การพัฒนาผลสัมฤทธิ์ทางการเรียน กับกิจกรรมการเรียนรู้ที่มีการควบคุม โดยรูปแบบของแผนการบริหารการเรียนรู้ ไปยังศูนย์กลาง นิสิต, นักศึกษา ในวิชาธรณีวิทยามหาวิทยาลัยราชภัฏอุดรธานี

Developing Learning Achievements with Controlled Learning Activities by the Forms of Learning Administration Plans onto Student's Center in Geology Course in Udon Thani Rajabhat University

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บทคัดย่อ

จุดมุ่งหมายของรายงานวิจัยสิ่งแวดล้อมการเรียนรู้ในชั้นเรียน ควบคุมโดยรูปแบบของแผนบริหารการจัดการเรียนรู้ สำหรับศูนย์กลางนักศึกษาในวิชาธรณีวิทยา เครื่องมือการเรียนรู้ถูกใช้กับกลุ่มตัวอย่างซึ่งเป็นนักศึกษา 45 คน ที่เรียนหลักสูตรธรณีวิทยา และวิทยาศาสตร์ มหาวิทยาลัยราชภัฏอุดรธานี ภาคการศึกษาที่ 2 ปีการศึกษา 2551 เครื่องมือการวิจัยเป็น (1) แผนการบริหารการเรียนรู้ 13 บท (2) แบบทดสอบวัดผลสัมฤทธิ์ และ (3) ผลงานการเรียนรู้ทำการประเมินปฏิสัมพันธ์ระหว่างอาจารย์-นักศึกษา กับแรงจูงใจ

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ใฝ่สัมฤทธิ์ของผลสัมฤทธิ์ทางการเรียนของนักศึกษาโดยใช้แบบสอบถาม 45 ข้อ เกี่ยวกับปฏิสัมพันธ์ของอาจารย์ ศึกษาการรับรู้สิ่งแวดล้อมการเรียนรู้ โดยใช้มาตรวัดสิ่งแวดล้อมในห้องปฏิบัติการธรณีวิทยา GLEI จำนวน 35 ข้อ ที่ปรับปรุงมาจากมาตราวัดสิ่งแวดล้อมในห้องปฏิบัติการวิทยาศาสตร์ฉบับดั้งเดิม (SLIE) แบบสอบถามส่วนใหญ่มีรูปแบบแท้จริงและรูปแบบที่ชอบทำการประเมินผลสัมฤทธิ์ทางการเรียนของนักศึกษากับการประเมินระดับชั้นเรียน ทำการวิเคราะห์ความมีนัยสำคัญทางสถิติกับการวิเคราะห์ขั้นสูง

ผลการวิจัยพบว่า

1. มีความแตกต่างอย่างมีนัยสำคัญ ระหว่างผลสัมฤทธิ์ทางการเรียนก่อนการทดลองกับหลังการทดลอง โดยใช้แบบทดสอบผลสัมฤทธิ์ มีนัยสำคัญระดับ 0.001

2. มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติ ระหว่างผลสัมฤทธิ์ทางการเรียนของนักศึกษา และพฤติกรรมระหว่างบุคคลของอาจารย์ผู้สอน กับผลสัมฤทธิ์ทางการเรียนที่มีต่อวิชาธรณีวิทยาที่ระดับ 0.05 ในด้านภาวะผู้นำความพึงพอใจ, การกล่าวว่าตักเตือนและพฤติกรรมเข้มงวด มีนัยสำคัญทางสถิติในสหสัมพันธ์พหุคูณ สำหรับรูปแบบที่แท้จริงของ QTI และผลสัมฤทธิ์ทางการเรียน, 77% ของความแปรปรวนในผลสัมฤทธิ์ของผู้เรียนต่อการรับรู้ ที่เป็นสาเหตุของแรงจูงใจใฝ่สัมฤทธิ์ และการพัฒนาสำหรับผลสัมฤทธิ์ทางการเรียนของผู้เรียน

