A CORRELATIONAL-COMPARATIVE STUDY OF MATHAYOM THREE STUDENTS' MOTIVATION FOR LEARNING SCIENCE AND THEIR SCIENCE ACHIEVEMENT IN THE ENGLISH AND THAI PROGRAMS AT MATHAYOMWATSING SCHOOL IN BANGKOK, THAILAND

Htike Htike Lwin

A Thesis Submitted in Partial Fulfillment of The Requirements for the Degree of
MASTER OF EDUCATION
in Curriculum and Instruction
Graduate School of Education
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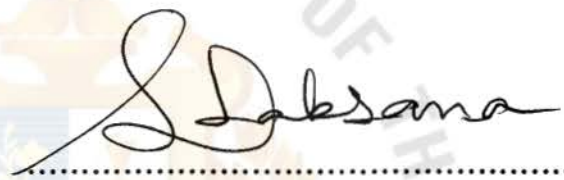

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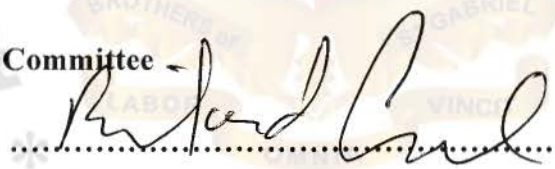

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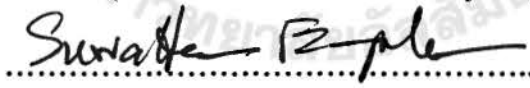

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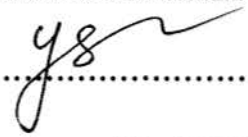

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ABSTRACT

I.D. No.: 5419503

Key Words: MOTIVTION FOR LEARNING SCIENCE, SCIENCE ACHIEVEMENT, ENGLISH PROGRAM, THAI PROGRAM, MATHAYOMWATSING SCHOOL, BANGKOK

Name: HTIKE HTIKE LWIN

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The study had six objectives which were 1) To determine the level of student motivation for learning science in the English Program at Mathayomwatsing school, in Bangkok, Thailand; 2) To determine the level of student motivation for learning science in the Thai Program at Mathayomwatsing school, Bangkok, Thailand; 3) To find the correlation between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand; 4) To find the correlation between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand; 5) To compare student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand; 6) To compare science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The population of this study was all the students in Mathayom 3 at Mathayomwatsing school in Bangkok, Thailand. The researcher selected Mathayomwatsing 3 students in academic year 2013 from the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand as the subjects for data collection. Twenty-two students of Mathayom 3 from the English Program and 33 students from the Thai Program totaling 55 students who are studying science were asked to complete the science motivational questionnaire.

There were two research instruments. The first one was the science motivational questionnaire designed by Glynn and Koballa, 2006. The second one was the students' O-Net grades from the National Institute Educational Testing Service taken in March 2014.

The study's findings were 1) The level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand were "sometimes to often" motivated; 2) The level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand were "sometimes to often" motivated; 3) There was a significant relationship between student motivation for learning science and science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand; 4) There was a significant relationship between student motivation for learning science and science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand; 5) There was no significant difference of student motivation for learning science and science achievement between students in the English Program at Mathayomwatsing school in Bangkok, Thailand; and 6) There was no significant difference of student motivation for learning science and science achievement between students in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

In order to improve the academic motivation in students' science learning, science teachers need to effectively motivate their students in 1) questioning students to engage them

in the lesson, 2) incorporating hands-on activities to help learn the lesson concepts, 3) exhibiting enthusiasm in lesson presentations, 4) using a variety of activities, 5) believing that students can achieve, 6) building caring relationships in the classroom. There are a lot of differences in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. English Program students, while being quite independent learners, also like to join group work, to discuss in class and engage in project work with others.

Field of Study: Curriculum and Instruction

Graduate School of Education

Academic Year 2014

Student's signature.....

Advisor's signature.....

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

In this chapter, the researcher started with background of the study including statement of the problem, research questions, research objectives, research hypotheses followed by theoretical framework, conceptual framework according to the research objectives and research hypotheses and finally briefly described scope of the study, definition of terms and significance of the study.

Background of the Study

The ultimate goal of this research is to successfully use a variety of instructional strategies and tools into the science classrooms to accommodate the different learning styles and abilities exhibited by our students. Guild (2001) stated that the everyday experience in the classroom confirms that students learn in different ways. These learning differences have led to extensive research and the formation of well-accepted theories in the academics. Most educators can identify learning differences by name, cognitive style, psychological type, or a combination of intelligences (multiple intelligence). Because of the uniqueness of each student, they can hone their individual approach, talents, and interests to the classroom to make learning more interesting.

When science is taught out of context and seems irrelevant to their lives, many students lose interest. And if a student's own motivation is disregarded, even the most careful preparation on the part of the teacher will be wasted. It is crucial, therefore, to highlight the importance of science and its relevance to students' lives (Bordie, 2006). To be motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated (Ryan and Deci, 2000).

Staver (2007) stated that learning is a purposeful, internal, mental process. Teachers can monitor learning by observing and gathering data on changes in students' actual behaviour or potential performance. Motivation drives the process of starting and continuing learning. Relevance refers to activities that give students satisfaction and meet their needs, including the chance to achieve personal learning goals. Given that there are learning differences in the classrooms; teachers must also have a way to capture each student's curiosity. According to Staver (2007), teachers must make connections between their lesson and everyday life in order to capture students' attention and to activate their motivation to learn. In this way, academic subjects such as science can be related to personal interests or issues, societal issues, cultural backgrounds, and other everyday events or concerns.

The researcher noticed that not all students are alike. Based on this knowledge, differentiated instruction applies an approach to teaching and learning so that students have multiple options for taking in information and making sense of ideas. The researcher also believes that a good teacher should have ability to impart knowledge in many ways. Hence, teachers must always remember that each child and each human is different (Breaux and Magee, 2010). In addition, in reaching out to our students using methods that best suit the needs of each individual (Breaux and Magee, 2010), we would be able to bring out their curiosity through creative learning experiences and relevant discussions in the classroom (Simpson, 2008). Therefore, the ultimate goal of education would be to create an independent and confident student, thinker, and citizen through motivational experience.

Therefore, the researcher discussed motivation in science learning, students' science achievement and constructivism instruction in teaching and learning science.

Statement of the Problem

According to researcher's experience, the academic motivation in students' science learning declines gradually as the students enter Mathayom levels. In addition, they typically view science as dull and hard. "Science is too difficult. It doesn't really matter anyway. I will never need that type of stuff when I start work. I can't learn this topic. I don't know how to apply. I have forgotten the concepts from the previous years." The researcher often hears these phrases from her science students. So it becomes the duty of secondary science teachers to meet the challenge of engaging the students.

In order to give students motivation, Kirk (2010) wrote that teachers have a lot to do with their students' motivational level. Each student arrives at class with a certain degree of motivation, which will be affected by the following factors: the teacher's behavior and/or teaching style, the nature of the assignments, and their relationship with other students. Those are the main reasons the researcher wants to find out the students' motivational level in science learning and the students' achievement in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.

Research Questions

The following were the research questions of the study:

1. What is the student motivation level for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand?

2. What is the student motivation level for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand?

3. Is there any relationship between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand?

4. Is there any relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand?

5. Is there any difference of student motivation for learning science between students studying in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand?

6. Is there any difference of science achievement between students studying in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand?

Research Objectives

The following were the research objectives of the study:

1. To determine the level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand.

2. To determine the level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

3. To find the correlation between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

4. To find the correlation between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

5. To compare student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

6. To compare science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Research Hypotheses

The following were the research hypotheses of the study:

1. There is a significant relationship between student motivation for learning and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

2. There is a significant relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

3. There is a significant difference of student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

4. There is a significant difference of science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Theoretical Framework

This study was conducted based upon the following supporting theories:

Experiential education was discovered by John Dewy in 1896. John Dewey (as cited in Utanir, 2012) emphasized the notion that the heart of the content and the process of education is a child's own experience. He is famous for rejecting the thought that there is a separation between classroom experience and the "real world," and for questioning the idea that education's primary goal is preparing students for life. In Deweyan school of thought, school education should not be significant in their own right. Based from what he stated. "We always live at the time we live and not some other time, and only by extracting at each present time the full meaning of each present experience are we prepared for doing the same thing in the future. This is the only preparation which in the long run amounts to anything."

Social cognitive theory, developed by Bandura (1986, 2001, 2005) and extended by others (e.g., Pintrich, 2003), explains human learning and motivation in terms of reciprocal interactions involving personal characteristics (e.g., intrinsic motivation, self-efficacy, and self-determination), environmental contexts (e.g., high school), and behaviour. Bandura (1993) found that thoughts shaped most courses of action. Belief in one's efficacy can influence the kinds of anticipatory scenarios s/he will formulate and enact. People who have high sense of self-efficacy see success scenarios that give positive influences and assists for performance. On the other hand, people who fight with self-doubt see failure scenarios and focus on negative outcomes of events.

And finally, psychologists Edward Deci and Richard Ryan developed a theory of motivation. According to the theory, people seem to be motivated by a desire to grow and improve fulfillment. According to Ryan and Deci's (2000) research, in some situations, extrinsic rewards can decrease existing intrinsic motivation. Resentment, resistance, disinterest or, as an alternative, with an attitude of willingness that shows the inner acceptance of the worth or usefulness of a task, are some of the actions that students who are extrinsically motivated can perform. Intrinsic motivation is an individual's inherent inclination from which stems his or her tendency to learn about particular areas of life regardless of the presence of external enticements (Ryan and Deci, 2000).

Conceptual Framework

This study provided information about the uses of motivation in science teaching that affected student achievement in science subjects. It was also to gather information about what motivated students to learn. The students were given a questionnaire to determine the level of motivation for learning science in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. To find the correlation between student motivation for learning science and student science achievement and to compare the student

motivation for learning science and student science achievement between students in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand, the researcher used the students' "O" Net grades taken in March 2014.

