving useful problems (P21 Partnership for 21st Century, 2002).

The 21<sup>st</sup> century skills listed above are required for students in order to be prepared for the 21<sup>st</sup> century. Thailand should focus on creative thinking because in most developed countries creative work is more emphasized rather than just routine work. Thailand needs to consider the aspects of creative and productive education for learners such as to make the learners understand ASEAN and Western culture, prepare for innovation, hold strong ethics, create new things, understand others, collaborate to form new paths in the society. Teachers must make the students aware – and give them practice in applying - analytical thinking skills in order to know the worth of things they use in their lives. Teachers and school administrators should conquer some wrongdoings such as emphasizing on academics but not on real life, emphasizing on memory but not on thinking, emphasizing on past theories but not on future innovations and, lastly, emphasizing on constancy but not on change (Sinlarat, Rachapaetayakom & Swatevacharkul, 2013).

### **STEM Education**

STEM education is a curriculum based on science, technology, engineering and mathematics, integrating them together in a challenging way for students to learn and at the same time apply in the real world. STEM Education allows students to prepare themselves for STEM jobs and occupations for the future (Hom, 2014).

STEM education is a new learning transformation which joins science, mathematics, technology and engineering together. This method helps learners to participate and apply their knowledge in solving real life problems. It also provides the learners with an

opportunity to think of new ideas, methods and new solutions through problem-based and project-based learning. It helps learners to make a connection with what they learn for their private life and professional life, for the future. STEM education is not just limited to a particular subject but it can be joined up with other subjects in order to develop knowledge along with skills of the learners (Boonruang, 2015).

The Thai Government and the Ministry of Education are currently emphasizing STEM education in national education policy. Given this, it is important that Thai teachers' knowledge about STEM Education should also be given attention to in order to achieve success in STEM policy implementation. According to Manosuttirit (2016), due to lack of sufficient information and knowledge about STEM education, not all schools in Thailand can discover and implement the methods and format of STEM instruction. Due to this reason, schools are afraid that STEM instruction might affect the teaching and learning of various subjects at school. Schools still suffer from problems such as lack of budget, financial help, teaching and learning time, unclear curriculum, proper skills for the implementation of STEM education in schools. Manosuttirit (2016) argued that STEM education needs time in order for teachers and others to understand and use this new approach towards teaching. Teachers in Thai schools are occupied with responsibilities and work; therefore, teachers are not ready to adapt this new approach and take on this new responsibility. On the other hand, many schools are already implementing STEM instruction without clear and accurate guidance and help so they not sure of whether is it the right way or not and might lead to mistakes in teaching and implementing STEM at schools. Manosuttirit (2016) has further noted that activities in STEM education should be open, flexible, challenging and emphasize problem-solving ideas and methods. These activities should not be too easy for learners nor too difficult to solve and understand. STEM education should be used along with the 21<sup>st</sup> century skills and critical thinking. This will bring enhancement and also help to increase the



economic status of Thailand to a higher level. STEM education teaching styles are entertaining and beneficial for the future careers of learners. STEM education is a connection bridge between knowledge and life. There are many STEM education networks in Thailand such as Thai STEM education Center which are working to support STEM teaching and learning throughout Thailand (Manosuttirit, 2016).

### **Science Globally**

Through learning science, children discuss, write and talk about science principles and this helps them to use this knowledge in making decisions in their lives. People need different ways through which they can freely experience and develop their skills and obtain opportunities. Every citizen should play an active role in decision-making for the community, and that comes through their scientific understanding which strongly supports the decision-making process. Science which students are not able to relate to their personal lives is usually not accepted by the students in schools. Science needs to have space for students' lives and their ideas not just soaking their brains into the knowledge given from the teacher. According to UNESCO (2010), basic school science education enables students to seek for a variety of career opportunities in the future, which are a lot better in terms of money and quality of work. Without basic science education, people will not be able to play the role of effective citizens in the society, it also allows people to explore and study the great accomplishments of the world and enables them to adapt powerful ways of thinking (UNESCO, 2010).

**Science as a subject.** Teaching science allows students to understand the functioning of the world and how the world works around them. Science offers a huge bundle of knowledge for students to access. Science enables students to understand the functioning of their bodies and also gives them an understanding of modern technology. According to Redman (2013), science allows students to use knowledge for making decisions, learning

new concepts and being well informed about the world. Science provides reasons behind everything children see on television or in books. For some students, science is highly motivating and fascinating. Science brings a feeling of interest and allows students to build meaning and ask questions from what they learn and also wish to learn for the future. Students with high achievements in science tend to build a strong critical thinking ability (Redman, 2013).

### **Instructional Methods**

According to Concordia University (2012), in a teacher-centered classroom the teacher talks and students listen by putting all their attention on the teacher. No collaboration is encouraged and students work individually. In teacher-centered instruction the classroom remains organized, students are not noisy and the teacher has full control over the class. Students work individually so this results in students being more independent. The teacher covers all the important topics because the teacher has control over all the class activities. In a student-centered classroom, students and teacher focus and interact equally. Students work in groups, collaborate and communicate with each other. Through group work students learn communicative and collaborative skills. Students ask questions and direct their own learning. Students also interact actively with each other and perform learning activities with enthusiasm. Thai teachers in recent years are using more of student-centered instruction methods in their classrooms. This is likely because, as discussed above, both the National Education Act (1999) and the Basic Core Curriculum introduced in 2008 emphasized the student-centered approach to teaching and learning. However, when both the teacher-centered and student-centered approaches are used together in class, students can enjoy and get the benefits from a balance of both educational atmospheres (Concordia University, 2012). This combined dual approach also recognizes the importance of Thai social and cultural imperatives that historically have tended to emphasize authoritative approaches to teaching

and learning while at the same time providing grounds for the modern student-centered international approach.

### **Teacher-centered Instruction**

Traditional instruction is usually the teacher-direct orientation which has always been implemented as a main method of instruction in Thailand. This method of instruction emphasizes rote learning. Knowledge is transmitted from teacher to students where the teacher has total control and controls what students learn.

According to Thamraksa (2011), many teachers are not open to new teaching instructions as they do not wish to move out of their comfort zones and do something new. Also, teachers have a perception that their teaching methods are already the best and therefore require no change. Some students consider traditional instruction as evidence that they are really being taught in school (Thamraksa, 2011).

According to Donnelly (2014), learning occurs in both passive and active ways. Memorization and rote learning is also important for learning because students have different levels of understanding; for example; some learn best by active participation, pictures, memorization, hands on experience or by reading. On the other hand, traditional instruction is often a situation where children function as parrots who repeat exactly what is taught. Depending on what is being taught and what is suitable for the students, the teacher must use different teaching and learning strategies accordingly (Donnelly, 2014).

The student centered instruction for some teachers is something new where they are not sure of the ways in which they can apply and use it in their classes. They also question its effectiveness in enhancing students' quality. They also may fear that a student centered approach will replace them in classroom in the long run (Thamraksa, 2011).

## **Student-centered Instruction**

Student-centered learning (SCL) is a teaching strategy in which students are given more attention and more responsibility for their own learning. SCL includes techniques like active learning, problem solving using creative and critical thinking, role playing and team learning such as cooperative learning. According to Froyd and Simpson (2008), proper teaching using SCL can increase student motivation to learn, in-depth understanding of content and an overall positive attitude for the subject. SCL provides students with an opportunity to discover and construct knowledge.

Many approaches of SCL has been developed and have been named such as, active learning, collaborative learning, cooperative learning, experiential learning, problem-based learning, team-based learning, peer instruction, project-based learning, small group learning and inquiry based learning.

There are many reasons why a SCL approach should be adopted; firstly, it is a very enjoyable method for learners and secondly research has strongly indicated that this approach tends to improve student learning. Using SCL is not a way to cut out teacher roles, but an approach to bring a change in teaching techniques which improves learning and knowledge of the learners (Froyd & Simpson, 2008).

The student-centered method focuses on activities where students solve problems, make questions on their own, discuss debate and brainstorm during the lesson rather than the traditional approach in which team work is not encouraged and most time is spent on 1 teacher lecturing. An example of student-centered method includes cooperative learning where students work in groups on a project or problem. The student-centered method has been shown to be more effective than traditional teacher-centered instruction methods as it involves critical and creative thinking, problem solving, deeper understanding of content in a

short time and also building a positive attitude with greater student confidence towards that subject (Felder, 2009).

Student-centered classrooms give best results when student-centered pedagogies are used along with teacher support. Technology-rich collaborative classrooms also known as sociotechnological classrooms are designed based on student-centered learning and teaching. They are designed to provide an environment that allows student involvement related to the course content with the use of new technology. When compared to conventional classrooms when the teacher stands in front of the class facing the students, sociotechnological classrooms allow students to sit in small groups, which encourages collaboration and interaction among students. Student-centered learning helps students to organize their ideas and information in a logical structure when compared to teacher-centered learning methods (Lasry, Charles, & Whittaker, 2014).

According to Asoodeh, Asoodeh and Zarepour (2012), the main aim of today's education is not to give information to students directly but to allow them to research for it themselves. Student-centered instruction creates active learning in several ways such as cooperative learning, problem-solving exercises and critical thinking exercises. Working in groups not only improves students' participation in class activities, but also it is a way to increase a students' self-confidence and making the work less stressful. It helps to take away the feeling of learners being bored in class (Asoodeh et al., 2012). The major characteristics of the student centered approach which will be used in this study include creating a learning environment where students take charge of their learning and get involved in it (Thamraksa, 2011).

**Collaborative Learning.** Collaborative learning is the interaction among people, where they work together towards a common goal. Collaborative learning happens in an interactive situation which should boost the peer's cognitive process. Peers learn because



they work together and perform activities through collaborating which triggers learning process. The teacher's role is called as a facilitator in terms of collaborative learning, where the teacher leads the way through hints in order to make the group work productive and monitor on the member who are lagging behind and are not interacting (Dillenbourg, 1999).