3. มีสหสัมพันธ์อย่างมีนัยสำคัญทางสถิติ ระหว่าผลสัมฤทธิ์ทางการเรียนของผู้เรียนกับการรับรู้สิ่งแวดล้อมการเรียนรู้ ในชั้นเรียนปฏิบัติการทางธรณีวิทยา ที่ระดับ 0.5 ในเรื่องของความสามัคคีของผู้เรียน, ความเปิดกว้าง, ความเป็นระบบ, ความชัดเจนของกฎและสิ่งแวดล้อมด้านเนื้อหาสาระ และ 64% ต่อสิ่งแวดล้อมการเรียนรู้ธรณีวิทยาที่พัฒนาผลสัมฤทธิ์ทางการเรียน

4. มีความแตกต่างอย่างมีนัยสำคัญระหว่างการรับรู้ของผู้เรียนเกี่ยวกับพฤติกรรมระหว่างบุคคลของผู้สอนที่เป็นแบบแท้จริงกับที่ชื่นชอบในธรณีวิทยา

5. มีความแตกต่างอย่างมีนัยสำคัญ ระหว่างการรับรู้ของผู้เรียน เกี่ยวกับสิ่งแวดล้อมในการเรียนรู้ที่แท้จริง กับที่ชื่นชอบในวิชาปฏิบัติการธรณีวิทยา

ABSTRACT

The aims of classroom learning environment research were developed students' learning achievement, controlled by the forms of learning administration plans for students' center in Geology course. The learning instruments administered to a sample of 45 students in geology and science programs, Udon Thani Rajabhat University in the second semester in academy year 2008. The instrument researches were also determined with the 13 chapters of the forms of the Learning Administration Plans, the Achievement Tests, and the Learning Work Sheets. Teacher-student interactions with their achievement motive of students' learning achievement were assessed with the 48-item Questionnaire on Teacher Interaction (QTI) (Wubbels & Levy, 1993). The learning environment perceptions were obtained using the 35-item Geology Laboratory Environment Inventory (GLEI) modified from the original Science Laboratory Environment Inventory (SLEI) (Fraser, McRobbie, & Giddings, 1993). Most of these questionnaires have an Actual Form and a Preferred Forms. Students' learning achievements were assessed with a Grade Level Assessment. Statistically significances were analyzed with the advance analysis and the results of this study are following as:

1. Statistically significant differences between the students' learning achievement of their Pre and Post Achievement Tests are correlated significant at the 0.001 level.

2. Statistically significant associations were found between students' learning achievements and teachers' interpersonal behavior with their learning achievement towards their geology course at the 0.05 level on leadership, helping and friendly, understanding, student responsibility and freedom, uncertain, dissatisfied, admonishing, and strict behaviors. The multiple correlations were significant for the Actual Form of the QTI and the learning achievements, 77%

of the variance in student's achievements to their perceptions are attributable to achievement motives and development for students' learning achievement.

3. Associations between students' learning achievement and learning environment perceptions of their geology laboratory class were also related correlations significant at the 0.05 level in term of the student cohesiveness, open-endedness, integration, rule clarity, and material environment, and 64% to geology learning environments were attributable to develop of their learning achievement.

4. Statistically significant differences were found between the students' perceptions of actual and preferred teacher interpersonal behavior in geology class.

5. Statistically significant differences were found between the students' perceptions of actual and preferred learning environments in geology laboratory class.

INTRODUCTION

Education in Thailand can be said to have begun in the 13th century when Sukhothai was Thailand's capital (A.D. 1238-1378). It continued to be the Ayuttaya and Bangkok period (1782 onwards), education system set up in the palace to prepare prince and court children for further studied abroad as well as a number of schools outside the palace for education of commoners children. Thailand has a long tradition of literacy and education dating back centuries, primarily as the result of the Sangha (Buddhist order). Young men could spend time at Buddhist monasteries and in the process could study both Thai and Pali, the language of Theravada Buddhism. The complex and logical Thai writing script dates back to 1292. Thus, the widespread presence of monasteries and learned monks created an important traditional system of education in ancient Siam. King Chulalongkorn, the fifth king the Chakri Dynasty, ruled Siam from 1868-1910. The quotation from the King's decree indicated above demonstrates the King's visionary and progressive view of education. His visionary leadership resulted in reforms that transformed Siam from a traditional into a modernizing society that eventually became modern Thailand.