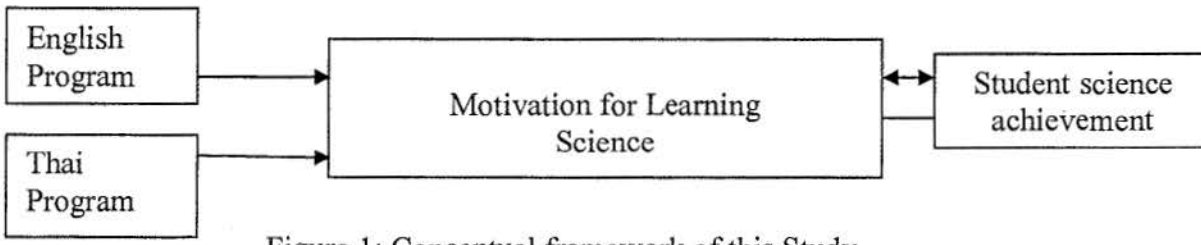

Figure 1: Conceptual framework of this Study

Scope of the Study

The researcher limited the population of this study to the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. The research sample for this study consisted of Mathayom 3 of the English Program students and one class of Mathayom 3 from the Thai Program students in the academic year of 2013, second semester (from November, 2013 to February, 2014) at Mathayomwatsing school in Bangkok, Thailand. Mathayom 3 is one of the grades which is required to take O-Net exams and they study Fundamental Science and Supplementary Science subjects and also the highest level in lower secondary education. Additionally the researcher taught Mathayom 3 students in the English Program at Mathayomwatsing school in Bangkok so it was easy for her to get the students' O-Net scores from her school. This study focused on motivation for learning and six components of motivation for learning used in the questionnaire 1) anxiety about science assessment, 2) confidence (self-efficacy in learning science, 3) extrinsically motivated science learning, 4) intrinsically motivated science learning, 5) Personal relevance of learning science to personal goals, 6) Responsibility (self-determination) for learning science.

Definitions of Terms

Mathayomwatsing school: A government secondary school located on Ekachai Road, Bangkutien, Jomthong in Bangkok.

English Program: English program is a program which English is definitely the medium of instruction used in the teaching-learning process in many subjects.

Thai Program: Thai Program is a program which Thai is definitely the medium of instruction used in the teach-learning process in many subjects.

Motivation to learn science: As used in this study, motivation to learn science is defined in terms of anxiety about science assessment, confidence (self-efficacy) in learning science, extrinsically motivated science learning, intrinsically motivated science learning, personal relevance of learning science to personal goals, responsibility (self-determination) for learning science.

1. Anxiety about science assessment: A worried feeling or a nervous or impatient feeling you have when you have a science test. It will be measured by item numbers 4, 6, 13, 14, 18.

2. Confidence (self-efficacy) in learning science: The belief that you are able to do in learning science. It will be measured by item numbers 12, 21, 24, 28, 29.

3. Extrinsically motivated science learning: Motivation coming from outside a student in science learning. It will be measured by item numbers 3, 7, 10, 15, 17.

4. Intrinsically motivated science learning: Motivation that comes from inside an individual rather than from any external or outside rewards, such as money or grades. It will be measured by item numbers 1, 16, 22, 27, 30.

5. Personal relevance of learning science to personal goals: Learning science both in theoretically and practically related to goals set by an individual to influence the direction of his/her efforts. It will be measured by item numbers 2. 11, 19, 23, 25.

6. Responsibility (self-determination) for learning science: A duty to deal with or take care of yourself for learning science. It will be measured by item numbers 5, 8, 9, 20, 26.

Science Achievement: Science achievement refers to the students test score of science studies both in English and Thai Languages, and in this study O-Net the national standardized exam grades was used as student science achievement.

Significance of the Study

The significance of this study was to recognize the English and Thai Programs students' motivation toward learning science and students' achievement in science. It was also to explore specific motivational strategies for learning. This study also helped the science teachers at Mathayomwatsing school to understand their own students and developed more effective teaching and learning strategies. It also encouraged teachers to use a lot of strategies and various types of motivational techniques to keep their students focused because students fell asleep if teachers lectured too long. In addition, all students learn differently. This study result would also be valuable for teachers to apply the constructivism in teaching science lessons in class. Finally, this study benefited students studying science in the English and Thai programs at Mathayomwatsing school from improved teaching practices in science classrooms.

This study was also significant in that it helped teachers to think, choose and decide what the best teaching strategies to improve students' motivation and achievement for them to use in their classroom. The teachers and students in the study were based in Bangkok, Thailand, so the results dealed with the particulars of Thai students in Bangkok.

This study should also benefit university students who are training to become science teachers. These students would be able to read up on the effective strategies in

teaching and learning and be better prepared to become science teachers knowing a lot of strategies and various types of motivational techniques to keep their students focused.

CHAPTER II

REVIEW OF RELATED LITERATURE

This study was comprised of a comprehensive literature review which relates to the topic of the research. The first section of this chapter briefly described a view of the motivational philosophies and strategies in order to demonstrate motivation was recognized as a crucial factor in the construction of knowledge. The second section summarized a range of effective teaching strategies to improve students' motivation. The third section examined six components of the importance of motivation for science learning used in the questionnaire. The fourth section highlighted science education in Thailand and then student science achievement and finally Mathayomwatsing school in Bangkok, Thailand.

Motivational Philosophies and Strategies

With regards to motivation, Bandura (as cited in Bandura, 1993) found that self-efficacy plays an important role in the self-regulation of motivation because most human motivation is mentally created. In the exercise of their thoughts, people motivate themselves and guide their actions according to the anticipated consequences. Therefore, they form beliefs about what they can do and they predict the outcomes of prospective actions. Based on their experience, they can set goals and actions designed for the future (Bandura, 1993). In addition, McCombs (2013) added that a key to motivating students is to let them take responsibility for their own learning. With the right motivation, learners ask questions and seek answers because of their own curiosity as they ask engage with different lessons. Lastly, Renninger (2007) pointed out that the definition and meaning of the words "motivation" and "understanding" can vary from person to person.

Motivation in Science

Today, children are exposed to a world full of technology brought about by scientific inquiry and engineering development. By the end of formal schooling, graduates will enter a

world where there are new products born out of new technology and science (Staver, 2007). Hence, our students must be trained in scientific methods and information in order to make decisions regarding their personal lives, careers, and communities. However, science is not a discipline of unchanging truth but a field which equips us with knowledge, understanding, and methods which offer powerful ways to view our society (Ryan, 2009).

Vosniadou (2001) found that motivated learners are described as passionate and go-getters in achieving their goals. They are also characterized by a great deal of determination and persistence, which influences the amount and quality of what they learn. However, even motivation is not clear-cut phenomenon; rather, people have different amounts, different levels, and different kinds of motivation. Most frequently, the orientation of a person's motivation justifies their actions (Ryan and Deci, 2000). In fact, early research on student learning treated motivation separately from cognitive functions. However, as Wiseman and Hunt (2001) stated, motivation plays a part in the development and emergence of meta-cognitive skills, which enriches thinking and learning.

Types of Motivation

In addition, Ryan (2009) stated that there are two types of ways to motivate people: extrinsically or intrinsically. Extrinsic motivation is motivation that is stimulated by things that are outside of your interests and self-esteem i.e. money, a nice car, an expensive house, high grades in school, gold stars, etc. In other words, extrinsic motivation requires something outside of yourself that you need to obtain. On the other hand, intrinsic motivation is the opposite because you are motivated for something that you are truly interested in and aligns with your passion i.e. interest in work, happiness in learning, or joy in doing something for yourself (Ryan, 2009).

Variety of Strategies in Science

Schunk (1991) found that instructional studies have substantiated the idea that teaching strategies have an effect with regards to self-efficacy and achievement. Effective strategies are important because they hone a student's problem-solving skills according to different situations. In addition, they can improve and facilitate faster learning. Lastly, teaching techniques may differ in various ways, such as accuracy, nature of execution, requirements, and the variability of application (Vosniadou, 2001).

Consequently, if you want to motivate students in learning and in understanding fundamental science, you will need to engage them in activities that develop a scientific method of inquiry as discussed earlier through establishing relationships between patterns and explanations in experiences; engaging in scientific application or inquiry; and developing scientific habits that are brought on by curiosity and model-based reasoning (Anderson, 2003).

Through science learning, students will be able to learn how to define, refine, and resolve problems and ideas through practical data gathering, varied information collection, data transformation and data generalization, and justification of outcomes and opinions based on the evidence gathered. Through this method, students will be able to analyze the limitations of their data and to further develop their arguments (Ryan, 2009).

There are three types of varieties of strategies to improve students' motivation in science. They are 1) Teacher enthusiasm, 2) The learning environment, 3) Use of hands-on activities.

1. Teacher Enthusiasm: A teacher's enthusiasm affects student motivation. For example, if you become bored or apathetic, students will too. Typically, an instructor's enthusiasm comes from self-confidence, an innate excitement about the topic of the lessons, and a sincere pleasure in teaching (University of Arkansas, 1993). As Garbett (2011) illustrated, successful teachers of science need to be knowledgeable about 1) science content, 2) effective teaching

and learning strategies in science, and 3) the combination and application of content knowledge and pedagogical knowledge in the classroom. Moreover, Anderson (2003) wrote that good science teachers motivate their students into learning and understanding science. Thus, another goal of science education is to create good science teachers to help students develop scientific understanding.

To facilitate better learning, teachers must also be aware that their expectations of the students' have an impact on classroom performance. Teachers should set high learning expectations while encouraging students to also set expectations for their learning as well. There are nonverbal and verbal behaviors that teachers use to express their expectations of students (Staver, 2007). Students are more likely to respond positively to an enthusiastic teacher who has planned out a well-organized course because of his/her interest in the learning of the students. Therefore, all activities in the classroom must promote learning that will enhance student motivation (University of Arkansas, 1993).

