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Recognition of Unmotivated Students in Science Learning in a Junior High School in Japan

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日本の中学校理科における学習意欲の低い生徒の認識に関する研究

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The purpose of the study is to investigate how unmotivated students in science in a junior high school recognize their science lessons. Students' motivation to learn science was measured by using a questionnaire consisting of 35 items with a five-point Likert-Scale based on six factors: self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation. In this study, 177 junior high school students participated and 20.3%, 13.0%, 5.7%, 6.8%, 13.0%, and 27.7% of the students were not motivated to learn science by self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation, respectively. Students are least motivated by learning environment stimulation. In addition, unmotivated students' recognition of science learning was investigated by using another questionnaire. Most of the unmotivated students want to conduct fun activities and do more experiments in science learning.

本研究の目的は，理科学習意欲の低い生徒がどのように理科授業を認識しているかを明らかにすることである。理科の学習意欲を測定するための質問紙が開発され，177名の中学生を対象に調査が行われた。質問紙は，「自己効力感」，「能動的学習方略」，「理科学習の価値」，「成績目標」，「達成目標」，「学習環境」という６つの観点が含まれており，35の質問から構成されている。調査の結果，上記の観点において消極的に回答した生徒の割合は，それぞれ20.3%，13.0%，5.7%，6.8%，13.0%，27.7%であり，生徒の認識では「学習環境」による理科学習意欲の低下が顕著であることが明らかになった。理科の学習意欲が低いとされた生徒を対象として，理科学習に対する認識について追加調査を行ったところ，学習意欲の低い生徒の多くは，理科の学習で楽しい活動や，より多くの実験をしたいと思っていることが明らかになった。

キーワード：motivation to learn science（理科学習の動機づけ），
unmotivated students（学習意欲の低い生徒），recognition（認識）

1. INTRODUCTION

Japan has been accepted as a strong nation for its systematic educational structure and high technological advancement. Since Japan's education system is regarded as one of the best in the world, its teaching methods, technology in the classroom, and techniques to promote active learning and provide a positive learning environment are exemplary to be studied. Many international assessments such as the Trends in International Mathematics and Science Study（TIMSS）and the Program for International Student Assessment（PISA）have typically shown that Japanese students are performing better in science-related subjects than students from many other countries. In the TIMSS 2019, for example, Japan's 4th and 8th-grade students scored above the international average in both mathematics and science, expressing the country's high educational standards（Mullis, Martin, Foy, Kelly & Fishbein, 2020）.

In Japan, Science lessons are often accompanied by practical and hands-on activities to complement students' theoretical learning. Laboratory work, an integral component of science education, allows students to engage in real-world problems and scientific concepts. Students are also familiar and proficient in laboratory activities; experiments, observation, data collection, analysis, and critical thinking. All these activities aim to enhance students' conceptual understanding of scientific laws and principles, and their ability to apply

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theoretical knowledge in their everyday life. Apparently, students' collaboration, problem-solving, and communication skills are also cultivated through laboratory activities.

1.1 Background of the study

There are a number of ways to describe and define motivation. The word "motivation" itself comes from a Latin word, moreover, meaning to set in motion. Broadly defined, motivation is a person's internal instigation and direction that influences his behavior (Churchill, Ferguson, Goodinho, Johnson, Keddie, Letts, Mackay, McGill, Moss, Nagel, Nicholson, & Vick, 2011). Motivation has also been viewed by different educators from different perspectives. Behaviorists see motivation as derived from past experience and influenced by rewards and punishment. In contrast to behaviorists, social cognitivists view children are innately active learners, and therefore rewards are not necessary to achieve goal-directed behavior and motivation to learn something. Humanists perceive motivation in terms of a hierarchy of needs, the components of which act as motives whereby particular types of human endeavor (i.e., learning) are contingent on meeting those needs. Based on the philosophies teachers accept, their definition of motivation and their methods of making students motivated to learn will not be the same. One common duty of every teacher is to investigate students' motivation and find better strategies to motivate the students.

1.2 Purpose of the study

The purpose of the study is to investigate how unmotivated students in science in a junior high school recognize science learning.