The Department of Education became a full-fledged Ministry of Education in 1982, and in 1999, the first Education Reform Plan was lunched. Interestingly the current reforms involve in 2002, the merging of the Ministry of University Affairs, the Ministry of Education, and the Office of the National Education Commission. Actually, there have been four major periods of educational reform in Thailand: firstly, the early seventies saw the beginnings of Thai student political activism with the growth in power and influence of the National Student Centre of Thailand (NSTC). The concentration of many of Thailand's leading universities in one city, Bangkok, facilitated the mobilization efforts of the NSTC. Secondary, people from all sectors of society

volunteered to help clear away all the debris in Bangkok. Thirdly, Thai students will have a chance to study this important part of their modern political history of Education reform in Thailand, will require a genuine sense of commitment and a true spirit of collaboration among concerned parties. Finally, Thailand's current educational reform initiatives stem from the shock of the Asian economic crisis and subsequent political reforms such as the new October 1997 Constitution, which mandated educational reform and decentralization. Thus, Thailand as part of its strategic path to economic recovery, initiated new education sector reforms, which are currently being implemented. Due to the quantitative increase of the number of students and number of higher education institutions has resulted in problems regarding quality and mismatching of graduate profiles and national development requirements and direction.

As the concern to achieve worldwide literacy developed over the past decades, it became apparent to educators that providing access to and improving the quality of basic education continue to be a major challenge. Thailand, the developing country, needs to maximize the effectiveness of the funds that students spend on education. What children learn, retain, and practice after leaving school has a direct impact on each nation's competencies in basic skills, and likewise has an impact on that nation's ability to compete in the global marketplace. Direction is needed in how to improve the quality of basic education on a permanent basis and with the monitoring ability will come to improvements in quality. Learning Achievement begins with a student ready and able to study. A student's most important learning challenges and achievements occur before entering school. During the early years a student learns to walk and talk, to relate to people, to think and reason, to solve problems, and so much more. If these learning achievements do not occur

(and at the right time) future learning in university and in later life will be more difficult. Thus learning achievement in school or university depends on earlier learning achievements.

Student-centered learning (also called child-centered learning) is an approach to education focusing on the needs of the students, rather than those of others involved in the educational process, such as teachers and administrators. This approach has many implications for the design of curriculum, course content, and interactivity of courses. Student-centered learning, that is, putting students first, is in stark contrast to existing establishment/teacher-centered lecturing and careerism. Student-centered learning is focused on the student's needs, abilities, interests, and learning styles with the teacher as a facilitator of learning. This classroom teaching method acknowledges student voice as central to the learning experience for every learner. Teacher-centered learning has the teacher at its centre in an active role and students in a passive, receptive role. Student-centered learning requires students to be active, responsible participants in their own learning. This study arranged the learning activities for improving students' achievement with themselves by the needs of the students to involve students' managements of their learning activities processes in geology course. Teaching Plan is a typical example of the planning document written for each school-based project. The planning takes place between artists and teachers in the weeks before the project starts and in most cases integrates two or more subjects in the curriculum. Prior to the planning meetings taking place the teachers will have been asked by the artists to put forward proposals as to a part(s) of the curriculum that they are having problems with delivering in the classroom or an aspect of the curriculum that they would like to experiment with in terms of delivery. In most cases the

proposals are in the form of a Scheme of Work that the teachers have been considering or a specific concept that the children have found it hard to grasp through traditional teaching methods. In all cases the project work is planned to assist teachers to deliver the curriculum in a way that promotes creative learning in the children and is not an extra activity to be accommodated in the timetable. Based on the outcome of the meetings between the teachers and artists the Teaching Plan is then written by the artists and is used as a reference point as the project involutions. In this study, using the 13th forms of administration plans or teaching plans were administered for controlling the learning activities to the targets or goals of achievement motivation to supporting and developing students' outcomes, successfully.