Effective teachers believe that it is important to reach students through a variety of methods because they feel responsible for the success of their students. In essence, the effective teacher believes that all students can learn (Stronge, 2002). Aside from conveying passion and enthusiasm, as stated earlier, teachers must be willing to provide individual help. Also, the simple things such as body language and voice must convey your eagerness in the classroom. Lessons are engaging when teachers move around instead of sitting during a lecture (Palmer, n.d.). Among teachers, the most important qualities in the profession are "dedication," "passion," "zeal," "enthusiasm," and "love of teaching." Educational degrees and level of knowledge are secondary to passion for teaching (Urban, 2008).

2. The Learning Environment: Positive experiences in school create lifelong learning for citizens and provide them with situations to apply their learning. With active involvement and participation, students learn through observing, paying attention, memorizing, understanding,

and assuming responsibility for their own learning (Ryan, 2009). With this in mind, teachers should also consider the type of classroom environment they wish to create in order to foster learning (Vosniadou, 2001). In addition, Lai (2011) wrote that teachers should empower students with autonomy or the ability to control the progress of their learning by allowing them to collaborate and cooperate with each other and to make individual choices. A supportive classroom environment in line with goals, objectives, and assessment are key in fostering this type of autonomy and collectivity in school learning. Research has also proved that social collaboration enhances student performance and achievement because of the contribution of social interactions to learning (Vosniadou, 2001).

The role of schools is to prepare students for the workforce wherein jobs have yet to be created, technologies have yet to be invented, and where new problems are expected to arise (Schleicher, 2010). The second philosophy I will identify with is progressivism according to Simpson (2008). Opposite with perennialists who holds onto fundamental and unchanging truths, progressivists see the world as constantly changing. Our ideas, interests, values, and visions are part of this process of change and therefore make each individual unique. In addition, this continuous change in society means that educators should allow children to bring interesting knowledge and experiences from the real world into the classroom (Simpson, 2008). In hindsight, if we take the interest of the students and incorporate them into the lessons we teach, our children and youth would effectively learn, retain, and acquire knowledge.

3. Use of hands-on activities

For the United Nations Educational, Scientific & Cultural Organization (2013), using teaching methods that appeal to inquisitiveness and ingenuity that describe all children is the best way to capture and increase students' interest in learning science related subjects.

The teachers should use hands-on and inquiry-based activities to promote teamwork, critical thinking and problem-solving skills among students.

According to the study of the Third International Mathematics and Science study, classroom activities such as the teacher doing demonstrations and sample problems, science projects, group activities, and student investigations and experiments aided increase students' interest in science (House, 2002).

Hands-on activities in science classes can increase students' motivation in studying the subject. However, based on Stohr-Hunt's (1996) survey, it is not sufficient to just case any hands-on activity but rather, it should be "meaningful, relevant, and appropriately timed." Throughout the activity, teachers must provide students scaffolding and assist them comprehend the concepts being studied.

Effective teaching strategies to improve students' motivation

For the past two decades, science education studies have determined that the field contributes to the development of cognitive and affective abilities. Constructivism has contributed to how we understand the nature of learning vis-a-vis the uniqueness of each learner and the meanings he/she constructs through social experience (Cavas, 2011). Constructivist science instruction is different than traditional approaches because it is student centered and goes beyond repetition and memorization of definitions and formulas (Duit,1996). According to Lorsbach & Tobin (1997), the constructivist perspective sees science "is not the search for truth". Rather, it is a process that helps us interpret the world around us. In using a constructivist perspective in teaching science, learners become scientists that are active in the process of understanding social experiences in relation to society, which is very much different from the more abstracted version of "school science".

In general, a deep understanding of science transcends memorization of abstract facts and concepts. Instead, it comes from scientific inquiry and the development of strong

problem-solving skills (Staver, 2007). In accordance with Anderson (2007), the teacher must "provide students with choice, flexibility, on-going assessment, and creativity" in teaching different concepts. Simultaneously, the teacher also has to understand how his or her students process and understand the required concepts and skills, and how they are able to demonstrate their learning using their level of knowledge. Lastly, the teacher must actively involve students in science through "hands-on, minds-on science" because it is the goal of science education reform (Lorsbach & Tobin, 2997). I believe it is an admirable goal which can be achieved through constructivist philosophy, theory, and techniques.

According to Piaget (as cited in Gray, 2007), constructivist's perspective on learning is based on the belief that learners are the ones building and creating meaning and knowledge through an active, mental process of development. It draws on his developmental work where he sees that knowledge is not something that a teacher can simply transfer to students understand the significant of science concepts and principles to their and other people's lives, instead of providing them with science knowledge through definitions and formulas (Duit, 1996).

Piaget asserts that (as cited in Gray, 2007) active construction of meaning rather than passive recipience is when learning occurs. Disequilibrium or imbalance is created when learners are faced with circumstances that are different with their present way of thinking. He then continued (as cited Gray, 2007) that it is necessary to change our thinking to reinstate equilibrium or balance. In order to achieve this, we must aim to incorporate new information into our existing knowledge. Otherwise, we adapt it to our old way of thinking through reorganizing our current knowledge to a more advanced level of thinking.

According to Geer & Rudge (2002), students acquire knowledge by making sense of situations as they encounter it, assess evidentiary facts, and try to understand it based on the society's accepted context considering the existing knowledge. They found that most

constructivists concur that learning happens when there is an assimilation of new information into current mental archetypes, or build new models, on account of differing perceptions, that can accommodate existing and new insights obtained from experience.

According to Dewey (as cited in Utanir, 2012), knowledge is formed through experiences. These experiences are translated into knowledge if students are able to apply what they have learned in classrooms to everyday life situations. This is why students cannot learn by simply memorizing information. It is evident in Dewey's theory that, in order for students to learn, they should be able to apply the concepts they learned at school within their significant activities.

The importance of existing knowledge was highlighted by Ausubel in his statement, "The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly." The latest developments of the constructivist science education research showed the dominant existing knowledge of the learners, which led them to undertake development and assessment of new approaches to the definitions of "teach him accordingly." (Duit, 1996).

As Garbett (2011) wrote, in constructivism, the teacher's role is to guide their students in actively constructing new knowledge based on the learner's prior knowledge. An important aspect in a constructivist approach is the diagnosis of student's prior knowledge, followed by a sequence of carefully planned teaching practices that empowers learners to grasp unknown concepts based on what they already know. Students are then assessed by analyzing if they can apply their new found knowledge in various contexts. In this way, this "construction of knowledge" is very much related to individual experiences in the everyday world. However, this experience can also be attained within the context of different pedagogical approaches within the classroom, with a premium on active participation and active learning in the process of constructing knowledge (Geer and Rudge, 2002).

Students see teachers as subject matter experts that transfer knowledge to them, similar to filling a bottle with a liquid. This traditional role of teachers will be problematic, if students did not see this as being fulfilled. Since many students still assume that they should be controlled and loaded up with knowledge, they will be baffled and will have trouble engaging should the teacher not fulfill his/her conventional duties Lorbach & Tobin (1997).

Teaching students how to become effective learners should be a primary concern in order for students to be successful in learning science. If teachers have to educate themselves on how to teach using a constructivist approach, students must also learn how they can effectively learn Lorbach & Tobin (1997).

Improving Teaching and Learning in Science

There are multiple tasks that need to be done when teaching: carefully preparing and planning the objectives and activities for learning in a classroom setup on an hourly, daily and weekly basis. Planning on a long-term basis will ensure that the curriculum has covered the marking period, semester and year. Having high expectations for students and selecting strategies to prompt students' learning are some of the characteristics of an effective educator (Stronge, 2007).

There should be a significant shift on teachers, parents, and students' approach in using constructivism. Teachers should spend minimum time on lecturing, teaching students basic concepts and mindless learning (Andrew, 2007).

Science teachers should involve scientific inquiry, thereby lessening their emphasis on teaching science as a chain of lectures and reading assignments. They must also decrease their time teaching non-fundamental scientific knowledge (Staver, 2007).

The Six components of motivation for science learning used in the questionnaire

1. Anxiety about science assessment

Olatoye (2009) described anxiety as "an emotional component of human beings that manifests itself in life endeavours in form of worry and restlessness." When this emotional component is present in a test or assessment condition, then it can be considered as an anxiety.

He also found that test anxiety is "an experience which expresses itself in candidate's mind and behaviour in form of fear or failure, negative self-valuation in relation to one's previously established standard, self-blame for perceived shortcomings, social evaluation in relation to one's estimate of how others are doing and negative prediction of what will be the outcome of a test" (Olatoye, 2009).

Mallow's (2010) research showed that there is a correlation between science anxiety reduction and role modeling. Science anxiety of both male and female students was reduced in Physics classes that were taught by an instructor of the same gender, on the condition that the instruction was interactive.

Based on the study conducted Olatoye (2009), two independent variables, students test anxiety and motivation for examinations, have significant influences on and are significant predicators of science achievement. There is a negative and significant relationship between test anxiety and students' science achievement. Hence, the higher the test anxiety, the lower the science achievement. These two factors should always be considered if educators are to improve science achievement.

For Zhao (2013), standardized testing encourages the ability to find the "correct answer" but discourages creativity that promotes questioning and challenging the status quo. If a curriculum is narrow and uniform, it will deprive children of exploring their interest and passion, which is fundamental in entrepreneurship. If children are constantly being tested and

being told that they are not good enough, their confidence depletes. Thus, their fuel for innovation decreases.

2. Confidence (Self-efficacy) in learning science and Education

Bandura (as cited in Webb-Williams, 2006) suggested that there are different ways to build up self-efficacy to help enhance a person's sense of accomplishment and well-being. The difference between individuals who have strong self-efficacy and those who doubt their capabilities are as follows: people with high self-efficacy see hard tasks as challenges rather than threats; they have challenging goals which they are committed to achieve; even when they failed, they sustain their effort and quickly recovers from it; they also attribute their failures to adaptable factors such as insufficient effort or skills; and they have intrinsic interest in doing their activities. He also found that people's belief about how abilities change over time also effect human functioning. There are people who believe that as their age increases, their abilities shrink. Thus, their faulty performances are quickly attributed to their declining capacities. In return, they do little to explore what they can do. On the other hand, those who regard abilities as a skill that should be developed and practiced over time have higher attainments (Bandura, 1993).