1.3 Rationale and significance of the study

Developing countries, for example, Myanmar, prepare laboratory work in science-related subjects by designing new curricula to motivate students in science learning. Many laboratory experiments and hands-on activities can obviously be seen in new science textbooks. Here, there is one question to be answered; Are all of the students motivated to learn science by mere participation in laboratory activities?

Although almost all teachers are always trying to improve the achievement of their students in their respective subjects, students' motivation to learn is different from each other. Therefore, schools and teachers need to investigate continuously their students' motivation to learn in the classroom and be aware of unmotivated students' recognition of science learning.

As Japan is a leading country in the world's education system, science teaching, instructional practices, measuring students' motivation to learn science, and investigating recognition of unmotivated students in science are worthy enough to be done by a teacher from a third-world country, Myanmar.

2. LITERATURE REVIEW

Motivation is a kind of stimulus that arouses and sustains an individual's interest in the direction of achieving a certain goal, including a change in attitude, interest, and behavior. Motivation is an internal power that arouses, directs, and controls human interest and behavior (Woolfolk, 1990 cited in Sang, 2003).

According to Tuan, Chin & Shieh (2005), motivation is a set of factors that is comprised of self-efficacy, active learning strategies, science learning values, goals, and learning environment stimulation. *Self-efficacy* is an expectation that people are capable of performing a task or succeeding in an activity that influences our motivation for the task or activity. *Active learning strategies* include a wide range of activities that share the common element of involving students in doing things and thinking about the things they are doing (Bonwell & Eison, 1991 cited in Eison, 2010). In science class, there are many unique features highlighting the *values of science learning*, such as problem-solving, science inquiry, thinking, and the relevance of science knowledge in students' daily lives. Students have the cognitive ability to think more abstractly and connect what they are learning now with goals and future possibilities so utility value becomes important to these students (Eccles & Wigfield, 1985 cited in Woolfolk, 1998). A *goal* is something an individual strives to accomplish. Goals direct people's attention to the task at hand, mobilize their effort, increase persistence, and promote the development of new strategies even when old strategies fall short. The level of cognitive engagement was affected by two interrelated factors: the control that the teacher had over almost all activities, and student beliefs about learning in this context (Hanrahan, 1998). The *stimulation of the learning environment* is an important factor in stimulating students to learn. Intrinsic motivation is essential to do something or to learn a particular subject resulting in a willingness to spend extra time and energy seemingly without requiring much effort. However, common factors such as lack of choice, lack of the opportunity to explore one's own ideas, and lack of support for autonomy may disturb intrinsic motivation.

On the other hand, extrinsic motivation, associated with factors such as good student-teacher relationships, and goals such as receiving a reward and future employment, leads to trying harder, and more commitment to paying attention and making tasks completed. However, such motivation is more easily prey to sensory and mental distractions and can also be weakened

by perceptions that goals such as teacher affirmation may seem somewhat unattainable (Hanrahan, 1998). It can be said that a stimulated learning environment is also an important factor in motivating students to learn science. All these factors; self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation are going to be worthy enough to measure students' motivation.

3. RESEARCH METHOD

In this study, instructional practices, instructional materials, and learning environment in science teaching were observed for nine months in a junior high school in Chiba City. Students' motivation to learn science was measured by a questionnaire that consists of 35 items with a five-point Likert-Scale, based on self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation (Tuan et al., 2005).

The data were analyzed by descriptive statistics (mean, standard deviation, and percentage). Instructional practices, instructional materials, and learning environment stimulation are discussed as follows.

3.1 Instructional practices in the science classroom

After World War II, "the right to receive an equal education" was one of the fundamental rights of the people (Article 26), and the Basic Act on Education prescribed the principle of equal educational opportunity (Article 3) were prescribed by the new constitution. A school system, composed of kindergarten (1-3 years in duration), elementary school (6 years), lower secondary school (3 years), upper secondary school (3 years), university (4-6 years), and schools for special education (kindergarten, primary, lower secondary and upper secondary divisions), was adopted to guarantee equal educational opportunities (Kitamura, Omomo & Katsuno, 2019).