Motivation is the activation or energization of goal-oriented behavior. Motivation may be intrinsic or extrinsic. The term is generally used for humans but, theoretically, it can also be used to describe the causes for animal behavior as well. This article refers to human motivation. According to various theories, motivation may be rooted in the basic need to minimize physical pain and maximize pleasure, or it may include specific needs such as eating and resting, or a desired object, hobby, goal, state of being, ideal, or it may be attributed to less-apparent reasons such as altruism, morality, or avoiding mortality. Achievement motivation is the tendency to endeavor for success and to choose goal oriented success or failure activities. This study was used many instruments and work sheets to assess the students' learning achievement classroom learning and relationships between student and teacher interpersonal behaviours in geology class by the achievement motivation.

Geology is the science and study of the solid and liquid matter that constitutes the Earth. The field of geology encompasses the study of

the composition, structure, physical properties, dynamics, and history of Earth materials, and the processes by which they are formed, moved, and changed. The field is a major academic discipline, and is also important for mineral and hydrocarbon extraction, knowledge about and mitigation of natural hazards, some engineering fields, and understanding past climates and environments. In this study, to manage the geology content with the 13 chapters, 10 laboratory works, 82 work sheets, 280 items for administrating students' learning assessments.

Udon Thani Rajabhat University is one of the oldest community universities in the northeast of Thailand. It was established on November 1, 1923 and offers various programs of study for all levels. Among these are associate, bachelor, master, and doctorate degrees as well as post-graduate diplomas in three major areas: education, science and arts. The philosophy of this university is: to provide general academic and professional education, to conduct research, to offer academic services to society, to improve, transfer and develop technology, to preserve art and culture, and to produce teachers and promote teachers' academic status. Focusing on developing students' learning achievement controlled by the forms of learning administration plans for students' center in Geology course in Udon Thani Rajabhat University. Using the 13 forms of the Learning Administration Plans to improving student's achievement motivation for student's learning outcome by the Achievement Tests, Geological Experimenting Laboratory and the Learning Work Sheets.

Research efforts over the last 30 years have firmly established classroom environment as a thriving field of study (Fraser, 1994). Recent classroom environment research has the teacher-student interactions that occur in the classroom (Wubbels & Levy, 1993). This study was to develop, improve, adapt, and describe the assessments

of the actual and preferred of geology learning environment and teachers' perceptions to extend this notion in order to obtain more comprehensive picture of teacher interpersonal behavior of student's learning achievement within their geology environment class in Udon Thani Rajabhat University in Thailand.

Research in Classroom Learning Environment. In the last decade, many countries have used learning environment instruments in conducting research studies. Some examples of these are the Science Laboratory Environment Inventory (SLEI) was developed by involving Australian secondary school students (Fraser, 1991) and was extensively validated in diverse setting such as, the USA, Australia, Canada, England, Israel, Nigeria, Brunei, Singapore, South Korea and the counties in South Pacific Islands (Fraser, Giddings & McRobbie, 1995; Henderson, Fisher, & Fraser, 2000; Hoftstein, Cohen, & Lazarowitz, 1996; Lee & Fraser, 2001; Wong & Fraser, 1996). The Questionnaire on Teacher Interaction (QTI) was originally an instrument in the Dutch language developed for use in a teacher education in the Netherland (Creton, Hermans, & Wubbels, 1990; Wubbels, Brekelmans & Hooymayers, 1991), USA (Wubbels & Levy, 1991), China (Song & Hunt, 2002), Canada (Nair & Fisher, 2001), Singapore (Khine & Fisher, 2001), Nigeria (Idiris & Fraser, 1997).), Indonesia (Soerjaningsih & Fraser, 2001), South Africa (Ntuli, 2001), India (Koul & Fisher, 2003), Taiwan (Aldridge, Fraser, & Huang, 1999), Thailand (Kijkosol, 2005; Santiboon & Fisher, 2004 ; Santiboon, 2005; Santiboon, 2007; Sittikosol, 2007; Wanpen, 2005), and Brunei (Scott & Fisher, 2001). Therefore, it was considered appropriate and helpful to select convenient questionnaires that could be used to investigate the nature of geology classroom and environments.

In addition to a form, which measures perceptions of actual environment, the instruments have an additional form, which measures preferred environ-

ment. The preferred form is concerned with goals and value orientations as it measures perceptions of the environment ideally liked or preferred. Although item wording is almost identical for actual and preferred form, the directions for answering the two forms instruct student clearly as to whether they are rating what their class is actually like or what they would preferred it to be like.