Self-efficacy is defined by social learning theorists as a "sense of confidence regarding the performance of specific tasks" (Jinks & Lorbach, 1999). Lorsbach & Jinks (1999) assert that students' academic self-efficacy can change students' attitude towards their learning environment. They believe that student self-efficacy beliefs about academic performance can have significant implications for developing learning environments and student outcomes.

Schunk (1991) found that children with high self-efficacy were more likely to continue doing and were more successful finishing a certain difficult task compared to children with a low sense of self-efficacy.

According to Bandura (1993), perceived self-efficacy utilizes its influence through cognitive, motivational, affective, and selection processes. Perceived self-efficacy acts as a significant contributor to academic progress at three different levels. Aspirations, level of motivation, and academic accomplishments are determined by students' self-efficacy beliefs to administer their own learning and master academic activities.

According to Schunk (1989), a person's success can raise self-efficacy and his/her failure can lower it, but an occasional failure may not have much effort on a person that has developed a strong sense of self-efficacy. People assess their self-efficacy from the information they acquire based on their actual performances, second-hand experiences, forms of persuasion, and physiological indexes.

Schunk (1989) also explained that peer modeling can help students with learning problems who doubt their capabilities for learning. Although it may seem that an adult teacher flawlessly demonstrating cognitive skills help children hone their skills, it does not help them develop learning efficacy. Students will only see teachers as someone who is competent which they may view as unachievable. However, if students see that their peers are performing successfully, it will raise their self-efficacy because they are apt to view themselves as someone who can attain those sills as well.

3. Extrinsically motivated science learning

Students who are extrinsically oriented are disposed to increase the minimum amount of effort needed to obtain the maximum reward. Positive rewards such as praise, high grades, awards, money and food, that are used to increase the frequency of a target behaviour can result to extrinsic motivation.

Anderson (2003) stated that there are students who are extrinsically motivated that they have high expectancy of their learning capability in science and will do anything to get a good grade. Even though it might seem as a pure motive, teachers can still help extrinsically

motivated students to learn with understanding. As a teacher, students will see you as accountable for making sure that the efforts they put to get their grades help them acquire valuable knowledge.

Intrinsic motivation is an individual's inherent inclination from which stems his or her tendency to learn about particular areas of life regardless of the presence of external enticements (Ryan and Deci, 2000). Intrinsic motivation is when learners actively participate in activities without having to be rewarded for it. The child who likes to put together puzzles for the fun of it intrinsically motivated. In recent years schools have increasingly come to recognize that intrinsic, or self-motivation is a much more powerful driver of learning and achievement (Vosniadou, 2001).

4. Intrinsically motivated science learning

Intrinsic motivation is when learners actively participate in activities without having to be rewarded for it. The child who likes to put together puzzles for the fun of it is intrinsically motivated. In recent years schools have increasingly come to recognize that intrinsic, or self-motivation is a much more powerful driver of learning and achievement (Vosniadou, 2001).

For Ryan and Deci (2000), "intrinsic motivation results in high-quality learning and creativity, it is especially important to detail the factors and forces that engender versus undermine it". "The presumption of intrinsic motivation is humans have the innate ability to learn which is perceived as "a natural and enjoyable activity" (Ryan and Deci, 2000).

Learners who actively participate in activities without the thought of having a reward are those who are intrinsically motivated. For example, a child who likes to solve puzzles just for fun is intrinsically motivated. It has been observed recently that intrinsic motivation, or self-motivation, can fuel a student more to study and achieve goals (Vosniadou, 2001).

Based on Anderson's (2003) observation, there are only few students who are intrinsically motivated to learn science. Science teachers will find students coming to class liking and believing that the subject is important (high value) and that they have the ability to learn it (high expectancy). These types of students are the easiest and most rewarding students to teach.

5. Personal relevance of learning science to personal goals

In order to develop better school science, we need to change teaching and learning the subject in a way that it is better matched to science in the wider world. As Ryan (2009) stated, for cognitive learning theorists, it is important that teachers relate new information to things that are already familiar and meaningful to students for them to learn the subject better.

There are numerous techniques that were proposed to motivate the development of mastery goals. Students do not understand the purpose and usefulness of many school activities that's why they find it meaningless. To combat this, teachers should situate school activities in a real context (Vosniadou, 2001).

Contemporary research findings showed that the capability to relate newly acquired information to prior knowledge is crucial for learning. As Vosniadou (2001) said, "it is not possible for someone to understand, remember or learn something that is completely unfamiliar."

6. Self-determination for learning science

When self-determination theory is applied to education, its concern focuses on promoting an interest in learning for students, valuing education, and building students' self-efficacy (Deci & Ryan as cited in Deci, Vallerand, Pelletier, Ryan, 1991). These results are indications of students being intrinsically motivated and having the values and regulatory processes internalized.

Research on students' motivation towards science learning

Sevinc, Ozmen & Yigit (2011) found that academic success has a significant effect on students' motivation towards science learning. Students who have high academic success have high motivation level towards science learning. In a study of promoting science and motivating students in the 21st century, Bordie (2006) found that inviting researchers and organizing student science conferences are needed for teachers who want to improve their students' motivation for science. Patchen (2010) also found that teachers must use more student-centered constructivist teaching practices to teaching for students to get involved in their learning.

Poor motivation among students adversely affects student achievement; research has shown that there is a link between motivation and achievement. Research indicates that motivation impacts student engagement and student engagement affects academic achievement (Athman & Monroe, 2004). Therefore, if student motivation affects student achievement, the more motivated a student is the higher his/her academic achievement.

Many studies have explored the relations between students' motivation to learn and their achievement in science, mainly their performance and scores in science tests (Trumper, 1995). As cited in Trumper (1995), Uguroglu and Walberg (1979) found that survey of 40 studies contained more than 200 correlations between motivation and achievement, 11.4% of the variance in achievement was accounted by motivation. As cited in Trumper (1995), Kremer and Walberg (1981) reviewed 20 studies dealing with student motivation and concluded that there is a positive relationship between motivational constructs and science learning.

Science Education in Thailand

Science is a way and a method of knowing and learning about nature. Scientific inquiry is the formal and systematic method of learning the subject, which is based on common sense. According to Staver (2007), science education has three purposes: 1) preparing the students in studying science in higher educational levels; 2) preparing the students in entering the workforce, pursuing occupations, and taking up careers; and 3) preparing them to become more scientifically literate citizens.

Our world today is shaped and influenced by science and technology. However, humanitarian issues such as preserving the environment, reducing poverty, and improving health care are challenges that require scientists and citizens to develop sustainability and feasible responses (Tang, 2009). Because science is the triumph of the 21st century, it can be used for the benefit of all, and can be the knowledge to develop technology for rational and creative purposes. Hence, science education also opens up the possibilities of more citizens to experience the joys of science in light of a reformation of teaching and learning within the field (Ryan, 2009). One of the wide-spread influences of science in human society is the phenomenon of globalization. In globalization, everyone is part of the global communication society anywhere in the world because of the easy exchange of and access to information. This information revolution has also brought about changes in how people work and how society has transformed into a knowledge society (Ryan, 2009).

Developing scientific literacy has been an increasing concern of educators and political leaders worldwide. In Thailand, science education has been greatly influenced by the educational reform in 1999 which gives emphasis on the idea that science education are shaped by the thought of scientific literacy (Yuenyong and Narjaikaew, 2009).

Science education in Thailand gives importance to the scientific knowledge, the nature of science and the relationships of society and science technology. Research, articles,

national tests, and even teaching and learning the subject give importance to scientific achievement rather than science as a way of knowing even though Thai science education curriculum promotes scientific literacy (Yuenyong and Narjaikaew, 2009).

Based on the National News Bureau of Thailand (2013), the Education Minister explained that the lack of scientists which create the framework for future growth and development is the reason why Thailand lags behind other countries when it comes to science. It is vital that the country creates original items instead of constructing from someone's else idea since the sales of counterfeit or knock-off merchandise cannot be sustained for a long period of time. Original invention, according to the Education Minister, will have greater possible rewards for the country.

Student Science Achievement

According to Yuenyong and Narjaikaew (2009), prestigious schools in Thailand strongly stresses science achievement in which they provide special science and technology programs. It is evident that scientific achievement is still the most important in science teaching in Thailand even though they promote scientific literacy and science, Technology and Society (STS) approach to teaching. Gifted and talented science and mathematics students are selected to participate in special International Science Olympics (Yuenyong and Narjaikaew, 2009).

Based on Zhao's perspective, most education system began by determining the outcomes. They gamble which skills will be significant and assure that once those skills are mastered, students will succeed (Zhao, 2013). However, he sees this as a weakness because it homogenizes everyone into a single group, like making a sausage out of different kinds of meat. Determining outcomes permits the system to measure results, but it suppresses individuality (Zhao, 2013).

This is the kind of attitude towards science used to be – memorization of facts and high examination scores than knowing whether they actually liked science were more important to students (Zhao, 2013). It is fortunate that this view is already changing. Based on a research, even though much importance is given to the role of science in giving knowledge to students, appreciation and affinity to the subject in general is much more significant for students to learn while in school. However, it is until students reach college or high school that they realize what they want to have as a profession. With this, rote memorization is pointless and discourages scientific literacy and appreciation (Zhao, 2013).

"O" Net exams in Thailand

O-Net is the national standardized exam. It is a standardized test required for Prathom 6, Mathayom 3 and Mathayom 6. O-Net consists of eight major subject areas according to the national education curriculum: 1) Thai Language, 2) Mathematics, 3) Science, 4) Social Science, Religion, and Culture, 5) Health and Physical Education, 6) Art, 7) Career and Technology, and 8) Foreign Languages. This is the main reason the researcher chose Mathayom 3 students as the sample for her study and used M3 students' "O" grades taken in March 2014 as student science achievement. There are 40 questions in Mathayom 3 O-Net science exam and it has 2 sections. A total test time 90 minutes should be allowed to complete 45 multiple choice questions. The first section has 40 multiple choice questions with 4 choices including one correct answer. Each question is worth two points. For the second section which has 5 questions with many choices with more than one answer. Each question is worth 4 points. So it is a total of 45 questions with 100 points.