Collaborative learning is a way of teaching and learning through which students group up to work on a project, search for answers and discuss lectures or assignments. Collaborative learning happens when students work in teams and it can result in better understanding of topics, greater motivation, better self- esteem and higher achievement (Educational Broadcasting Corporation [EBC], 2004). Collaborative learning can be accomplished when there are shared values, common goals, variety of thoughts, and dedication towards group, motivation and understanding from both ways (Hakkinen, 2002).

Collaborative interactions are marked by negotiation, sharing work, interaction and depending on each other. Through interactions, team members explain, talk and communicate which has great effects on improving their understanding and learning. In collaborative learning, students with high ability tend to engage actively in discussions as compared to low-achieving students. Collaboration is also related to many educational results, for example, critical thinking and motivation. A collaborative task for learners brings something fresh and new; also, working with others brings new interest and curiosity. However, there are some challenges in assessing group collaborative learning. In a group setting, individual work may be hidden. Group work and individual work cannot be considered the same as the participation of each group member might not be equal or not equally done by all (Lai, 2011). Students should be able to use the cognitive domain of the revised Bloom's Taxonomy in which learners get to apply, analyze, evaluate and create meaningful material from what they learn. To be able to create, evaluate, analyze, apply, understand and remember are very essential results of education (Krathwohl, 2002).

Collaborative learning is a method of working together where learners interact, discuss, make decisions and are responsible for their actions. This form of instruction helps learners with their communication skills, group work, sharing ideas and student involvement. Children can perform better when they get the help of others and work in groups rather than working alone on their own. It also allows students to experience active learning, where they control their own learning through participating in group discussions, choosing the correct resources and connecting new knowledge with previous knowledge they have along with the support and encouragement of the teacher (Singh, 2011).

Collaboration among students helps to improve their writing and learners get to consider others' opinions. This provides learners with a chance to talk with each other about their academic work and get a much clearer idea. Collaborative learning can be practiced in many ways in a classroom such as an entire class exercise or group work in small or big groups or even in pairs. Teachers should be able to design the exercises carefully in order to reflect the goals of the lesson and also to meet the needs of the students. One of the most commonly used methods in collaborative learning is peer group. According to Dartmouth University (2016), when students do collaborative research they are able to cover more of the topic rather than just isolate and work privately and find limited information. In collaborative activities students talk and work together to accomplish a given task. Group presentations are also a way to allow collaborative learning to take place in class where students work together and at the end of the research present the topic in class through the use of media. But one concern is that the weaker students may depend on the stronger students for passing the course. On the brighter side, however, it allows students to produce a work together and also allows them to divide the work equally. It provides them with a chance to express their ideas in different ways by discussion and debate among the group. According to Dartmouth University (2016), the entire class discussion improves if the teachers first allow the students

to work in smaller groups earlier. One important idea that the teacher should keep in mind is that before allowing collaborative learning to take place in class, the instructor should make it clear to the students the standards for evaluating the group work (Dartmouth University, 2016).

**Experiential Learning.** Experiential learning theory states that learning is created through experience and is based on four stages of the learning cycle which are experience, observation, conceptualization and testing which will further lead to new experiences (Clark, 2011).

According to Banerjee (2012), learners develop intellectually through social interaction and learning is a social process. Based on the sociocultural theory, initially people learn from interactions and then by themselves. The innovation of collaborative learning began during ancient civilization when learning was not based on school hours and was later replaced by learning philosophies from the West and the colonized East. It then came again into the picture in the 20th century, when research proved that learners gain more knowledge at a faster pace when they work in pairs. The base of collaborative learning is constructivism. People learn from observation, listening and from the feeling around them. People also tend to learn by exploring and from experience in life (Banerjee, 2012).

Experiential learning theory states that knowledge is created by the gaining experience and conversion of experience. It states that learning is the main cause of human development and aids in personal development. Experiential learning is the construction of knowledge through experience, reflection, thinking and action (Yeganeh & Kolb, 2009).

The definition for learning in terms of experiential learning is the process through which knowledge is built from experience. Knowledge is constructed through obtaining and transforming experience. Experiential learning theory emphasizes the importance of experience in the learning process (Kolb, Boyatzis & Mainemelis, 1999). Experiential

learning theory is an overall combination of experience, perception, cognition and behavior. Experiential learning is a concept which describes the process of human adaptation to the social and physical environment (Kolb, 1984).

Experiential learning allows experience to be the main factor leading to all the teaching and learning taking place. The major point of experiential learning is that it allows learners to analyze from their experience through reflection, evaluation and reconstruction so that it can result in a meaning for the learner to understand. It supports learner- centered approach and creates a more participative and engaging environment for learners (Andersen, Boud & Cohen, 1993).

### **Self-Efficacy for Learning Science**

Self-efficacy is a person's belief in their capabilities to achieve their goals. Self-efficacy beliefs control the way people behave, feel, think and motivate themselves. A strong sense of efficacy can increase a person's achievement and well-being in several ways. An effective way of building strong efficacy is through successful experiences. Success builds a powerful belief in a person's self-efficacy. Self-beliefs of efficacy also effect self-regulation of motivation. Human motivation and beliefs about what a person can do is all built in the mind. Humans set goals and base their actions on them (Bandura, 1994).

### **Social Learning Theory**

According to Moore (1999), people imitate what they see and develop it into their own behavior. Bandura is known for social learning theory also called as social cognitive theory. He conducted many studies related to observational learning. For a person to imitate a behavior he needs a reason or a stimulant that he imagines and this will push him to imitate that behavior. These stimulants are in fact acting as reinforces leading the person to conduct that particular activity (Moore, 1999).

Bandura is famous for the development of social learning theory which is an ongoing process and is a method through which children learn from people around them. It focuses on observation and imitation of behavior. Children learn social behavior through watching other people (Banyard & Grayson, 2000).

Social cognitive theory is a method to learn from surrounding experience. Children observe people around them and try to learn and be like them such as parents, siblings, friends, relatives. They are the models to whom children observe and imitate. Children pay careful attention to some of the people and remember their behavior and later at some point of time copy that particular behavior. The people around can respond through rewarding or punishing the child. If the child is rewarded, then the imitated behavior will be repeated by the child (McLeod, 2016).

Self-efficacy acts as a base of motivation in humans. If people believe that they can achieve a certain goal, their actions will lead them to it in spite of challenges along the path. Information acquired through observation certifies that personal efficacy belief affects a person's life in terms of productive thinking, personal motivation and also their life choices. People cannot spend life in isolation. Bandura developed the concept of individual human actions to also include collective actions whereby people help each other and work together on shared beliefs to make their lives better. Students need to have both the desire to succeed and also the skills required to succeed in order to be successful in class. It is in this sense that self-efficacy facilitates the cognitive involvement of students in class (Pajares, 2004).

In social learning, new styles of behavior can be learned through direct experience or by observing the behavior of others. Learning built through direct experience is controlled by rewarding and punishing consequences that follow any action. People observe the consequences of their various actions, and on the basis of the feedback they develop either



positive or negative thoughts related to the consequences of the actions performed. These thoughts serve as a guideline for future behavior and actions. Performance can be changed to some extent by reinforcement without an individual being consciously aware of the link between their actions and the outcomes. In social learning theory, reinforcement serves as a motivation and informative function. To a large extent actions are controlled by expected outcomes. A person's cognitive skill provides the potential of awareness and planning for the future (Bandura, 1971).

### **Previous Research on Instructional Methods**

Zuber and Lynch (2016) noted that in Thailand traditional teacher-centered approaches fail to grasp the interest of students. They found that statistically there was a difference in the level of academic achievement between students who study under traditional learning instruction and students who study using cooperative learning instruction. From the pre-test and post-test students under traditional learning instruction improved by a score of 54% and students under cooperative learning instruction improved by a score of 68%. Cooperative learning instruction is one of the ways to create appealing, motivating and student-centered teaching models. It is also encouraged by the Thai Ministry of Education as an effective teaching method (Zuber & Lynch, 2016).

Khuvasanond (2013) investigated the effects of teacher-centered versus student centered instructional strategies on the vocabulary learning of Grade 6 Thai students and found that teacher-centered classrooms show low positive feedback. Overall, cooperative student-centered versus teacher-centered instruction showed that students performed best through student-centered instruction and preferred student-centered more in their classes. Students also reported positive feelings towards student-centered classes. Higher mean scores in spelling and vocabulary were achieved by students through cooperative student-centered instructional techniques. Students were encouraged and were also able to interact and develop

thinking and social skills through cooperative learning instruction. Students in teacher-centered technique classrooms had less opportunity to develop communicative skills, critical thinking skills and social skills (Khuvasanond, 2013).

### **Triamudomsuksa Pattanakarn School English Program (TUP EP)**

Triamudomsuksa Pattanakarn School English Program has been functioning successfully since 2013 and currently has Mathayom 1 to 5. The classrooms have a modernized pattern of structure with air conditioners, projectors and laptops for teachers to access and use in their lessons. There are 15 teachers from various countries for example, Philippines, USA, and India, in the English Program. Teachers hold specific major educational degrees according to the particular subject that they are teaching. The teachers are experienced and have met the standards for teaching in Thailand. Students are taught in English and also get to experience various activities during the academic year. There are three foreign teachers in the English Program teaching Science to the students from grade 7 to grade 11. Triamudomsuksa Pattanakarn School's mission also wants teachers to create an environment that has a high level of student involvement. The English Program teachers provide students with a new approach to their teaching and therefore help to motivate the students for a higher level. The English Program aims to provide students with international academic standards while also respecting Thai culture (Vinrade, 2016).

The vision of the school is to develop learners to live in harmony and to be able to reach the international standard with world class character. The mission of the school is to develop learners with high international standards, encourage learners to be good world citizens, provide an educational experience that will affect the life and quality of students, and to allow teachers to learn and develop themselves and the school (Jinn, 2014).