According to the study of instructional practices, instructional materials, and learning environment conducted in the junior high school in Chiba City for nine months, some common techniques such as concept lessons, inquiry-based lessons, cooperative learning activities, and problem-based learning and discussion were used in the classroom. These educational reforms and practices in Japan are worthy enough to be studied by a teacher from Myanmar that is also starting reforms in the education field.

3.2 Instructional materials and learning environment

Based on the study, the learning environment at the school was embodied with laboratories and experiments. Many lessons are held in science laboratories and students have to do experiments in all lessons. Teachers usually demonstrate procedures for some difficult lessons such as the reflection of light on a screen by a convex lens and the preparation of oxygen in the laboratory. Students are usually grouped into four or five to conduct the experiment, take down notes, and discuss with the classroom after the experiment. Students usually take part actively in the experiments and each takes his or her own responsibility for the whole experiment.

Students get chances to express their ideas in the classroom and most of the students are smart and know what to do and how to maintain a good mood in the classroom. Students can control their routines and duties in laboratories and show positive behavior to their peers and teachers while manipulating their experiments. Unfortunately, a few students showed some inappropriate behaviors such as sleeping on the desk while the teacher was teaching, combing hair while the teacher was telling some important points of a lesson, and talking to friends without any concern while the teacher was explaining an important concept. All these misbehaviors led to the investigation of the students' motivation to learn science at the junior high school.

3.3 Questionnaire for students' motivation to learn science

The questionnaire for students' motivation to learn science, consisting of 35 items with a five-point Likert-Scale, was used to measure students' motivation to learn science. Based on a questionnaire developed by Tuan et al. (2005) to measure students' motivation to learn science, the questionnaire was developed in the Japanese language. Factors such as self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation, are used to measure students' motivation to learn science.

3.4 Sample size

In this study, (177) students were participated (See Table 1).

Table 1. Sample Size of the Study

Grade	Male	Female	Total
1	33	35	68
2	17	10	27
3	45	37	82
Total	95	82	177

4. FINDINGS AND INTERPRETATIONS

Mean scores and standard deviation of (177) students in self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation are 3.53 and 0.73, 3.70 and 0.71, 3.97 and 0.71, 3.50 and 0.55, 3.66 and 0.86, and 3.27 and 0.92 respectively (see Table 2).

In this study, Students who possess mean scores of under 3 were identified as unmotivated students in each item. The number and percentage of unmotivated students in self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation are 36 (20.3%), 23 (13.0%), 10 (5.7%), 12 (6.8%), 23 (13.0%) and 49 (27.7%) respectively (see Table 3). The number of unmotivated students is highest in learning environment stimulation and lowest in science learning values. Particularly, the learning environment stimulation appears to have a considerable impact, with a relatively higher number of unmotivated students than other factors. In contrast, science learning values have a comparatively lower impact on student motivation, with a low number of unmotivated students compared to other factors.

Table 2. Descriptive Statistics of the Factors of Motivation

(N = 177)

Factors	Mean	SD
Self-efficacy	3.53	0.73
Active learning strategies	3.70	0.71
Science learning values	3.97	0.71
Performance goals	3.50	0.55
Achievement goals	3.66	0.86
Learning environment stimulation	3.27	0.92

Table 3. Number and Percentage of Unmotivated Students

Factors	Number of unmotivated students
Self-efficacy	36 (20.3%)
Active learning strategies	23 (13.0%)
Science learning values	10 (5.7%)
Performance goals	12 (6.8%)
Achievement goals	23 (13.0%)
Learning environment stimulation	49 (27.7%)

4.1 Follow-up questionnaire

The follow-up questionnaire to examine these unmotivated students' recognition of science lessons was administered based on the data analysis of students' motivation to learn science. The questionnaire consists of four questions: Can you tell me your feelings and thoughts while you are learning science in the classroom? Why are you feeling like that? In what kind of classroom do you want to learn science? and What do you expect from your science teacher? Some of the unmotivated students' recognition of science learning is as follows.