Aramnet (2010) reported that the O-Net scores for 2010 showed that the amount of students passing was "below 50 percent" despite the Thai Ministry of Education's actions to improve test scores. And one of the researcher's students said that most of the Thai students do not pay that much attention to the "O" Net exams and they also think that "O" Net exams

stuck in 20th century. Teachers can not rely on "O" Net exam scores and the students do not trust "O" Net exams as trusted indicators of their performance (Saengpassa and Khaopa, 2012).

Mathayomwatsing School

Mathayomwatsing school is a double sex school located on Ekachai Road, Bangkutien, Jomthong, Bangkok. It was established as a co-educational government school in 1953. Permission to start the Mini-English Program was given by the Ministry of Education gave the school permission to start the English Program making it the third school in Bangkok to do so. The school takes students from a variety of backgrounds to study in school from Mathayom 1 to Mathayom 6. The school caters to diverse groups by offering a wide range of programs. The English Program, Gifted Education Program and Regular Program are provided to serve the students' and community's needs. Arts, sports, cultural and other activities are also provided to help develop good social skill.

Bax (2010) concluded that the English Program although still relatively small in percentage terms, is famous and attractive to stakeholders and has good prospects for future growth. There are many English Program schools around Thailand. Mathayomwatsing English program is one of them. The setting for this study is the English Program of a large government secondary school in Bangkok, Thailand. The program, which consists of students in grades seven through twelve, has mostly Thai students and a diverse foreign teacher population. The program operates on a traditional schedule with each class period lasting 50 minutes. The program's curriculum is in accordance with the Basic Education Curriculum B. E 2544 of the Ministry of Education. English is definitely the medium of instruction used in the teaching-learning process in many subjects. The subjects conducted in English are Mathematics, English, Science, Health Education, Geography, Tourism and

Computers, whereas the subjects conducted in Thai and Thai language, Physical Education, Social Studies (Buddhism, History, etc.) which are related with Thai customs and culture.

The English Program department at the school consists of 10 foreign teachers, 4 of whom held at least a masters certification in subject matter. The teachers in the English Program are non native speakers from various countries: The Philippines, India, South Africa. The English Program offers a wide variety of classes in order to meet the required courses for secondary graduation in Thailand. Each science teacher teaches twenty-one 50 minute classes each week with Twelve 50 minute planning period. EP classrooms are air-conditioned and equipped with LCD projectors, screens and flat screen TVs, and lockers. Classroom sizes average only 30-35 students to maximize teacher-student development.

Science is basically a hands-on subject. The science teachers use hands-on and teacher-directed inquiry-based activities to promote increased student understanding in the English program at Mathayomwatsing school in Bangkok, Thailand. For example, the Biology teacher assigned her students group project work exploring the carbon cycle, the nitrogen cycle, the oxygen cycle and the water cycle. These studies required students to prepare a model, an information board, power point slides and present information to the class. The Chemistry teacher also encouraged his science students to take an active role in their own learning. For example, he incorporated his view of scientific inquiry that "students are in charge of their learning. During a lab activity in which the students were given the required materials such as milk, ice, plastic bags, etc., to make an ice-cream. Students then designed a demonstration to illustrate how to make an ice-cream. As students interacted with each other in this activity, they asked each other. "How can you tell when the ice-cream is edible? and "What if it doesn't work?" He also indicated that labs are his number one student motivator because they give students a chance to see and experience a topic.

Summary

To find out why motivation was very important in learning science, the researcher provided the information about motivation in learning, types of motivation as well as a wide range of ways to improve students' motivation in science learning.

In order to increase students' motivation in science related subjects and accommodate their various learning styles, unique and individual personalities, backgrounds, and abilities in classrooms, students should be provided with a variety of strategies, i.e. instructions can be given orally and visually through writing and pictures and lots of hands-on activities.

The researcher also explained about how important constructivism is in science education and why we as educators should use a variety of instructional strategies in our daily teaching. The researcher also pointed out science education in Thailand and the information about the English Program at Mathayomwatsing school in Bangkok, Thailand where the study took place.

CHAPTER III

RESEARCH METHODOLOGY

In this chapter, the researcher will explain the research methodology for this study, including research design, population, sample, research instrument, collection of data and data analysis.

Research Design

The research focused on motivation in science learning and students science achievement in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. A total of 55 Mathayom 3 students from the English and Thai programs at Mathayomwatsing school were asked to complete a science motivational questionnaire.

This is a quantitative type of research. The first step in this research was to gather information about what motivates students to learn. The students of Mathayom 3 were asked to complete the Science Motivational Questionnaire.

Population

Population of this study was all the students in Mathayom 3 at Mathayomwatsing school in Bangkok, Thailand.

Sample

The researcher selected Mathayom 3 students in academic year 2013 from the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand as the subjects for data collection. Twenty-two students of Mathayom 3 from the English Program and 33 students from the Thai Program totaling 55 students who are studying science were asked to complete the questionnaire.

Research Instrument

There were two research instruments. The first one was the science motivational questionnaire designed by Glynn and Koballa, 2006. The second one was the students "O"

Net grades from the National Institute Educational Testing Service taken in March 2014. O-Net is the national standardized exam and it is given in Thai language and given to Mathayom 3 students.

In the first instrument, quantitative data were collected from the science subjects with the use of a questionnaire to investigate students' motivation and science learning achievement by (Glynn & Koballa, 2006). The motivational components and their associated items included 6 factors.

Table 1: The Six Components of Motivation for Science Learning categorized by question numbers

Six components of motivation for science learning	Questions
I. Intrinsically motivated science learning	1, 16, 22, 27, 30
II. Extrinsically motivated science learning	3, 7, 10, 15, 17
III. Personal relevance of learning science	2, 11, 19, 23, 25
IV. Self-determination to learn science	5, 8, 9, 20, 26
V. Self-efficacy for learning science	12, 21, 24, 28, 29
VI. Anxiety about science assessment	4, 6, 13, 14, 18

The questionnaire was to find out the students' motivational level in science learning. This study used the questionnaire designed by Glynn and Koballa 2006. The questionnaire was attached in Appendix A.

Students responded to each of the 30 randomly ordered items on a five-point Likert-type scale of temporal frequency ranging from 1 (never) to 5 (always). Students were asked to decide whether they agree or disagree with each statement. Then, students marked one of the boxes: never, rarely, sometimes, often and always. Each has the following numerical values.

Never	1
Rarely	2
Sometimes	3
Often	4
Always	5

When the questionnaire was completed, all the numerical values for each question was identified. The questions were divided into six components of motivation: The anxiety about science assessment items are reverse scored when added to the total, so a higher score on this component means less anxiety. The Science Motivation Questionnaire maximum total score is 150 and the minimum is 30. The questionnaire was chosen because it was especially developed for motivation for science learning. It also has been used in many research studies in science learning.

30-59 means "Never to rarely" motivated

60-89 means "Rarely to sometimes" motivated

90-119 means "Sometimes to often" motivated

120-150 means "Often to always" motivated

Validity and Reliability of this instrument

The reliability of the science motivation questionnaire items: the Cronbach coefficient alpha was 0.91, which is considered excellent. The 30-item total score was found to be related to science GPA ($r=0.61$, $p<0.001$) and the belief that science was relevant to one's career ($r=0.50$, $p<0.001$) providing evidence of criterion-related validity.

In the second instrument, the researcher used Mathayom 3 students "O" Net grades (see Appendix B) taken in March 2014 from the National Institute Educational Testing Service to find out the students' science achievement.

Translation validity

The questionnaire was translated into Thai and the researcher also sought the help of three bilingual Thai-English teachers to review the questionnaire for its translation validity.

Reliability of this study

The researcher carried out the reliability analysis of the questionnaire and calculated by Cronbach's alpha coefficient. The value of Cronbach's Alpha of this study was .919 from 30 items.

Collection of Data

The data collection process followed these steps:

1. The researcher asked permission from the school.

2. The researcher distributed the science motivational questionnaire designed by (Glynn & Koballa, 2006) in class, during regular class time. The students were asked to complete the questionnaire within 20 minutes. They were encouraged to answer the questions honestly according to their attitudes and feelings, regarding motivation in science learning at the present time and picked the questionnaires up on the same day. All of the students completed the questionnaires and returned it to the researcher when they were finished.

3. The researcher collected the students' science achievement which is the students' science "O" Net grades taken in March 2014 from the National Institute Educational Testing Service to find out the students' science achievement.

Table 2: Data Collection Process

Date	Data Collection Process
June 1st, 2013	Ask for the permission from the English Program Coordinator of Mathayomwatsing school, Bangkok, Thailand
Jan 27th, 2014	Distribute the questionnaire to Mathayom 3 students from the English Program and collect all questionnaires within that class
Feb 4th, 2014	Distribute the questionnaire to Mathayom 3 students from the Thai Program and collect all questionnaires within that class
March 20th, 2014	Collect the students "O" Net grades from the school

A total of 55 questionnaires were distributed to students and students completed and returned them on the same day with a 100% return rate.

Data Analysis

The following statistical methods were used to realize the research objectives:

Objective 1: To determine the level of student motivation for learning science in the English Program students at Mathayomwatsing school in Bangkok, Thailand.

Mean and standard deviation were computed to find the level of student motivation for learning science in the English Program students at Mathayomwatsing school in Bangkok, Thailand.

Objective 2: To determine the level of student motivation for learning science in the Thai Program students at Mathayomwatsing school in Bangkok, Thailand.

Mean and standard deviation were computed to find the level of student motivation for learning science in the Thai Program students at Mathayomwatsing school in Bangkok, Thailand.