The teachers are usually using teacher-centered instructional methods to teach in most of the classes at this school. Students do not involve in activities and teacher leads the class by lecturing and directing the students. Teachers teach and students make notes in most of the classes at this school.

This chapter described the situation of education in Thailand along with the importance of science as a subject, STEM Education and also the Thai curriculum for science was explained. Teacher-centered and student-centered instructional methods were also discussed and analyzed. Student-centered collaborative learning methods, social learning theory and experiential learning were discussed as well. A brief description of the school in which the research was conducted concluded this chapter. The next chapter will present the research methodology used in the study.

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

This chapter will describe the methods and procedures used by the researcher to carry out this study. The sections in this chapter will include research design, population, sample, research instrument, experimental procedures, collection of data and data analysis. The purpose of this study is to determine if there is a difference in student motivation and academic achievement between use of teacher-centered and student-centered instructional methods in Grade 8 science class.

#### **Research Design**

This comparative study used a quantitative approach as it will use pre-test and post-test to compare student academic achievement under two different instructional methods. Also, the researcher will use a questionnaire to measure the level of motivation of students in each of the two instructional methods.

This research used two groups of students. The control group followed the teacher-centered instructional method usually used by the school. The experimental group was provided with student-centered instructional method, so the treatment in this study was collaborative learning in which students work in groups. The teacher controlled the teacher-centered group and student did not get to participate or do any activities, which was different from the student-centered group where the students worked in groups together and did many activities and discussions together. The independent variables were teacher-centered instructional method and student-centered instructional method. The dependent variables were student academic achievement and level of motivation.

### **Population**

The population was the 59 students enrolled in Grade 8 English Program science class at Triamudomsuksa Pattanakarn School.

### **Sample**

The sample was all of the 59 students. The sample was a purposive research sample divided into two groups, a control group of 30 students and an experimental group of 29 students. The English Program has separated students of Grade 8 into two sections only 2/15 and 2/16 based on their entrance exam scores.

Both sections are capable of performing good work and activities in the class at the same level. Given that the researcher had asked the head of the English program that both the sections are initially academically at the same level, the researcher will simply choose 2/15 to be the control group and 2/16 to be the experimental group. The mean score of the experimental group was the same as the control group in science from their previous Grade 7 records.



Table 1

*Population and Sample Sizes*

Grade level	Section	Population size	Sample size
8	2/15	30	30
	2/16	29	29
Total		59	59

**Research Instruments**

Two research instruments pre-post achievement test and the Motivation for Learning Science Questionnaire (MLSQ) were used throughout the research.

**Pre-Post Achievement Test**

The first instrument was a test prepared by the researcher consisting of 15 multiple choice questions, five true or false, and 10 fill in the blanks which will comprise a total point value of 30 (see Appendix A). This test has been used previously by the researcher in other classes for test purposes and has been checked and approved by science teachers in the science department at school. Table 2 shows the question types, how many of each question, and also the level of Bloom’s taxonomy tapped by each item.

Table 2

*Table of Specifications with Bloom's Categories for the Questions from Pre-Test and Post-Test*

Content	Remembering	Understanding	Applying	Total number of items
Part 1 Multiple choice	Q1 Q3 Q15	Q2 Q5	Q4 Q6 Q7 Q8 Q9 Q10 Q11 Q12 Q13 Q14	15
Part 2 Fill in the blank	Q4 Q7 Q9	Q1 Q2 Q5 Q6 Q8 Q10	Q3	10
Part 3 True or False	Q4 Q5	Q1 Q2	Q3	5

A pre-test was given to students before the instruction in order to determine the students' level of knowledge in terms of the lower order thinking skills (LOTS) of Bloom's hierarchical taxonomy of the cognitive domain, which includes remembering, understanding and applying. In Bloom's model, the LOTS serve as the foundational knowledge levels and as essential prerequisites to the three higher order thinking (HOTS) levels of analysis, evaluation and creativity, all of which are crucial to science learning and practice. A post-test, which will be the same as the pre-test, was given to the students after an instructional period of two months. The pre- and post-tests was used to determine the academic achievement of the two groups. The interpretation from the pre-test and post-test percentage of marks of the student achievement will be as per Table 3 below.

Table 3

*Interpretation of Student Achievement*

Percentage of marks	Interpretation
80 - 100	Excellent
75 - 79	Very Good
70 - 74	Good
65 - 69	Moderate
60 - 64	Satisfactory
55 - 59	Low
50 - 54	Poor
0 - 49	Failing

## Motivation for Learning Science Questionnaire

The second instrument was a seven-point Likert-type- scale, the Motivation for Learning Science Questionnaire (MLSQ) which was adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991) The questionnaire is composed of 26 items (see Appendix B). The questionnaire was given to the students before delivering the instruction and once again after the instruction is provided in order to determine if there is a difference in motivation level before and after the instruction. The subscales used in this questionnaire were intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs and self-efficacy for learning and performance. The researcher has used the same scale as the original questionnaire of MSLQ developed by Pintrich et al (1991) and has used only changed the subject name as science.

Table 4

*MLSQ Items and Relevant Subscales in terms of learning and performance*

Items	Subscale
1, 13, 18, 20	Intrinsic goal orientation
6, 9, 11, 25	Extrinsic goal orientation
3, 8, 14, 19, 22, 23	Task value
2, 7, 15, 21	Control of learning beliefs
4, 5, 10, 12, 16, 17, 24, 26	Self-efficacy for learning and performance

According to the Objective 1, the researcher will determine the level of motivation of students through the questionnaire. The MLSQ allowed the students to choose between the high level of motivation (scores of 5.81 to 7.00) to low level of motivation (scores of 1.00 to 2.20) as per shown in Table 5 below.

Table 5

*Interpretation Scores of the MLSQ*

Score	Interpretation
5.81 - 7.00	Very high motivation for learning science
4.61 - 5.80	High motivation for learning science
3.41 - 4.60	Moderate motivation for learning science
2.21 - 3.40	Low motivation for learning science
1.00 - 2.20	Very Low motivation for learning science

**Validity and Reliability****Validity and Reliability of the Pre and Post Achievement Test**

The pre and post-test has been used earlier for 3 years by the researcher for Grade 8 science. The test has also been checked by the head of science department and science co-teachers for the content-validity. Also the English grammar has been checked by the head of English department at the school.

**Validity and Reliability of the MLSQ**

The scales in the Motivated Strategies for Learning Questionnaire represents a coherent conceptual and empirically validated framework in assessing student motivation and use of learning strategies. Studies have supported the factor structure of MSLQ and the stability of the scales. The MSLQ has been used in academic settings for many studies. A measure a content validity can be concluded from the close relation between a scales item and a coherent domain of theory (Feiz, Hooman, & Kooshki, 2013).



The reliability of the MLSQ can be determined from the Cronbach's alpha table for each subscale shown in Table 6.

Table 6

*Specifications of the Sub-Scale of the Items and Cronbach's Alpha Value in the MLSQ*

Sub-scale	Cronbach's alpha value by Pintrich et al. 1991	Cronbach's alpha value in this study
Intrinsic goal orientation	.74	.72
Extrinsic goal orientation	.62	.63
Task value	.90	.85
Control of learning beliefs	.68	.59
Self-efficacy for learning & performance	.93	.89
Total	.77	.74

### Experimental process

The table 7 explains the experimental process conducted in each week.

Table 7

#### *Experimental Process for Control and Experimental Groups*

Week	Control group	Experimental group
1	Science pre-test and motivation pre-test was conducted in class.	Science pre-test and motivation pre-test was conducted in class.
	New topic introduced in class along with lecture and power point presentations given in class.	New topic introduced in class along with peer work given in class. Students work in peers.
	Students listen to the teacher and make notes about balanced and unbalanced forces in class.	Students work in groups and discuss about balanced and unbalanced forces.
2	Students were given exercises and individual work was done.	Students work in group on the exercises given from the textbook
	Students learn about the motion through lecture and power point presentation of the teacher.	Students work in groups of five and discuss about the topic.
	Teacher lectures about the Newton's laws through power point presentation in class	Students were seated in peers and discuss about Newton's laws through research.

Week	Control group	Experimental group
3	Teacher lectures the students about motion and pressure through power point presentation by the teacher.	Students seated in groups and discuss about the motion and pressure in class.
	Review of the previous lesson was done in class.	Students draw a mind map and review the previous topic in group.
	Teacher introduces new topic in class about soil and students make notes.	Students sit and work in groups and discuss about new topic soil.
4	Teacher discuss about the details related to the properties of soil.	Students work in group and make a mind map related to the properties of soil and present in class.
	Students learn about the motion through lecture and power point presentation of the teacher.	Students work in groups of five and discuss about the topic.
	Teacher present and discusses about the factors affecting the soil formation.	Students sit in peers and prepare a mind map related to the the factors affecting the soil formation.
5	Students make notes on new chapter earth and teacher give lecture on that topic.	Students prepare a presentation on the topic earth and research about it in class.
	Teacher discusses about the Rocks and students make notes.	Students sit in groups and make a table about rocks and discuss.

Week	Control group	Experimental group
	Teacher presented about the rock cycle. Students make notes.	Students research together and present about rock cycle in class.
6	Students work on questions from the textbook.	Students work in peers on the questions from the textbook.
	Students listen to the teacher and note the correct answers.	Students and teacher discuss together the answers in class.
	Post –Test conducted in class.	Post-Test conducted in class.



### Collection of Data

The collection of data was conducted during a period of six weeks, with three 50-minute lessons per class in each of those weeks during August to September 2017. The data was collected by the researcher. The topic was taught at the same time to both the groups but the only difference is the style in which the instructions were delivered. Table 8 below explains the experimental process of how the instruction for both the control and experimental groups was organized according to the weeks, periods and topics. A sample lesson plan for both groups (Week 1 - Period 2 and 3) is given in Appendix C.