Student A

1. I am very interested in science lessons and I think science is fun.
2. I like learning science and especially doing experiments. While I am doing experiments, I feel I am proofing something true in my real life. Whether the experiment is failed or succeeded, all these experiences are nutrients for my growth.
3. I want to do more experiments and enjoy the experiments.
4. I want to do more experiments.

Student B

1. I enjoy what I am doing in the science lessons. I can study science easily while I am doing experiments. In addition, the science teacher gave me a chance to write my feelings about science learning. Therefore, I can study and concentrate on my lessons. Thank you, Teacher A and Teacher B.
2. My teacher is always thinking about how to make the lessons more enjoyable and easier.
3. I want to study in a brighter room. I want to discuss and talk more while I am doing experiments and studying in the classroom.
4. I want to go field study more. For example, studying celestial bodies such as the Moon, the Sun, planets or stars at an astronomy gallery. I want to get more chances to use computers in the classroom.

Student C

1. I think science is difficult.
2. Science is too difficult to learn.
3. I want my teacher not to get angry with me and I want to study science more joyfully.
4. I want my teacher to explain lessons in an easier and simpler way.

Student D

1. I feel science is difficult, and sometimes, it is boring.
2. I do not like science.
3. I want to be more joyful in the classroom.
4. Nothing special.

Student E

1. I feel science is difficult and I want my teacher to explain it in an easier way.
2. I do not like science both in elementary and junior high school.
3. I want to receive an easier explanation from the teacher and I want to be free and joyful in the class because the class is very stressful for me.
4. I want my teacher to make more fun in the classroom and make the students relaxed.

Regarding "*Q-1. Can you tell me your feelings and thoughts while you are learning science in the classroom.?*", the statements, "*I am very interested in science lessons and I think science is fun*" (Student A-1), and "*I enjoy what I am doing in the science lessons. I can study science easily while I am doing experiments*" (Student B-1), are the students' attitude towards science experiments. Both Student A and Student B reveal interest and enjoyment in science lessons, particularly during experiments. They find value in science experiments and appreciate the effort put in by their teacher.

Regarding "*Q-2 Why are you feeling like that.?*", the statement, "*My teacher is always thinking about how to make the lessons more enjoyable and easier*" (Student B-2), shows the student's positive attitude towards the teacher. Student B appreciates the teacher's efforts to make lessons clear and easy, highlighting the positive impact of teacher engagement on the students.

Regarding "*Q-3 In what kind of classroom do you want to learn science.?",* the statements, "*I want to do more experiments and enjoy the experiments*" (Student A-3), and "*I want to receive an easier explanation from the teacher*" (Student E-3), are the students' desire for more experiments and clearer explanation of the teacher about science lessons. Students express a desire for more experiments and interactive learning. Student B also desires a brighter classroom environment in the statement "*I want to study in a brighter room*" (Student B-3).

Regarding "*Q-4. What do you expect from your science teacher.?",* the statement, *"I want my teacher to make more fun in the classroom and make the students relaxed*" (Student E-4), is the student's desire for a change for something different from the current situation. "*Make more fun in the classroom*": This part of the statement shows the student's desire for a more engaging and enjoyable experience in the classroom. It could be assumed that the current situation was a lack of engagement and enjoyment for the student. "*Make the students relaxed*": The statement also mentions the student's desire for a relaxing environment in the classroom. Reducing stress and tension among the students might positively impact their science learning.

5. DISCUSSION AND SUGGESTION

All of the systems of the school are worthy enough to be studied by a teacher from Myanmar and these experiences are invaluable for a trainee from a third-world country. The things learned from the nine-month field study are supportive of a country in which educational reforms are beginning. In a classroom, students differ in their family background, interests, intelligence, motivation, and many others. Among these factors, students' motivation to learn science was investigated. In the study, it was observed that 20.3%, 13.0%, 5.7%, 6.8%, 13.0%, and 27.7% of students were not motivated to learn science in self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation respectively.

The result of the descriptive survey is wondering as the number of unmotivated students is comparatively less than the number of motivated students in the junior high school. However, the most important duty of the school is to make all of the students actively participate in every single activity and motivate them to learn everything as much as their peers do.