The Questionnaire on Teacher Interaction (QTI). Historically, classroom environment research grew out of the studies of Moos and Walberg in the late 1960s and early 1970s. Since then, a number of instruments have been developed with which it is possible to conduct research focusing on the classroom environment. Wubbels, Creton and Hoomayers (1985) focused on the teacher variable for improving the learning environment, and developed a model to map teacher interpersonal behaviour. It was based on the model for interpersonal behaviour of Leary (1957). Wubbels et al. (1985) adapted the Leary model and developed a model for interpersonal teacher behaviors. They mapped the behaviors of teacher with a proximity dimension (Cooperation, C - Opposition, O) and an influence dimension (Dominance, D - Submission, S). These dimensions can be represented in a coordinate system divided into eight equal sections as shown in Figure 1. Each sector of the diagram represented the following typical interpersonal behaviors of the teacher: Leadership, Helping/Friendly, Understanding, Student Responsibility/ Freedom, Uncertain, Dissatisfied, Admonishing and Strict behaviors. The Questionnaire on Teacher Interaction (QTI), which measures students' perceptions of teacher interpersonal behavior, is based on this model (Wubbels & Levy, 1993). When the 64-item USA version of the QTI was used with 1,606 students and 66 teachers in the USA, the cross-cultural validity and usefulness of the QTI were confirmed. Using the Cronbach alpha coefficient, Wubbels

and Levy (1991) reported acceptable internal consistency reliabilities for the QTI scales ranging from 0.76 to 0.84 for students' responses. The Australia version of the QTI containing 48 items was used in studies involving science classes in Western Australia and Tasmania (Fisher, Fraser, & Wubbels, 1993; Fisher, Fraser, & Wubbels, & Brekelmans, 1993; Fisher, Henderson, & Fraser, 1995; Waldrip & Fisher, 2001).

The Geology Laboratory Environment Inventory (GLEI). Fraser, Giddings, and McRobbie (1993) developed a new instrument specifically suited to assess the environment of science laboratory classes at the senior high school or higher education levels. The Science Laboratory Environment Inventory (SLEI), has five scales and the response alternatives for each item are Almost Never, Seldom, Sometimes, Often, and Very Often. Since Fraser, Giddings and McRobbie (1993) developed the SLEI by involving Australian secondary school students (Fraser, 1991) and was extensively validated in diverse setting such as, the USA, Australia, Canada, England, Israel, Nigeria, Brunei, Singapore, South Korea and the counties in South Pacific Islands (Fraser, Giddings & McRobbie, 1995; Wong & Fraser, 1996, Lee & Fraser, 2001; Quek, Fraser, & Wong, 2001). As a result, a Personal Form of the SLEI was developed and later applied to the other instruments in learning environment research (Lee & Fraser, 2001).

In this present study gives a scale description the actual of each SLEI scales. However, in order to ensure that the Geology Laboratory Environment Inventory (GLEI) was suitable for use in Thailand, some items were reworded. Further, because this study was concerned with classroom environment in geology laboratory classes, the word science was replaced with geology. The Thai version was translated the containing the 35-item of the GLEI modified from the original SLEI contained five scales, namely, Student Cohesiveness (SC), Open-Endedness (OE), Integration

(IN), Rule Charity (RC), and Material Environment (ME).

This study discusses the geology environment instrument selected for use in this research. The rationales for the selection, assessments of the 13 Learning Administrated Plans, the 13 Learning Achievement Tests, the 82 Learning Activities Work Sheets, and the 10 Experimental Laboratory Works. Recent classroom environment research focused on geology laboratory classroom environment by the Geology Laboratory Environment Inventory (GLEI) modified from the original Science Laboratory Environment Inventory (SLEI) (Fraser, McRobbie, & Giddings, 1993) and teacher-student interactions that occur in the classroom were assessed by the Questionnaire on Teacher Interaction (QTI) (Wubbels & Levy, 1993), and is followed by a discussion of the climate of geology environments including how improving, developing, achievement motivation of students' achievement are one of unique features of educational reform with in geology classroom environment and therefore, the selection of the Students' Achievement Outcome in Grade Level. Because students' perceptions of geology classroom environment have been favorably associated with student's achievements to their outcomes, it was decided to select an appropriate measure of students' achievements of their authentic assessments.