Objective 3: To find the correlation between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

Pearson Product-Moment Correlation Coefficient was computed to find the correlation between the level of student motivation for learning science and science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

Objective 4: To find the correlation between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Pearson Product-Moment Correlation Coefficient was computed to find the correlation between the level of student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Objective 5: To compare student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The independent t-test of sample analysis was computed to find the comparison between student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Objective 6: To compare science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The independent t-test of sample analysis was computed to find the comparison of science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Table 3: Summary of the Research Process

Research Objective	Sources of data/sample	Data collection/Research instrument	Method of data/ analysis
1. To determine the level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the English Program at Mathayomwatsing school in Bangkok	- Science motivational questionnaire	Means and Standard deviation
2. To determine the level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the Thai Program at Mathayomwatsing school in Bangkok, Thailand.	- Science motivational questionnaire	Means and Standard deviation
3. To find the correlation between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the English Program at Mathayomwatsing school in Bangkok, Thailand.	- science motivational questionnaire - Mathayom 3 students' "O" Net scores taken in March 2014	Pearson Product Moment Correlation

Research Objective	Sources of data/sample	Data collection/Research instrument	Method of data/ analysis
4. To find the correlation between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the Thai Program at Mathayomwatsing school in Bangkok, Thailand	science motivational questionnaire Mathayom 3 students' "O" Net scores taken in March 2014	Pearson Product Moment Correlation
5. To compare student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the English and Thai Programs at Mathayomwatsing school in Bangkok	- Mathayom 3 students science motivational questionnaire	t – test
6. To compare science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.	Mathayom 3 students from the English and Thai Programs at Mathayomwatsing school in Bangkok	- Mathayom 3 students' "O" Net scores taken in March 2014	t – test

CHAPTER IV

RESEARCH FINDINGS

This chapter provided the analysis of data collected from 55 questionnaires completed by the students and the O-Net grades of 55 students. The data analysis part divided into two major sections demographic of students' profile and the information about the students' motivational level, and students' achievement and correlational and t-test information to see the relationship between students' motivational level and students' science achievement.

Table 4: Number of students categorized by gender

	Frequency	**Percentage**
Male	30	54.54%
Female	25	45.45%

Research Findings

Research Objective 1: To determine the level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand.

Research finding was presented in Table 5.

Table 5: The level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand classified by Mean and Standard Deviation

	Number of students	Mean of the level of student motivation	Standard Deviation	Interpretation
The six components of motivation	22	101.31	17.89	Sometimes to often

From table 5 the level of student motivation for learning science in the English Program at Mathayomwatsing school is "sometimes to often" motivated.

Research Objective 2: To determine the level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Research finding was presented in Table 6.

Table 6: The level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand classified by Mean and Standard Deviation

	Number of students	Mean of the level of student motivation	Standard Deviation	Interpretation
The six components of motivation	33	99.27	17.53	Sometimes to often

From table 6 the level of student motivation for learning science in the Thai Program at Mathayomwatsing school is "sometimes to often" motivated.

Correlational Analysis

Pearson product-moment correlation coefficient was utilized to examine the relationship between 2 variables; student motivation for learning science and science achievement. In this section, the findings examined research objectives 3 and 4 and research hypotheses 1 and 2. The presentation of findings presented respectively in order of the research objectives and research hypotheses.

Research Objective 3: To find the correlation between student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

Research finding was presented in Table 7.

Table 7: Pearson's Product Moment Correlations for student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

	Students "O" Net scores	Student motivation for learning science
Pearson Correlation	1	.494*
Sig. (2-tailed)		.019
n	22	22

* $p<0.05$

From table 7, the resulting data indicated that r=.494 and Sig. was .019 which was smaller than .05. Therefore, there was a significant relationship between the students' motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

The finding was agreed to the research hypothesis 1.

The research hypothesis (1) was "there is a significant relationship between the level of student motivation for learning science and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

Research Objective 4: To find the correlation between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Research finding was presented in Table 8.

Table 8: Pearson's Product Moment Correlations for student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

	Students "O" Net scores	Student motivation for learning science
Pearson Correlation	1	.853*
Sig. (2-tailed)		.000
n	33	33

* $p<0.05$

From table 8, the resulting data indicated that r=.853 and Sig. was .000 which was smaller than .05. Therefore, there was a significant relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

The finding was agreed to the research hypothesis 2.

The research hypothesis (2) was "there is a significant relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand."

Research Objective 5: To compare student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Research finding was presented in Table 9.

Table 9: t-test result comparing student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Subject	students	n	Mean	SD	t	df	Sig. (2-tailed)
Motivation	English Program	22	96.40	15.21	-.549	53	.585
	Thai Program	33	98.84study	16.72			

From table 9, student motivation for learning science in the English Program t = -.549 and Sig. (2-tailed) was .585 which was bigger than .05. Therefore, it was indicated that there was no significant difference between student motivation for learning science between students in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.

The finding was disagreed to research hypothesis 3.

The research hypothesis (3) was "there is a significant difference in student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand."

Research Objective 6: To compare science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The finding was presented in Table 10.

Table 10: t-test result comparing science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Subject	students	n	Mean	SD	t	df	Sig. (2-tailed)
science achievement	English Program	22	2.11	.671	1.031	53	.307
	Thai Program	33	1.95	.473			

From table 10, science achievement between students in the English and Thai programs t = 1.031 and Sig. (2-tailed) was .307 which was greater than .05. Therefore, it was indicated that there was no significant difference between science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The finding was disagreed to research hypothesis 4. The research hypothesis (4) was "there was a significant difference in science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand."

Summary of the hypothesis testing

Table 11: Summary of the Hypotheses Testing

No	Hypothesis	Statistical	Level of Significance	Result
1.	There is a significant relationship between student motivation for learning and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.	Pearson product-moment correlation coefficient	.019	Significant correlation
2.	There is a significant relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.	Pearson product-moment correlation coefficient	.000	Significant correlation
3.	There is a significant difference of student motivation for learning science between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.	t-test	.585	No significant difference
4.	There is a significant difference of science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.	t-test	.307	No significant difference

CHAPTER V

CONCLUSION, DISSCUSSION, AND RECOMMENDATIONS

This chapter presents a brief review of how this study was conducted, what instruments were used to gather the data, as well as the study's findings, conclusions, discussion, and its recommendations for the sampled school and for future study.

The study tried to determine the level of student motivation for learning science and student science achievement in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

Summary of the Research Findings

Research Objectives 1-2. The level of student motivation for learning science in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.
Means and Standard Deviations were calculated to establish the level of student motivation for learning science.

Mean and standard deviation for the level of student motivation for learning science in the English Program is 96.4091 (SD = 15.21) and the Thai Program is 98.84 (SD = 16.72). The level of student motivation for learning science in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand is "sometimes to often" motivated.

Research objectives 3-4. Correlational Analysis was utilized to explore the relationship between student motivation for learning science and student science achievement in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.

The resulting data indicated that r=.494 and Sig. was .019 which was smaller than .05. Therefore, there was a significant relationship between student motivation for learning science and science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

The resulting data indicated that r=.853 and Sig. was .000 which was smaller than .05. Therefore, there was a significant relationship between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Research objectives 5-6. The independent t-test was used to compare student motivation for learning science and science achievement between students in the English and Thai programs at Mathayomwatsing school in Bangkok, Thailand.

The result of the mean of student motivation for learning science of the English program is 96.40 and the mean of student motivation for learning science of the Thai program is 98.84. The mean difference value of these two classes is -2.43.

A 2-tailed significant level at .585, which is greater than 0.05 at 95% of significance the result from the t-test confirms that there is no statistically significant difference of student motivation for learning science between students in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.

The result of the mean of science achievement of students in the English program is 2.11 and the mean of science achievement of students in the Thai program is 1.95. The mean difference value of these two classes is .15.

A 2-tailed significant level at .307, which is greater than 0.05 at 95% of significance, the result from the t-test confirms that there is no statistically significant difference of science achievement between students in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand.

Conclusions

From the findings, the following conclusions are drawn:

1. In general, the level of student motivation for learning science in the English Program at Mathayomwatsing school in Bangkok, Thailand is "sometimes to often" motivated.

2. The level of student motivation for learning science in the Thai Program at Mathayomwatsing school in Bangkok, Thailand is "sometimes to often" motivated.

3. There is a significant relationship between student motivation for learning science and science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand.

4. There is a significant relationship between student motivation for learning science and science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

5. There is no statistically significant difference of science achievement between students in the English Program at Mathayomwatsing school in Bangkok, Thailand.

6. There is no statistically significant difference of science achievement between students in the Thai Program at Mathayomwatsing school in Bangkok, Thailand.

Discussion

This study examined the relationship between students' motivational level for learning science and student science achievement in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand by using the six components of motivation for science learning used in the questionnaire.

Results from this study showed that student motivation for learning science in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand are "sometimes to often" motivated. As the researcher mentioned in statement of the problem,

the academic motivation in students' science learning declines gradually as the students enter Mathayom levels. In order to improve the academic motivation in students' science learning, science teachers need to effectively motivate their students in 1) questioning students to engage them in the lesson, 2) incorporating hands-on activities to help learn the lesson concepts, 3) exhibiting enthusiasm in lesson presentations, 4) using a variety of activities, 5) believing that students can achieve, 6) building caring relationships in the classroom. The researcher believes that teachers who incorporate such strategies into their classrooms will likely increase motivation and enhance learning for all students. Additionally, the effectiveness of teachers' strategies should be examined related to students liking science, developing an interest in science, and pursuing scientific careers.

Another finding from this study was there is a significant relationship between student motivation for learning and science achievement in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. In their review of 20 studies dealing with student motivation, Kremer and Walberg (1981) concluded that there is a positive relationship between motivational variables and science learning. Findings from this study are agreement with the results of this review. There was a positive correlation (r=.494) between students' motivation for learning and student science achievement in the English Program at Mathayomwatsing school in Bangkok, Thailand. There was also a positive correlation (r=.853) between student motivation for learning science and student science achievement in the Thai Program at Mathayomwatsing school in Bangkok, Thailand. In their study of motivation and achievement, Uguroglu and Walberg (1979) concluded that the mean correlation between motivation and achievement from samples of studies in psychological and educational literature is .338. They also suggested that motivation and achievement were more highly correlated in later grades and motivation accounts for 11.4 percent of the variance in achievement.