Table 8

*Summary of the Overall Data Collection Process for Control and Experimental Groups*

Week	Period	Topic	Control group	Experimental group
1	1	Pre-Test	Knowledge pre-test and motivation pre-test given to all students in the first lesson.	Knowledge pre-test and motivation pre-test given to all students in the first lesson.
	2	Forces	New vocabulary words introduced in class and students write down and search for the meanings. Individual work	New vocabulary words introduced in class and students work together as peer groups and search for the meanings. Peer work
	3		Teacher explains about the basics of force and different types of forces. Teacher describes about balanced and unbalanced forces.	Students sit in groups and discuss about the basics of force and different types of forces. Students explain and mind map about balanced and unbalanced forces.



Week	Period	Topic	Control Group	Experimental Group
2	1		Students finish the exercises in the workbook and teacher discusses the answers.	Students sit in peers, work on the questions in the workbook, and solve it.
	2		Teacher explains about speed, velocity and acceleration. Students individually work on the word problems in class.	Students sit in groups and discuss about speed, velocity and acceleration. Students try to solve the problems in the group.
	3		Teacher explains about Newton's law of motion. Teacher describes about the theory of inertia and each law of newton.	Students sit in peers and research on Newton's law of motion and all theories related to it by preparing a mind map in peers.
3	1		Teacher discuss about the relationship between force pressure and area.	Students discuss about the relationship between force pressure and area in groups.
	2		Teacher discuss about the previous topic.	Students discuss about the previous topic.
	3	Soil	New vocabulary words introduced in class and students write down and search for the meanings. Individual work	New vocabulary words introduced in class and students work together as peer groups and search for the meanings. Peer work

Week	Period	Topic	Control Group	Experimental Group
4	1		Teacher discuss about the types, properties, composition and formation of soil. Students make notes.	Students sit in group, describe and draw a picture related to the properties, composition and formation of soil.
	2		Teacher discuss about the layers of soil. Students make notes.	Students sit in peers and discuss about the layers of soil. Sketch and labels each layer of soil in peers.
	3		Teacher discusses about the factors affecting the soil formation also the uses of soil.	Students sit in groups and mind map about the factors affecting the soil formation also the uses of soil.
5	1		Teacher discusses about the structure of Earth and the four spheres of Earth.	Students sit in peers and discuss about the structure of Earth and the four spheres of Earth.
	2		Teacher discusses about the Rocks and classification of Rocks in the main types. Students make notes.	Students sit in groups and mind-map about Rocks and classification of Rocks in the main types.
	3		Teacher discusses about the rock cycle. Students make notes.	Students sit in peers and sketch about the rock cycle.

Week	Period	Topic	Control Group	Experimental Group
6	1		Teacher directs students to work on question in the workbook.	Students work in peers on the questions in workbook.
	2		Teacher discusses the answers with the students.	Students discuss with one another the correct answer and at the end of the lesson teacher helps them.
	3	Post-Test	Last week post-test given to all students.	Last week post-test given to all students.

### Data Analysis

The six objectives of the study were analyzed using a statistical software package. The results were compared to each other through independent samples *t*-test in order to make conclusion from them.

Objectives 1 and 2 both determine the level of student motivation using a 7-point Likert-type- scale, the Motivation for Learning Science Questionnaire (MLSQ). These two objectives were analyzed through the means and standard deviations.

Objectives 3 and 4 both determine the level of student academic achievement using means and standard deviations of pre-tests and post-tests.

The last two objectives, which determine if there is a significant difference between the two methods and were measured using means and standard deviations as well as independent samples *t*-test.

### Summary of the Research Process

The research process of this study is summarized in the Table 9.

Table 9

#### *Summary of the Research Process*

Research objective	Source of data	Data collection method or research instrument	Data analysis
1. Determine the level of student motivation under teacher-centered instruction method for English program students in Grade 8 science	Grade 8 students at TUP EP	Motivated for Learning Science Questionnaire (MLSQ)	Means and standard deviations
2. Determine the level of student motivation under student-centered instruction method for English program students in Grade 8 science	Grade 8 students at TUP EP	Motivated for Learning Science Questionnaire (MLSQ)	Means and standard deviations
3. Determine the level of student academic achievement under teacher-centered instruction method for English program students in Grade 8 science.	Grade 8 students at TUP EP	Pre-test and Post-test	Means and standard deviations

Research objective	Source of data	Data collection method or research instrument	Data analysis
4. Determine the level of student academic achievement under student-centered instruction method for English program students in Grade 8 science.	Grade 8 students at TUP EP	Pre-test and Post-test	Means and standard deviations
5. Compare the level of student motivation between teacher-centered instruction and student-centered instruction methods in Grade 8 science.	Grade 8 students at TUP EP	Motivated for Learning Science Questionnaire (MLSQ)	Independent samples <i>t</i> -test
6. Compare the level of student achievement between teacher-centered instruction and student-centered instruction methods in Grade 8 science.	Grade 8 students at TUP EP	Pre-Test and Post-Test	Independent samples <i>t</i> -test



## CHAPTER IV

### RESEARCH FINDINGS

This chapter details the research findings and links them to their corresponding objectives and hypotheses. Moreover, additional conclusions towards the instructional methods are also presented in this chapter.

#### Findings of the Study

Six research objectives as well as two hypotheses were designated for this research study. The findings of each objective is explained in this chapter. The objective was linked to the statistical valued obtained in this study and explained below.

#### Research Objective 1

The first objective was to determine the level of student motivation under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School. The analysis revealed a mean score of the MLSQ in the 4.61 to 5.80 range, thus displaying that the control group has high motivation for learning science ( $n=30$ ,  $M= 4.89$ ,  $SD= .76$ ). This information is given in Table 10.

Table 10

*Mean and Standard Deviation of the Control Group Motivation for Learning Science*

*Questionnaire MLSQ*

Teacher-centered Instruction	<i>M</i>	<i>SD</i>	Interpretation
Motivation for Learning Science Questionnaire (MLSQ)	4.89	.76	High motivation for learning science

*Note. n=30.*

The mean and standard deviation of the control group from the MLSQ shows high motivation for learning science under teacher-centered instructional methods. Students are motivated to learn science under teacher-centered instructional methods in their classroom. The means and the standard deviations are shown above.

The mean and standard deviation of each subscale for the control group are shown in the table 11 below.

Table 11

*Means, Standard Deviations and Interpretations of the Subscales of the Motivation for Learning Science Questionnaire MLSQ items for Control Group*

Subscale	Item number	<i>M</i>	<i>SD</i>	Interpretation
Intrinsic goal orientation	1,13,18,20	4.54	.95	Moderate
Extrinsic goal orientation	6,9,11,25	5.54	1.05	High
Task value	3,8,14,19,22,23	4.89	1.1	High
Control of learning beliefs	2,7,15,21	5.16	.91	High
Self-efficacy for learning and performance	4,5,10,12,16,17,24,26	4.32	.87	Moderate

*Note. n=30.*

## Research Objective 2

The second objective was to determine the level of student motivation under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School. The analysis revealed a mean score of the MLSQ in the 4.61 to 5.80 range, thus displaying that the experimental group have high motivation for learning science ( $n=29$ ,  $M= 5.30$ ,  $SD= .73$ ). This information is given in Table 12.

Table 12

*Mean and Standard Deviation of the Experimental Group Motivation for Learning Science Questionnaire MLSQ*

Student-centered instruction	<i>M</i>	<i>SD</i>	Interpretation
Motivation for Learning Science Questionnaire (MLSQ)	5.30	.73	High motivation for learning science

*Note. n=29.*

The mean and standard deviation of each subscale of the motivation for learning science questionnaire for the experimental group are shown in the Table 13 below.

Table 13

*Means, Standard Deviations and Interpretations of the Subscales of the Motivation for Learning Science Questionnaire MLSQ items for Experimental Group*

Subscale	Item number	<i>M</i>	<i>SD</i>	Interpretation
Intrinsic goal orientation	1,13,18,20	5.16	.98	High
Extrinsic goal orientation	6,9,11,25	5.53	.97	High
Task value	3,8,14,19,22,23	5.35	1.05	High
Control of learning beliefs	2,7,15,21	5.55	.87	High
Self-efficacy for learning and performance	4,5,10,12,16,17,24,26	4.94	.89	High

*Note.*  $n=29$ .

### Research Objective 3

The third objective was to determine the level of student academic achievement under teacher-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School. In the pre-test the control group scored low which was 54.67% ( $n=30$ ,  $M= 16.40$ ,  $SD=3.55$ ). In the post-test the control group scored excellently which was 83.23% ( $n=30$ ,  $M= 24.97$ ,  $SD=3.66$ ). This information is given in Table 14.



Table 14

*Mean and Standard Deviation of the Control Group Pre-Test and Post-Test*

Teacher-centered Instruction	<i>M</i>	<i>SD</i>
Pre-test	16.40	3.55
Post-test	24.97	3.66

*Note. n=30.*

#### **Objective Four**

The fourth objective was to determine the level of student academic achievement under student-centered instructional method in Grade 8 science at Triamudomsuksa Pattanakarn School. In the pre-test the experimental group scored poorly which was 53.9% ( $n=29$ ,  $M= 16.17$ ,  $SD=2.99$ ). In the post-test the experimental group scored excellently which was 79.53% ( $n=29$ ,  $M= 23.86$ ,  $SD=3.78$ ). This information has been given in Table 15.

Table 15

*Mean and Standard Deviation of the Experimental Group Pre-test and Post-Test*

Student-centered instruction	<i>M</i>	<i>SD</i>
Pre-test	16.17	2.99
Post-test	23.86	3.78

*Note. n=29.*

#### **Objective Five and Hypothesis 1**

The fifth objective was to compare student motivation between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School. An independent samples *t*-test (one-tailed) was used for the analysis. The means and standard deviations were analyzed and compared as detailed in Table 16.

Table 16

*Independent Samples t-Test (One-Tailed) of the Motivation for Learning Science**Questionnaire MLSQ*

Control group and experimental group MLSQ	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	Sig.(2-tailed)
	59	5.09	.77	57	-2.13	.04

The mean and standard deviation of each subscale of the MLSQ for the control and experimental group together are shown in the Table 17 below.