Science is a system of knowing the universe through data collected by observation and controlled experimentation (Rao, 2010). Because of the nature of science, it is not enough to learn scientific facts, concepts, laws, and theories by heart. It is difficult to imagine a highly and productively motivated student whose thinking is characterized by doubt, fragility, pessimism, or a lack of goals. Constructive thinking and productive motivation are two phenomena that go hand in hand (Donnell, Dobozy, Bartlett, Bryer, Reeve & Smith, 2012).

One of the goals of teaching is to help students learn without the help of teachers. It is necessary to motivate students to learn or participate in learning activities and other school activities so that they will do these activities eagerly. It is necessary to create a learning environment that arouses students' thinking and actions. A learning community is a setting in which individuals within the community have mutual goals, have common relationships, and show concern for one another (Arends, 2009). It is necessary to introduce fun activities and interactive teaching strategies to enhance students' motivation to participate, ask questions, and share their ideas. A relaxed learning environment can help students reduce stress and anxiety, creating a space where students and teachers are in healthy communication without fear of judgment. A combination of engagement and relaxation can lead to improved student outcomes.

If the teacher gives students more chances to participate in the learning process, they will be more moti-

vated and interested in learning. If teachers give students more opportunities to discuss their own ideas and opinions in the classroom, they will not feel stressed in the classroom. Teachers can make good use of interesting events to stimulate curiosity in learners (Driscoll, 2005). Maintaining students' attention is more difficult than gaining it as students' attention may be lost within twenty or thirty minutes. Maintaining attention on a perceptual level can also be achieved by varying the instructional approaches used in a class period or training session (Keller, 1983, 1987 cited in Driscoll, 2005). Despite using teacher-centered or learner-centered teaching methods, the most important thing is making students motivated to learn. When students are actively engaged in activities and feeling relaxed, they can absorb everything that they learn and actively participate in the learning process.

6. CONCLUSION

Myanmar is making educational reforms at the present time. The study can provide precious experience of learning instructional practices, instructional materials, and the learning environment of Japan, a country that can provide one of the best educational systems in the world. During the nine-month field study at the junior high school in Japan, many good systems and well-prepared practices could be learned. These experiences are invaluable for a science teacher from Myanmar, a third-world country that is making many reforms.

On the other hand, some of the students' behaviors in the science classroom were inappropriate and it created curiosity to investigate students' motivation to learn science in the school. According to the results, 20.3%, 13.0%, 5.7%, 6.8%, 13.0%, and 27.7% of students were not motivated to learn science by self-efficacy, active learning strategies, science learning values, performance goals, achievement goals, and learning environment stimulation respectively for certain reasons. They cannot learn science because science concepts are very difficult for them. Some cannot learn not only science but also other subjects because they are not good at learning. No matter what they have many reasons, one important duty of teachers is to make students able to learn effectively. Teachers should always investigate how much their students are interested and motivated to learn, what are their feelings and thoughts, and what they expect from the teachers and make adjustments and changes to make the students motivated to learn.

Motivation is an important factor in determining a student's achievement and behavior at school. A student's motivation can be measured by many dimensions such as self-efficacy, use of active learning strategies, learning value, performance goals, achievement goals, and learning environment stimulation. Motivated students develop their self-regulatory skills to set their goals and manage their own learning performance.

While the concept of motivation is considered, reinforcement should not be missed. Reinforcement can also motivate the behavior of someone. Extrinsic rewards may not be necessary in early childhood because children at this developmental level generally are curious, inquisitive, and motivated to learn new things (Harter, 1978 cited in Bohlin, Durwin & Weber, 2012). However, their intrinsic motivation becomes less and less as they move from upper elementary grades through middle and high school (Lepper et al., 2005; Spinath & Spinath, 2005 cited in Bohlin, Durwin & Weber, 2012). Therefore, stimulation from teachers and parents is especially necessary for adolescents.

In order to learn science successfully, students need to become active and highly motivated learners. Therefore, science teachers should always be active in investigating students' motivation to learn science to identify unmotivated students and investigate the recognition of unmotivated students in science learning.

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