Another finding in this study was there is a significant difference in student motivation for learning science and student achievement between students in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. These different findings of the current study may derive from differences of learning environment. There are a lot of differences in the English and Thai Programs at Mathayomwatsing school in Bangkok, Thailand. English Program students, while being quite independent learners, also like to join group work, to discuss in class and engage in project work with others. Moreover, the learning environment might be the reason of the difference on these different findings and the environment of learning might have affected student motivation for learning science and science achievement.

Recommendations for Mathayomwatsing school

The school should support and provide the suitable teaching materials and multimedia facilities for teachers, as well as help teachers to improve their skill and knowledge to apply these resources. In order to improve all students' motivation to learn science and interest in science related careers, the school should employ women and men who are in science-related careers in the community to take part in school science activities and perform as science role models. By doing so, these women and men should contribute their educational histories, career responsibilities, and professional and personal challenges, focusing on science experiences that will improve students' intrinsic motivation, self-efficacy, and self-determination.

In addition, student's achievement in science will be highly enhanced if the government, school administrators and other stakeholders in education industry could improve on the learning environment of students and motivate teachers. Moreover, Bax (2010) recommended the improvement of the systematic development and training in teacher education so that teachers are knowledgeable about their roles in the classroom and can

practice their skills in employing effective classroom techniques and approaches. This is the researcher's eighth year teaching in Thailand. It has been observed that teachers do not receive proper training from the Ministry of Education or their school. In order to encourage students to improve their motivation and raise their achievement, teachers need to take classes, attend conferences or enroll in courses to meet professional development goals. This study serves as a reminder for the Ministry of Education of the importance in conducting timely and effective seminars for foreign teachers periodically.

Recommendations for foreign and Thai teachers

Nowadays, the traditional lecture method of direct instruction is being replaced by multimedia approaches and effective teaching and learning strategies to learning. Powerpoint, video, animation and the internet make for diverse approaches to teaching and learning. Therefore, teachers should employ facilities that can conclude the full strategies of learning styles and strategies.

Recommendations for future research

Future research should be conducted in the different parts of Bangkok and provinces of Thailand. Also, the research should focus not only on students' motivation for learning science and but also for students' motivation for learning other subjects such as Mathematics and English.

The duration of this study was during December, 2013 to March, 2014. In order to avoid a restricted sample (e.g., majority secondary school students), future studies should collect data throughout the year. Impacts of other affective and cognitive variables on students' science achievement can be investigated in future studies.

Although the students in the study expected to perform well in their science classes, they did not see the value in pursuing science after high school. Such a situation does not improve the current shortage of scientists in Thailand.

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APPENDIX A

SCIENCE MOTIVATION QUESTIONNAIRE

The Science Motivation Questionnaire (SMQ) assesses six components of motivation: intrinsically motivated science learning, extrinsically motivated science learning, relevance f learning science to personal goals, responsibility (self-determination) for learning science, confidence (self-efficacy) in learning science, and anxiety about science assessment (Glynn & Koballa, 2006).

1. Gender: ☐ **Male** ☐ **Female**

In order to better understand what you think and how you feel about your science courses, please respond to each of the following statements from the perspective of "When I am in a science course…"

Statements	Never "1"	Rarely "2"	Sometimes "3"	Often "4"	Always "5"
1. I enjoy learning the science.					
2. The science I learn relates to my personal goals.					
3. I like to do better than the other students on the science tests.					
4. I am nervous about how I will do on the science tests.					

Statements	Never "1"	Rarely "2"	Sometimes "3"	Often "4"	Always "5"
5. If I am having trouble learning the science, I try to figure out why.					
6. I become anxious when it is time to take a science test.					
7. Earning a good science grade is important to me.					
8. I put enough effort into learning the science.					
9. I use strategies that ensure I learn the science well.					
10. I think about how learning the science can help me get a good job.					
11. I think about how the science I learn will be helpful to me.					
12. I expect to do as well as or better than other students in the science course.					

Statements	Never "1"	Rarely "2"	Sometimes "3"	Often "4"	Always "5"
13. I worry about failing the science tests.					
14. I am concerned that the other students are better in science.					
15. I think about how my science grade will affect my overall grade point average.					
16. The science I learn is more important to me than the grade I receive.					
17. I think about how learning the science can help my career.					
18. I hate taking the science tests.					
19. I think about how I will use the science I learn.					
20. It is my fault, if I do not understand the science.					

Statements	Never "1"	Rarely "2"	Sometimes "3"	Often "4"	Always "5"
21. I am confident I will do well on the science labs and projects.					
22. I find learning the science interesting.					
23. The science I learn is relevant to my life.					
24. I believe I can master the knowledge and skills in the science course.					
25. The science I learn has practical value for me.					
26. I prepare well for the science tests and labs.					
27. I like science that challenges me.					
28. I am confident I will do well on the science tests.					
29. I believe I can earn a grade of "A" in the science course.					

Statements	Never "1"	Rarely "2"	Sometimes "3"	Often "4"	Always "5"
30. Understanding the science gives me a sense of accomplishment.					

แบบสอบถามเกี่ยวกับแรงจูงใจในการเรียนวิทยาศาสตร์

แบบสอบถามเกี่ยวกับแรงจูงใจในการเรียนวิทยาศาสตร์ (SMQ) ประเมินจาก 6 องค์ประกอบของแรงจูงใจ อันได้แก่ การเรียนวิทยาศาสตร์ที่มีแรงจูงใจมาจากตนเอง การเรียนวิทยาศาสตร์ที่มีแรงจูงใจมาจากภายนอก ความเกี่ยวพันของการเรียนวิทยาศาสตร์กับเป้าหมายส่วนบุคคล ความรับผิดชอบ(การตัดสินใจด้วยตัวเอง)ต่อการเรียนวิทยาศาสตร์ ความมั่นใจ(การรับรู้ความสามารถของตนเอง)ในการเรียนวิทยาศาสตร์ และความวิตกกังวลต่อการประเมินในวิชาวิทยาศาสตร์ (กลีนน์ และ โคบอลลา, 2006)

เพศ ☐ ชาย ☐ หญิง

เพื่อให้เข้าใจในสิ่งที่คุณคิดและสิ่งที่คุณรู้สึกต่อการเรียนวิทยาศาสตร์ได้มากขึ้น กรุณาทำเครื่องหมาย ต่อความคิดเห็นในแต่ละข้อ โดยใช้มุมมองที่ว่า "เมื่อฉันเรียนวิทยาศาสตร์..."

ความคิดเห็น	ไม่เคย "1"	ไม่ค่อย "2"	บางครั้ง "3"	บ่อยครั้ง "4"	เสมอ "5"
1. ฉันสนุกกับการเรียนวิทยาศาสตร์					
2. วิชาวิทยาศาสตร์ที่ฉันเรียนสัมพันธ์กับเป้าหมายส่วนตัวของฉัน					
3. ฉันชอบที่จะทำคะแนนให้ได้ดีกว่านักเรียนคนอื่นๆ ในการทดสอบวิชาวิทยาศาสตร์					
4. ฉันรู้สึกกังวลกับการสอบวิชาวิทยาศาสตร์					
5. ถ้าฉันมีปัญหาในการเรียนวิทยาศาสตร์ ฉันจะพยายามหาสาเหตุว่ามันเกิดจากอะไร					
6. ฉันรู้สึกกังวลเมื่อถึงเวลาที่ต้องทดสอบวิชาวิทยาศาสตร์					

ความคิดเห็น	ไม่เคย "1"	ไม่ค่อย "2"	บางครั้ง "3"	บ่อยครั้ง "4"	เสมอ "5"
7. การทำคะแนนวิชาวิทยาศาสตร์ให้ดีเป็นสิ่งสำคัญสำหรับฉัน					
8. ฉันใช้ความพยายามมากพอในการเรียนวิชาวิทยาศาสตร์					
9. ฉันจะใช้วิธีต่างๆ ที่จะทำให้แน่ใจว่าฉันจะเรียนวิชาวิทยาศาสตร์ได้ดี					
10.ฉันคิดเกี่ยวกับการเรียนวิทยาศาสตร์ว่าจะสามารถช่วยให้ฉันได้งานที่ดีได้อย่างไร					
11.ฉันคิดเกี่ยวกับวิชาวิทยาศาสตร์ที่เรียนว่าจะเป็นประโยชน์กับฉันในอนาคตอย่างไร					
12.ฉันคาดหวังที่จะเรียนได้ดีเท่าๆ กับหรือดีกว่านักเรียนคนอื่นๆ ในวิชาวิทยาศาสตร์					
13.ฉันกังวลว่าจะสอบตกในการสอบวิชาวิทยาศาสตร์					
14.ฉันกังวลว่านักเรียนคนอื่นๆ จะทำได้ดีกว่าในวิชาวิทยาศาสตร์					
15. ฉันคิดเกี่ยวกับเกรดวิชาวิทยาศาสตร์ของฉันว่าจะมีผลต่อเกรดเฉลี่ยรวมอย่างไร					
16. วิทยาศาสตร์ที่ฉันได้เรียนรู้มีความสำคัญมากกว่าคะแนนที่ได้รับ					
17. ฉันคิดเกี่ยวกับการเรียนวิชาวิทยาศาสตร์ว่าจะสามารถช่วยในการประกอบอาชีพของฉันได้อย่างไร					
18. ฉันไม่ชอบการสอบวิชาวิทยาศาสตร์					
19. ฉันคิดเกี่ยวกับว่าฉันจะนำความรู้ทางวิทยาศาสตร์ที่ฉันเรียนไปประยุกต์ใช้ได้อย่างไร					