Table 17

*Means, Standard Deviations and Interpretations of the Subscales of the MLSQ items for both Groups*

Subscale	Item number	<i>M</i>	<i>SD</i>	Interpretation
Intrinsic goal orientation	1,13,18,20	4.84	1.01	High
Extrinsic goal orientation	6,9,11,25	5.53	1.0	High
Task value	3,8,14,19,22,23	5.11	1.09	High
Control of learning beliefs	2,7,15,21	5.35	.91	High
Self-efficacy for learning and performance	4,5,10,12,16,17 ,24,26	4.62	.93	High

*Note.* *n*=59.

This objective was directly linked to the first hypothesis. In this case, the first hypothesis was accepted as the analysis concluded that, there was a significant difference in student motivation between the two instructional methods with the control group ( $n=30$ ,  $M= 4.89$ ,  $SD= .76$ ) and the experimental group ( $n=29$ ,  $M= 5.30$ ,  $SD= .73$ ) condition;  $t(57) = -2.129$ ,  $p= .038$ . The experimental group which experienced the student-centered learning instructional method was overall significantly highly motivated with the instructional method than the control group.

### Objective Six and Hypothesis 2

The last objective was to compare students' achievement between teacher-centered and student-centered instructional methods in Grade 8 science at Triamudomsuksa Pattanakarn School. As previous research showed an improvement in favor of student-centered learning method, an independent samples  $t$ -test (one-tailed) was used for the analysis. Table 18 presents the analysis of the means and standard deviations.

Table 18

#### *Independent Samples t-Test (One-Tailed) of the Post-Test*

Control group and experimental group post-test	<i>N</i>	<i>M</i>	<i>SD</i>	<i>df</i>	<i>t</i>	Sig.(2-tailed)
	59	24.42	3.73	57	1.14	.26

This objective was directly linked to the second hypothesis. In this case, the second hypothesis was rejected as the analysis concluded that, there was no significant difference in achievement between the two instructional methods with the control group ( $n=30$ ,  $M= 24.97$ ,  $SD=3.66$ ) and the experimental group ( $n=29$ ,  $M= 23.86$ ,  $SD=3.78$ ) condition;  $t(57) = 1.141$ ,  $p = .259$ .

This chapter presented the study findings related to the research objectives and hypotheses. Chapter V will discuss the brief summary, conclusions and recommendations of the study.



## **CHAPTER V**

### **CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS**

This chapter gives a brief summary, conclusion, discussion and recommendations of the study.

#### **Summary of the Study**

This research was developed to determine if there was a significant difference in student academic achievement and motivation between teacher-centered and student-centered instructional methods. The research was conducted in the Grade 8 science English program at Triamudomsuksa Pattanakarn School, Bangkok, Thailand from 24<sup>th</sup> July to 9<sup>th</sup> September 2017. Twenty-one 50 minute periods of instructions were completed.

Two groups were selected for this study. The control group involved 30 students and followed teacher-centered instructional methods. The experimental group involved 29 students and followed student-centered instructional methods which were built on collaborative learning and group work.

To measure academic achievement, a same test was given to both groups. Student motivation was measured using a seven-point Likert scale the Motivation for Learning Science Questionnaire (MLSQ). The results from both the groups were then compared for a conclusion.

### **Conclusion**

The first objective revealed that students scored high motivation for learning science towards the teacher-centered instructional method. Therefore, this finding suggests that these students do not have motivation problem for learning science and are keen to learn.

The second objective once again revealed that students scored high motivation for learning science towards the student-centered instructional method. This finding suggests that these students do not have motivation problem for learning science.

The findings of the third and fourth objectives were high level of academic achievement; the result of the post-test was higher than the results of the pre-test. Students from both the groups scored excellently in the post-test. Therefore, these findings suggest that student achievement is not a problem for these students and their academic level was good from the instructional methods used.

For the fifth objective the *t*-test showed a significant difference in student motivation in favor of the experimental group. Therefore, the first hypothesis was proven correct.



The sixth objective showed that the difference between the two groups was not sufficient to be statistically significant. Therefore, this finding suggests that teaching instruction methods did not make a significant difference to the student achievement.

## **Discussion**

In this section the researcher will discuss about student motivation and academic achievement.

### **Student Motivation**

In terms of this research, the researcher was pleasantly surprised that the Thai students had high motivation towards learning science. The experimental group which experienced the student-centered learning instructional method was highly motivated with the instructional method in Grade 8 science class compared to the control group. Students in the experimental group participated actively and were more engaged in classwork within their groups than the students in the control group. According to Froyd and Simpson (2008), proper teaching using student centered learning can increase student motivation to learn, in-depth understanding of content and an overall positive attitude for the subject. SCL provides students with an opportunity to discover and construct knowledge.

### **Academic Achievement**

The researcher was pleasantly surprised again that the student-centered method did not lead to a decrease in terms of student achievement. The time frame in which the research took place played a significant role in which the research was not able to bring a statistical difference. The time span in which the study was conducted was short and made it difficult to bring a powerful impact in the students' academic achievement by the two different instructional strategies. With the researcher's experience of working at Triamudomsuksa Pattanakarn School for five years, the researcher has observed that Thai students are used to

the teacher-centered method of instruction because the students have been only given teacher-centered instruction in the previous years at this school with the teacher being the main source of instruction and leader in class.

Children can perform better when they get the help of others and work in groups rather than working alone on their own. It also allows students to experience active learning, where they control their own learning through participating in group discussions, choosing the correct resources and connecting new knowledge with previous knowledge they have along with the support and encouragement of the teacher (Singh, 2011).

Also, the researcher could have failed to properly implement the instructional methods in class with the students that could have cause no difference in their achievement.

The student-centered instructional method for some teachers is something new where they are not sure of the ways in which they can apply and use it in their classes. They also may fear that a student-centered instructional method will replace them in classroom in the long run (Thamraksa, 2011).

In conclusion, the students in the experimental group showed a high level of motivation in class. With more time and more improved preparations along with larger sample size it is the researcher's belief that the academic achievement would increase significantly through student-centered instruction method.

### **Recommendations**

The recommendations of this study are projected to the administrators and teachers at Triamudomsuksa Pattanakarn School as well as future researchers interested in directing similar studies.

#### **Recommendations for the Administrators**

The school administrators should encourage training for teachers to understand and learn new methods for implementing student-centered instructional methods in their

classroom. The administrators should encourage teachers to implement student-centered class activities and environment in their classrooms so that students are not restricted to teacher-centered methods all the time.

### **Recommendations for the Teachers**

Teachers who wish to implement student-centered instruction method should be alert that the approach requires proper planning and preparation before the instruction begins in class. Moreover, not all Thai students are comfortable to work in groups or to come out and work with other students in class. Students at Triamudomsuksa Pattanakarn School are more used to the teacher-centered method of instruction so it requires time for students to adapt new instructional methods. Teachers should began encouraging students to work in groups and peers in order to create student-centered environment in classrooms. Teachers should also create a culture of student-cooperation in classrooms. Teachers should be willing to go student-centered in their classrooms.

### **Recommendations for Future Researchers**

Researchers who wish to research on this topic should be well prepared to create a student-centered environment in class. Researchers should have larger sample sizes to get better results and should also researchers should conduct the research for a longer time span in order to implement the instructional method effectively and get remarkable outcomes. Researchers should also try to go for more schools to conduct the research and obtain results.

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APPENDIX A

Test



## TEST- SCIENCE PRE and POST-TEST

NAME: \_\_\_\_\_ CLASS: \_\_\_\_\_ CLASS NO: \_\_\_\_\_

Part	Question type	Marks
Part 1	Multiple choice	1 point each (total 15 points)
Part 2	Fill in the blanks	1 point each (total 10 points)
Part 3	True or False	1 point each ( total 5 points)

**Total 30 points**

### PART 1 Multiple choice

**Read the questions carefully. Mark the correct answer with a ✓ next to the answer.**

*Example: Respiratory and \_\_\_\_\_ system work together to deliver oxygen to the cells and remove carbon dioxide.*

1. Digestive      ☒ 2. Circulatory      3. Reproductive      4. Excretory

1. The distance traveled by an object per unit time in a particular direction, this statement is true about :

1. Deceleration      2. Velocity      3. Momentum      4. Pressure

2. Which of the following type of force slows down and stops moving objects?

1. Friction      2. Acceleration      3. Velocity      4. Pressure

3. Which of the following is an instrument used to measure force?

1. Meter rule      2. Spring balance      3. Stop watch      4. Thermometer

4. An object is moving with zero resultant force. Which of the following inference is true?

1. Its velocity is zero  
2. Its velocity is decreasing  
3. Its velocity is increasing  
4. Its velocity is constant

5. Force exerted by a charged body on another charged body is referred to as:

1. electrostatic force      2. unbalanced force  
3. gravity force      4. muscular force

6. During a softball game, a softball is struck by a bat and has an acceleration of  $1500\text{m/s}^2$ . If the net force exerted on the softball by the bat is  $300\text{N}$ , what is the mass of the softball?
1.  $0.3\text{kg}$                       2.  $0.2\text{kg}$                       3.  $14\text{kg}$                       4.  $0.5\text{kg}$
7. A lizard accelerates from  $2\text{ m/s}$  to  $10\text{ m/s}$  in  $4\text{ seconds}$ . What is the lizard's average acceleration?
1.  $3\text{ m/s}^2$                       2.  $2\text{m/s}^2$                       3.  $5\text{ m/s}^2$                       4. None of the given
8. If an object is standing still, then its momentum is \_\_\_\_\_.
1.  $9.8$                       2.  $2$                       3. Zero                      4. None of them
9. A  $250\text{ kg}$  box is pulled along a smooth road using a force of  $2000\text{ N}$ . What is the acceleration of the block?
1.  $8\text{m/s}^2$                       2.  $2\text{m/s}^2$                       3.  $10\text{ m/s}^2$                       4.  $20\text{m/s}^2$
10. What are the layers of the soil profile called?
1. Texture                      2. Layer                      3. Horizon                      4. Structure
11. George applies a net force of  $10\text{N}$  to a piece of wood. How much does the wood move in  $\text{m/s}^2$  if it weighs  $2\text{kg}$ .
1.  $5\text{ m/s}^2$                       2.  $15\text{ m/s}^2$                       3.  $50\text{ m/s}^2$                       4.  $2\text{ m/s}^2$
12. Which of the following factors does not affect soil formation?
1. Climate                      2. Time                      3. Soil pH                      4. Topography
13. What is the momentum of  $0.1\text{kg}$  mass moving with a speed of  $5\text{m/s}$ ?
1.  $0.5\text{kg} \cdot \text{m/s}$                       2.  $0.55\text{ kg} \cdot \text{m/s}$                       3.  $0.15\text{ kg} \cdot \text{m/s}$                       4. None of the given
14. If a Ferrari, with an initial velocity of  $10\text{ m/s}$ , accelerates at a rate of  $50\text{ m/s}^2$  for  $3\text{ seconds}$ , what will its final velocity be?
1.  $16\text{m/s}^2$                       2.  $60\text{m/s}^2$                       3.  $160\text{m/s}^2$                       4.  $1600\text{m/s}^2$
15. What is the name of a single force that is used to represent the combined effect of two or more forces in magnitude and direction?
1. Electrostatic force    2. Gravitational force    3. Magnetic force    4. Net force

**PART 2    FILL IN THE BLANKS**

*Positive          negative          weathering          static          velocity          zero          Newton*  
*Greater      Decreases      Increases      mass      more      friction      acceleration*  
*less          more          dynamic          habitat          crust          mantel          core*

1. A force can cause a \_\_\_\_\_ object to start moving, a moving object to change speed or direction of motion or change in size and shape.
2. If an object is standing still, then its momentum is \_\_\_\_\_.
3. Soil is formed from the \_\_\_\_\_ of rocks and minerals
4. The strength of a force is measured in \_\_\_\_\_.
5. When two forces act in opposite directions, the object will accelerate in the same direction as the \_\_\_\_\_ force.
6. The applied force required to push something across a surface \_\_\_\_\_ as friction increases.
7. Newton's second law of motion states that objects acceleration depends on its \_\_\_\_\_ and on the net force acting on it.
8. When the irregularities of one surface come into contact with those of another surface, \_\_\_\_\_ occurs.
9. The \_\_\_\_\_ is the thickest layer of earth made up of silicon, oxygen and iron.
10. The smaller the mass of an object, the \_\_\_\_\_ its inertia.

**PART 3    TRUE AND FALSE:**

*Example: Cilia are the main place where gas exchange occurs.    F*

1. The greater the mass (of the object being accelerated) the lesser the amount of force needed (to accelerate the object). \_\_\_\_\_
2. An object at rest will remain at rest. An object in motion continues in motion \_\_\_\_\_
3. The outer core of the Earth makes up the largest portion of the Earth's mass. \_\_\_\_\_
4. Deceleration or positive acceleration is when an object speeds up. \_\_\_\_\_
5. Momentum of an object is a measure of how hard it is to stop the object, and it depends on the objects force and height. \_\_\_\_\_



## Motivation for Learning Science Questionnaire

One of your teachers is participating in a study of grade 8 student motivation for learning basic science. I would like to kindly ask for your participation in completing this questionnaire.

In this study, I would like you to complete the following questionnaire, which is related to your motivation for learning in basic science classes. Your participation in this questionnaire is voluntary; it will not in any way affect your grade and is only related to learning about your motivation for basic science.

Please read the statements carefully and circle whether you agree or disagree about them using the directions given below. There are no correct or wrong answers for answering this questionnaire. I thank you for taking the time to consider your responses and answer honestly.

Student Name: \_\_\_\_\_

Student Class: M. 2 / \_\_\_\_\_

### Directions

The following questions ask about your feelings when learning basic science.

Remember there is no right or wrong answer, just try to think about whether you agree or disagree with the statements. Use the scale below to answer the questions.

1	2	3	4	5	6	7
not at all true of me						very true of me

If you feel a statement is very true for you, circle 7.

If you feel the statement is not at all true for you, circle 1.

If you feel somewhere in between, circle the number that you feel most closely matches your feelings.



1. In science class, I prefer content that really challenges me so I can learn new things.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

2. If I study in appropriate ways, then I will be able to learn the content in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

3. I think I will be able to use what I learn in science in other classes.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

4. I believe I will receive an excellent grade in science.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

5. I'm sure I can understand the most difficult content presented in reading for science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

6. Getting a good grade is the most satisfying thing for me in science class right now.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

7. It is my own fault if I don't learn the content in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

8. It is important for me to learn the content in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

9. The most important thing for me right now is improving my overall grade, so my main concern in science class is getting a good grade.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

10. I'm confident I can understand the basic concepts taught in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

11. If I can, I want to get better grades in science class than most of the other students.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

12. I'm confident I can understand the most complex content presented by the teacher in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

13. In science class, I prefer content that arouses my curiosity, even if it is difficult to learn.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

14. I am very interested in the content of science classes.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

15. If I try hard enough, then I will understand the content of science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

16. I'm confident I can do an excellent job on the assignments and tests in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

17. I expect to do well in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

18. The most satisfying thing for me in science class is trying to understand the content as thoroughly as possible.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

19. I think the content in science class is useful for me to learn.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

20. When I have the opportunity in science, I choose assignments that I can learn from even if they don't guarantee a good grade.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

21. If I don't understand the science content, it is because I didn't try hard enough.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

22. I like the subject of science.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

23. Understanding the subject of science is very important to me.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

24. I'm certain I can master skills being taught in science.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

25. I want to do well in science class because it is important to show my ability to my family, friends, employer, or others.

1	2	3	4	5	6	7
not at all						very true
true of me						of me

26. Considering the difficulty of this class, the teacher, and my skills, I think I will do well in science class.

1	2	3	4	5	6	7
not at all						very true
true of me						of me



APPENDIX C

Lesson Plan





### Learning Unit 1 : Forces in daily life

### Control Group

**Course**

SC22101

**Subject:** Science 3

**Code:**

**Semester:** 1

**Learning hour(s) / week:** 3

#### 1. Basic Concept

Forces and Motion: nature of electromagnetic, gravitational and nuclear forces; forces acting on objects; motion of objects; frictional forces; moment of variety of motions in daily life.

#### 2. Standard Indicators

SC 4.2 Forces in daily life

M.2/1. Understanding the basic concept of force and the various kinds of forces acting on an object

M.2/2. Gravitation force, frictional forces action on an object. Calculations for finding the force acting on a body.

M.2/3 Calculation of acceleration, deceleration, velocity, speed. Understanding the concept of momentum acting on an object.

M.2/4 Analysing the three Newton's law of motion.

#### 3. Terminal Objectives

At the end of the lesson students will be able to explain the characteristics and various types of motion of natural objects; investigative process for seeking knowledge and scientific mind; and communication of acquired knowledge for useful purposes.

#### 4. Enabling Objectives

1. Describe the meanings of the new vocabulary words.
2. Describe what is force and the various types of forces.
3. Explain about balanced and unbalanced forces.

#### 5. Content

Forces in daily life: friction, gravity, acceleration, deceleration, velocity, speed, pressure, newton's law of motion.

#### 6. Teaching Materials

1. Power-point Projector
2. Laptop



3. Worksheets, textbook, workbook
4. Activities

## 7. Learning Activities

Week 1:

PERIOD 2 and 3 Lesson Proper: Force

Objectives of the lesson

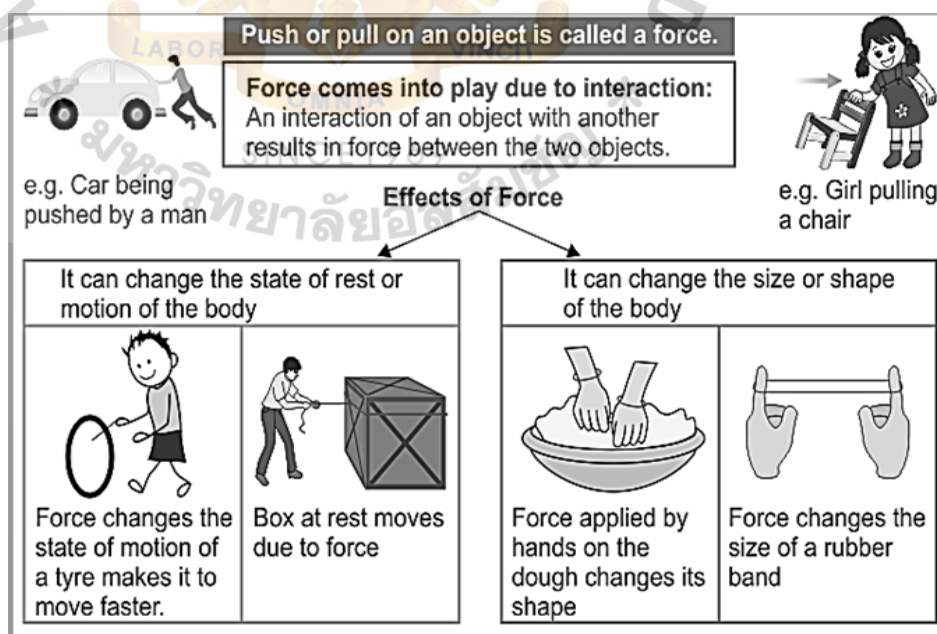
Teacher introduces new vocabulary words to the students.

## Vocabulary

1. Force
2. Friction
3. Gravity
4. Motion
5. Unbalanced force
6. Acceleration
7. Velocity
8. Initial velocity
9. Final velocity
10. Resultant force
11. Magnitude
12. Static



- Teacher discuss about what is force and the different forces acting on a body.