ความคิดเห็น	ไม่เคย "1"	ไม่ค่อย "2"	บางครั้ง "3"	บ่อยครั้ง "4"	เสมอ "5"
20. มันเป็นความผิดของฉัน ถ้าฉันไม่เข้าใจวิชาวิทยาศาสตร์					
21. ฉันมั่นใจว่าฉันจะทำงานทดลองและโครงงานวิทยาศาสตร์ได้ดี					
22. ฉันพบว่าการเรียนวิทยาศาสตร์เป็นสิ่งที่น่าสนใจ					
23. วิชาวิทยาศาสตร์ที่ฉันเรียนมีความเกี่ยวข้องกับชีวิตของฉัน					
24. ฉันเชื่อว่าฉันสามารถเพิ่มพูนความรู้และทักษะในการเรียนวิทยาศาสตร์ให้มากยิ่งขึ้นได้					
25. วิชาวิทยาศาสตร์ที่ฉันได้เรียนมีประโยชน์ในทางปฏิบัติสำหรับฉัน					
26. ฉันเตรียมตัวอย่างดีในการสอบและการทดลองวิทยาศาสตร์					
27. ฉันชอบวิชาวิทยาศาสตร์เพราะมันท้าทาย					
28. ฉันมั่นใจว่าฉันจะทำได้ดีในการสอบวิชาวิทยาศาสตร์					
29. ฉันเชื่อว่าฉันจะได้เกรด "4" ในวิชาวิทยาศาสตร์					
30. ความเข้าใจในวิชาวิทยาศาสตร์ทำให้ฉันรู้สึกว่าฉันจะประสบความสำเร็จ					

APPENDIX B

Validity for Translation

Name: Sangob Laksana Date: 10 June 2014

Academic Position: _____

Dear Educator,

I would like you to evaluate the following questionnaire for translation validity as part of my research for a Master's degree in Education (Curriculum and Instruction) at Assumption University, Bangkok, Thailand. My thesis is titled "A CORRELATIONAL-COMPARATIVE STUDY OF MATHAYOM THREE STUDENTS' MOTIVATION FOR LEARNING SCIENCE AND THEIR SCIENCE ACHIEVEMENT IN THE ENGLISH AND THAI PROGRAMS AT MATHAYOMWATSING SCHOOL IN BANGKOK, THAILAND"

1. Please write any other comments.

Correct translation

S. Laksana

APPENDIX C

O-Net Grades of Participants

รหัสโรงเรียน 1010032040

สังกัด สำนักงานคณะกรรมการการศึกษาขั้นพื้นฐา จังหวัด กรุงเ

ที่ตั้งโรงเรียน ในเมือง

ลำดับ	เลขที่นั่งสอบ	เลขประจำตัวประชาชน	91	ระดับผลการทดสอบ O - NET จำแนกตามวิชา						ร้อยละ
				95	92	96	97	98	93	ผลก
527	14301038	1659901916774	38.80	2.00	1.50	2.50	2.00	2.00	1.50	0.3
81	14300591	1101500969017	47.70	2.50	2.50	3.50	2.50	3.00	2.00	0.5
422	14300933	1110200177106	32.40	1.50	2.00	2.00	2.00	2.00	1.50	0.3
306	14300817	1102003007773	49.30	2.00	2.50	2.50	3.00	2.50	1.50	0.4
311	14300822	1102003022055	32.40	1.50	2.00	3.00	1.50	2.50	1.50	0.3
328	14300839	1102170013889	40.40	2.00	2.00	3.00	2.00	2.50	1.50	0.4
380	14300891	1103100604242	42.90	1.00	2.00	3.00	2.00	2.00	1.50	0.3
52	14300562	1100702915006	57.50	2.00	2.50	3.00	2.00	3.00	1.50	0.4
511	14301022	1529900962358	48.40	2.00	2.00	3.00	2.00	2.50	1.50	0.4
494	14301005	1451700018684	53.40	2.50	2.50	2.50	2.50	2.00	1.50	0.4
179	14300690	1101800984101	50.90	2.00	2.00	2.50	2.50	2.50	1.50	0.4
63	14300573	1100801274866	50.90	2.00	2.50	2.50	2.50	3.00	2.50	0.4
493	14301004	1450900170128	48.60	2.00	2.00	2.50	2.00	2.50	2.00	0.4
222	14300733	1101801020881	57.30	1.50	1.50	2.50	2.00	2.50	2.00	0.4
260	14300771	1102002940816	47.90	1.00	1.50	2.00	1.50	2.00	2.50	0.3
32	14300542	1100702781263	55.00	2.50	2.00	2.50	2.50	2.00	2.50	0.4
109	14300620	1101500998050	50.90	2.50	3.00	2.00	3.50	2.50	3.00	0.5
393	14300904	1103702597031	46.10	2.00	2.50	3.00	3.00	3.00	2.00	0.4
219	14300730	1101801019590	38.10	1.50	2.50	3.00	2.00	2.50	2.00	0.4
44	14300554	1100702828235	42.90	2.50	2.50	3.00	3.00	3.00	2.00	0.5
555	14301066	1759900333588	57.30	3.00	3.00	3.00	2.00	3.00	2.00	0.5
41	14300551	1100702821711	50.00	2.50	2.00	2.50	2.00	3.00	1.50	0.4
326	14300837	1102170013587	31.50	1.50	1.50	2.00	2.00	2.00	1.50	0.3

สทศ NIETS
สถาบันทดสอบทางการศึกษาแห่งชาติ (องค์การมหาชน)
National Institute of Educational Testing Service (Public Organization)

รายงานผลการทดสอบทางการศึกษาระดับชาติขั้นพื้นฐาน (O-NET)

ชั้นมัธยมศึกษาปีที่ 3 ปีการศึกษา 2556

ฉบับที่ 1 - ผลการทดสอบ O-NET รายบุคคล

ชื่อโรงเรียน มัธยมวัดสิงห์

กทมมหานคร **ขนาดโรงเรียน ใหญ่พิเศษ**

ผลคะแนนการทดสอบ O-NET จำแนกตามวิชา								
94	95	92	96	97	98	93	91	94
29.60	50.00	34.00	60.00	42.50	42.00	32.00	2.00	2.00
29.60	54.00	54.00	80.00	50.00	56.00	38.00	2.50	2.00
25.60	32.00	46.00	55.00	35.00	34.00	30.00	2.00	1.50
16.00	46.00	54.00	65.00	60.00	44.00	30.00	2.50	1.50
28.80	30.00	44.00	67.50	32.50	46.00	32.00	2.00	2.00
60.00	46.00	48.00	67.50	42.50	46.00	28.00	2.00	3.00
32.00	26.00	48.00	67.50	35.00	40.00	28.00	2.50	2.00
43.20	44.00	52.00	67.50	37.50	58.00	32.00	3.00	2.50
36.00	50.00	48.00	70.00	45.00	54.00	28.00	2.50	2.00
22.40	52.00	52.00	65.00	55.00	40.00	30.00	3.00	1.50
20.00	48.00	40.00	57.50	52.50	50.00	22.00	2.50	1.50
38.40	50.00	58.00	65.00	57.50	58.00	58.00	2.50	2.00
38.40	50.00	42.00	60.00	40.00	46.00	40.00	2.50	2.00
22.40	30.00	38.00	62.50	42.50	46.00	44.00	3.00	1.50
29.60	26.00	30.00	47.50	32.50	42.00	48.00	2.50	2.00
52.00	62.00	40.00	62.50	55.00	42.00	50.00	3.00	2.50
76.80	62.00	62.00	47.50	72.50	46.00	60.00	2.50	3.50
36.00	50.00	54.00	72.50	67.50	64.00	40.00	2.50	2.00
23.20	36.00	52.00	67.50	45.00	46.00	42.00	2.00	1.50
38.40	54.00	52.00	70.00	65.00	56.00	38.00	2.50	2.00
43.20	68.00	66.00	70.00	45.00	62.00	38.00	3.00	2.50
36.00	56.00	42.00	57.50	40.00	56.00	28.00	2.50	2.00
29.60	30.00	34.00	52.50	37.50	34.00	28.00	1.50	2.00

403	14300914	1103702827461	37.90	16.80	40.00	34.00	60.00	42.50	36.00	26.00
12	14300522	1100400965337	66.40	25.60	46.00	64.00	72.50	47.50	42.00	40.00
399	14300910	1103702746703	39.50	23.20	26.00	38.00	60.00	45.00	44.00	36.00
51	14300561	1100702907411	46.80	19.20	30.00	38.00	62.50	45.00	48.00	26.00
418	14300929	1104300105976	53.40	28.80	42.00	26.00	75.00	50.00	46.00	44.00
46	14300556	1100702840588	55.70	20.80	60.00	50.00	65.00	47.50	58.00	20.00
335	14300846	1102200163549	48.60	26.40	44.00	48.00	62.50	45.00	62.00	30.00
567	14301078	1390500045602	47.70	28.80	46.00	36.00	60.00	52.50	48.00	22.00
70	14300580	1100801288514	57.30	39.20	48.00	36.00	70.00	50.00	52.00	34.00
415	14300926	1104200078152	48.40	22.40	50.00	48.00	60.00	50.00	58.00	26.00
449	14300960	1319900645800	64.60	25.60	50.00	60.00	67.50	67.50	68.00	46.00
405	14300916	1103702866521	63.90	42.40	66.00	44.00	70.00	55.00	56.00	28.00

2.00	1.50	2.00	1.50	2.50	2.00	2.00	1.50	0.36
3.50	1.50	2.00	3.00	3.00	2.50	2.00	2.00	0.49
2.00	1.50	1.00	1.50	2.50	2.00	2.50	2.00	0.36
2.50	1.50	1.50	1.50	2.50	2.00	2.50	1.50	0.37
3.00	2.00	2.00	1.00	3.00	2.50	2.50	2.00	0.43
3.00	1.50	2.50	2.50	2.50	2.50	3.00	1.50	0.47
2.50	1.50	2.00	2.00	2.50	2.00	3.00	1.50	0.41
2.50	2.00	2.00	1.50	2.50	2.50	2.50	1.50	0.41
3.00	2.00	2.00	1.50	3.00	2.50	2.50	2.00	0.45
2.50	1.50	2.00	2.00	2.50	2.50	3.00	1.50	0.42
3.50	1.50	2.00	3.00	3.00	3.00	3.50	2.00	0.53
3.50	2.00	3.00	2.00	3.00	2.50	3.00	1.50	0.50