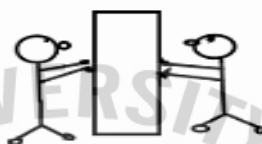


- Teacher describe about major types of forces such as gravity and frictional forces.
- Teacher explains resultant forces acting on static objects or objects moving with constant velocity also describes about balanced and unbalanced force.

- Students to read the textbook and answer question in the workbook.
- Page 79 questions 1, 2, 3, Page 80 question 1, Page 82 questions 1, 2, 3, 4 and 5
  - o Discuss and Ask Motivational Question during Lectures
  - o Students should be able to define vocabulary words for example, friction, gravity, unbalanced force, resultant force.

## Balanced and Unbalanced Forces

**Balanced Forces:** Equal forces that act on an object from opposite sides. The object doesn't move.



**Unbalanced Forces:** Unequal forces that act on an object from opposite sides, but make the object move.



A gravitational force



the Earth pulls  
the moon

A friction force



the ground pushes  
the shoe

A normal contact force



the chair pushes  
the person

- A **normal force** is created whenever an object is in contact with a surface. It is also known as **support force**
- The normal/support has equal strength to the object's weight.

The force of **gravity** is the force with which the earth, moon, or other large object attracts another object towards itself.

The force of gravity on earth is always equal to the weight of the object as found by the equation:

$$F_{\text{grav}} = m * g$$

where  $g = 9.8 \text{ N / kg}$  (on Earth)  
and  $m = \text{mass}$  (in kg)

**Applied Force:** An applied force is a force which is applied to an object by another object or by a person.



- Practice problems solved during the lesson by students.
- Homework given to students.

## HOMEWORK

*Answer these questions*

- What is a static object
- Name three types of forces
- State the effects of a force that is acting on an object.
- When an object is stationary, can there be forces acting on it? Explain

-Individual work done during the lesson. Students brainstorm on the question shown below.

*-What are the four forces that act upon an airplane? What causes each force?*

*Draw and describe about it.*

*-Give three examples of where:*

- *friction is useful*
- *friction is not useful*

*-Explain what is air resistance and how is it acting on a parachute flying in air? Draw and describe.*

## 8. Assignments and Resources Guided

- Focus Smart textbook Science Mathayom 2 textbook
- Focus Smart textbook Science Mathayom 2 workbook
- Worksheets, research and question answers.
- Power point presentation

**Course Code:**  
**Semester:** 1

SC22101

**Subject:** Science 3

**Learning hour(s) / week:** 3

**Learning Unit 1 :** Forces in daily life

**Experimental Group**

### 1. Basic Concept

Forces and Motion: nature of electromagnetic, gravitational and nuclear forces; forces acting on objects; motion of objects; frictional forces; moment of variety of motions in daily life.

### 2. Standard Indicators

SC 4.2 Forces in daily life

M.2/1. Understanding the basic concept of force and the various kinds of forces acting on an object

M.2/2. Gravitation force, frictional forces action on an object. Calculations for finding the force acting on a body.

M.2/3 Calculation of acceleration, deceleration, velocity, speed. Understanding the concept of momentum acting on an object.

M.2/4 Analysing the three Newton's law of motion.

### 3. Terminal Objectives

At the end of the lesson students will be able to explain the characteristics and various types of motion of natural objects; investigative process for seeking knowledge and scientific mind; and communication of acquired knowledge for useful purposes

### 4. Enabling Objectives

1. Describe the meanings of the new vocabulary words.

2. Describe what is force and the various types of forces.
3. Explain about balanced and unbalanced forces.

### 5. Content

Forces in daily life: friction, gravity, acceleration, deceleration, velocity, speed, pressure, newton's law of motion.

### 6. Teaching Materials

5. Power-point Projector
6. Laptop
7. Worksheets, textbook, workbook
8. Activities

### 7. Learning Activities

Week 1:

PERIOD 2 and 3 Lesson Proper: Force

Objectives of the lesson

Teacher introduces new vocabulary words to the students and students work in peers searching for the meanings of the words.

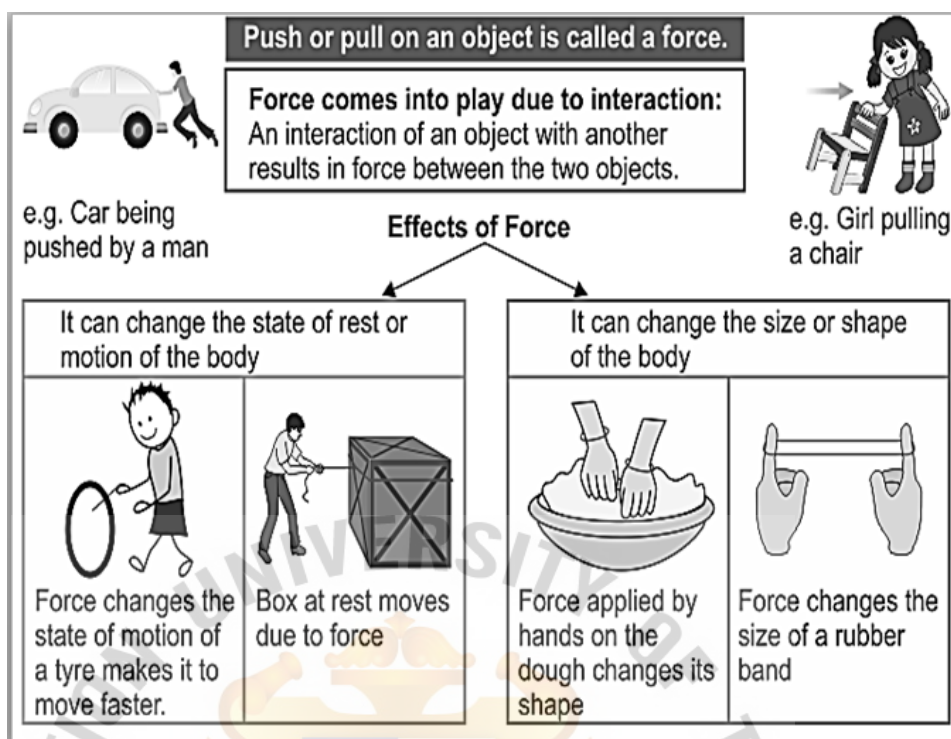
### Vocabulary

1. Force
2. Friction
3. Gravity
4. Motion
5. Unbalanced force
6. Acceleration
7. Velocity
8. Initial velocity
9. Final velocity
10. Resultant force
11. Magnitude
12. Static



- In peers, students make a mind map on what is force and the different forces acting on a body.

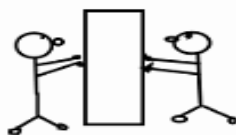




- In pairs students discuss and describe each other about major types of forces such as gravity and frictional forces.
- Students work together and explain resultant forces acting on static objects or objects moving with constant velocity also describe about balanced and unbalanced force.
- Students sit in pairs and read the textbook and answer question in the workbook.
- Page 79 questions 1, 2, 3, Page 80 question 1, Page 82 questions 1, 2, 3, 4 and 5
  - o Discuss and Ask Motivational Question during Lectures
  - o Students should be able to define vocabulary words for example, friction, gravity, unbalanced force, resultant force.

## Balanced and Unbalanced Forces

**Balanced Forces:** Equal forces that act on an object from opposite sides. The object doesn't move.



**Unbalanced Forces:** Unequal forces that act on an object from opposite sides, but make the object move.





A gravitational force



the Earth pulls  
the moon

A normal contact force

A friction force



the ground pushes  
the shoe



the chair pushes  
the person

- A **normal force** is created whenever an object is in contact with a surface. It is also known as **support force**.
- The normal/support has equal strength to the object's weight.

The force of **gravity** is the force with which the earth, moon, or other large object attracts another object towards itself.

The force of gravity on earth is always equal to the weight of the object as found by the equation:

$$F_{\text{grav}} = m * g$$

where  $g = 9.8 \text{ N / kg}$  (on Earth)  
and  $m = \text{mass}$  (in kg)

**Applied Force:** An applied force is a force which is applied to an object by another object or by a person.



- Practice problems solved during the lesson by students.
- Homework given to students.

# HOMEWORK

## *Answer these questions*

- What is a static object
  - Name three types of forces
  - State the effects of a force that is acting on an object.
  - When an object is stationary, can there be forces acting on it? Explain
- Students sit in group of 5 and work together during the lesson. Students discuss on the questions shown below:
- *What are the four forces that act upon an airplane? What causes each force? Draw and describe about it.*
  - *Give three examples of where:*
    - *friction is useful*
    - *friction is not useful*
  - *Explain what is air resistance and how is it acting on a parachute flying in air? Draw and describe.*

### **8. Assignments and Resources Guided**

- Focus Smart textbook Science Mathayom 2 textbook
- Focus Smart textbook Science Mathayom 2 workbook
- Worksheets, research and question answers.
- Power point presentation

## APPENDIX D

### Student-Centered Lesson Plans Validity Checklist



The following three experts were invited to check the validity of the student-centered lesson plans used in this study. They are as follows:

**1. Mr. Alon T. Mayomita**

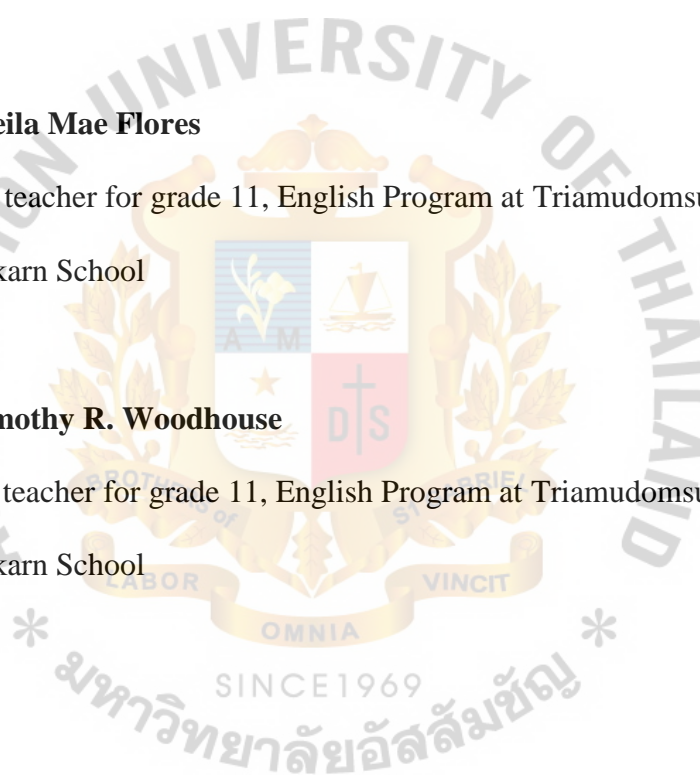
Science teacher for grade 7, English Program at Triamudomsuksa Pattanakarn School.

**2. Ms. Sheila Mae Flores**

Science teacher for grade 11, English Program at Triamudomsuksa Pattanakarn School

**3. Mr. Timothy R. Woodhouse**

English teacher for grade 11, English Program at Triamudomsuksa Pattanakarn School



### Student-Centered Lesson Plans Validity Checklist

Dear colleague,

I am currently completing my Master's Degree of Education in Curriculum and Instruction at Assumption University, Bangkok, Thailand. My research topic is "A Comparative Study of Student Motivation and Academic Achievement in Grade 8 Science under Teacher-Centered and Student-Centered Instructional Methods at Triamudomsuksa Pattanakarn School, Thailand".

In order to complete my Master's Thesis I need your professional opinion as well as the validation of the student-centered lesson plans used throughout my research. Please fill in the table below.

Thank you for your cooperation.

**Tick in the box for each item.**

Items	Agreed	Disagreed
1. The lesson plans are comprehensive as to cover all or almost all the aspects of the course content.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. The lesson plans are adapted to student-centered instructional methods.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. The lesson plans are clear and consistent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. The lesson plans cover a sufficient range of student-centered instructional methods.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Remarks**

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Name: Alon Maxornita

Signature: C. t. v.



### Student-Centered Lesson Plans Validity Checklist

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In order to complete my Master's Thesis I need your professional opinion as well as the validation of the student-centered lesson plans used throughout my research. Please fill in the table below.

Thank you for your cooperation.

Tick in the box for each item.

Items	Agreed	Disagreed
1. The lesson plans are comprehensive as to cover all or almost all the aspects of the course content.	✓	
2. The lesson plans are adapted to student-centered instructional methods.	✓	
3. The lesson plans are clear and consistent.	✓	
4. The lesson plans cover a sufficient range of student-centered instructional methods.	✓	

Remarks

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Name: Ms. Sheila Mae B. Flores

Signature: 



### Student-Centered Lesson Plans Validity Checklist

Dear colleague,

I am currently completing my Master's Degree of Education in Curriculum and Instruction at Assumption University, Bangkok, Thailand. My research topic is "A Comparative Study of Student Motivation and Academic Achievement in Grade 8 Science under Teacher-Centered and Student-Centered Instructional Methods at Triamudomsuksa Pattanakarn School, Thailand".

In order to complete my Master's Thesis I need your professional opinion as well as the validation of the student-centered lesson plans used throughout my research. Please fill in the table below.

Thank you for your cooperation.

**Tick in the box for each item.**

Items	Agreed	Disagreed
1. The lesson plans are comprehensive as to cover all or almost all the aspects of the course content.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. The lesson plans are adapted to student-centered instructional methods.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. The lesson plans are clear and consistent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. The lesson plans cover a sufficient range of student-centered instructional methods.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Remarks**

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Name: TIMOTHY RALPH WOODHOUSE

Signature: 

## APPENDIX E

### Test Validity Checklist



The following three experts were invited to check the validity of the test used in this study. They are as follows:

**1. Mr. Alon T. Mayomita**

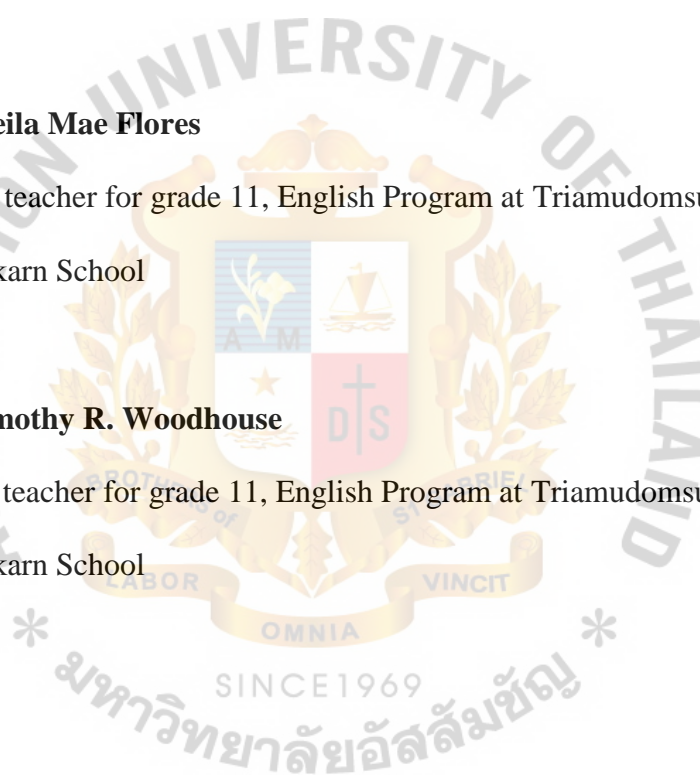
Science teacher for grade 7, English Program at Triamudomsuksa Pattanakarn School.

**2. Ms. Sheila Mae Flores**

Science teacher for grade 11, English Program at Triamudomsuksa Pattanakarn School

**3. Mr. Timothy R. Woodhouse**

English teacher for grade 11, English Program at Triamudomsuksa Pattanakarn School



### Pre-test and Post-test Validity Checklist

Dear colleague,

I am currently completing my Master's Degree of Education in Curriculum and Instruction at Assumption University, Bangkok, Thailand. My research topic is "A Comparative Study of Student Motivation and Academic Achievement in Grade 8 Science under Teacher-Centered and Student-Centered Instructional Methods at Triamudomsuksa Pattanakarn School, Thailand".

In order to complete my Master's Thesis I need your professional opinion as well as the validation of the Pre-test and Post-test used as the academic achievement measurement tool. Please fill in the table below.

Thank you for your cooperation.

**Tick in the box for each item.**

Items	Agreed	Disagreed
1. The assessment is comprehensive as to cover all or almost all the aspects of the course content.	✓	
2. The assessment is adapted to the level of learning expected from grade eight students.	✓	
3. The assessment items are clear and consistent.	✓	
4. The lesson plans measures a sufficient range of cognitive levels.	✓	
5. Overall, the assessment is helpful in evaluating academic achievement.	✓	

**Remarks**

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Name: Abn Mayormita

Signature: e. t-r



### Pre-test and Post-test Validity Checklist

Dear colleague,

I am currently completing my Master's Degree of Education in Curriculum and Instruction at Assumption University, Bangkok, Thailand. My research topic is "A Comparative Study of Student Motivation and Academic Achievement in Grade 8 Science under Teacher-Centered and Student-Centered Instructional Methods at Triamudomsuksa Pattanakarn School, Thailand".

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Thank you for your cooperation.

**Tick in the box for each item.**

Items	Agreed	Disagreed
1. The assessment is comprehensive as to cover all or almost all the aspects of the course content.	✓	
2. The assessment is adapted to the level of learning expected from grade eight students.	✓	
3. The assessment items are clear and consistent.	✓	
4. The lesson plans measures a sufficient range of cognitive levels.	✓	
5. Overall, the assessment is helpful in evaluating academic achievement.	✓	

**Remarks**

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Name: Ms. Sheila Mae B. Flores

Signature: \_\_\_\_\_



### Pre-test and Post-test Validity Checklist

Dear colleague,

I am currently completing my Master's Degree of Education in Curriculum and Instruction at Assumption University, Bangkok, Thailand. My research topic is "A Comparative Study of Student Motivation and Academic Achievement in Grade 8 Science under Teacher-Centered and Student-Centered Instructional Methods at Triamudomsuksa Pattanakarn School, Thailand".

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Thank you for your cooperation.

Tick in the box for each item.

Items	Agreed	Disagreed
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2. The assessment is adapted to the level of learning expected from grade eight students.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. The assessment items are clear and consistent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. The lesson plans measures a sufficient range of cognitive levels.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5. Overall, the assessment is helpful in evaluating academic achievement.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Remarks

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Name: TIMOTHY RALPH WOODHOUSE

Signature: 



## BIOGRAPHY

Priya Upadhya is currently a student in the Master's Degree in Education; Curriculum and Instruction (M.Ed.) program in the Graduate School of Human Sciences at Assumption University of Thailand. The author was born in 1990 in Bangkok, Thailand and attended Thai Sikh International School. For the undergraduate degree, Priya graduated in 2014 as a Bachelor of Engineering in Electrical and Electronics major from Assumption University (ABAC), Thailand. The author started working as a Science and Health education teacher for grade 7 extra class and normal class at Sarasas Ektra School Bilingual Program Thailand for a period of three years. Then the author moved to a government school named Triamudomsuksa Pattanakarn School and started teaching as a Science and Health education teacher for grade 8 English Program for a period of four years until now. The author specializes in teaching Science to grade 7 and 8 and Health Education to grade 7, 8, 9, 10 and 11 following the Basic Core Curriculum of English program from the Ministry of Education of Thailand.