RESEARCH QUESTIONS

Are there any differences between students' learning achievement of their pre-and post-achievement tests after using the forms of administration plans controlled with learning activities by the learning of student's center environments in 13 chapters of geology courses in Udon Thani Rajabhat University in Thailand?

Is the Geology Laboratory Environment Inventory (GLEI) a valid and reliable instrument for use in geology course in Udon Thani Rajabhat University, Thailand?

Is the Questionnaire on Teacher Interaction (QTI) a valid and reliable instrument for use in geology course in Udon Thani Rajabhat University, Thailand?

What associations are there between students' perceptions for achievement motivation of their geology laboratory classroom environments and their achievement grade level outcomes toward geology course?

What associations are there between students' perceptions for achievement motivation of their teacher's interpersonal behavior in geology and their achievement grade level outcomes toward geology course?

DESIGNS & PROCEDURES

In addition to the main questionnaires the Forms of Administrating Plans, the 82-Learning Work Sheets, the 13-Pre and Post Achievement Tests, QTI, GLEI, and the Students' Achievement Grade Level Outcomes, which was based on the assessing and motivating the student's developing achievement outcomes. This Students' Achievement Grade Level Outcomes were selected to use with the aim of investigating any possible relationships with students' perceptions about their laboratory environment and teacher's interpersonal behaviour in geology class. the Students' Achievement Grade Level Outcomes are consists of eight levels; 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0, and 0.0.

Table 1.

The Accounting Geology Chapter, Contents, Learning activity Forms, Hours for learning, Experimental laboratory works, Number of worksheets, and Assessing achievement test forms.

Chapter	Contents	Learning activity forms	Hours for learning	Experimental laboratory works	Number of worksheets	Assessing achievement test forms
1	Introduction	4MAT	6	-	8	4 Multiple choice 20 Items
2	Earth Born & Universe System	Cooperative	12	-	6	4 Multiple choice 20 Items
3	Plate Tectonics	4MAT	10	Lab 1	7	4 Multiple choice 30 Items
4	Earth profile	Science Process	6	Lab 2	6	4 Multiple choice 20 Items
5	Minerals	4MAT	8	Lab 3	7	4 Multiple choice 20 Items
6	Rocks	Inquiry process	8	Lab 4	5	F & T Test 20 Items
7	Igneous rocks	Science Process	8	Lab 5	8	4 Multiple choice 30 Items

Table 1. continued.

Chapter	Contents	Learning activity forms	Hours for learning	Experimental laboratory works	Number of worksheets	Assessing achievement test forms
8	Sedimentary rocks	4MAT	8	Lab 6	8	4 Multiple choice 20 Items
9	Metamorphic rocks	POE Constructivist	8	Lab 7	6	Selected word on to Item Blank 20 Items
10	Soils	Science Process	8	Lab 8	5	4 Multiple choice 20 Items
11	Surface process	4MAT	10	Lab 9	4	Selected word on to Item Blank 20 Items
12	Geological times	Investigation Constructivist	6	Lab 10	6	4 Multiple choice 20 Items
13	Geological Source	Inquiry process	6	-	7	Combined the same meaning 20 Items

Sample. The main study involved the 45 students who sat and registered to Geology course, fundamental controlling the Bachelor of Science (Geology program) and the Bachelor of Science Education (General Science Program) curriculums in the second semester in academy year 2008, that was administered by Geology Department, Faculty of Science, Udon Thani Rajabhat University in Thailand.

RESULTS

Assessing Pre and Post Achievement Tests. To pre-assess of student achievement for fundamental learning knowledge achievement before they were started to learning activities controlled with the forms of administration plans in each chapter and using the post achievement tests for assessing student's learning achievements after they were being gone on well done of students' learning activities, completely. Table 2 shows the result scores of 48 students' learning achievements in each chapter.

Table 2.

Mean Scores, Standard Deviations and Mean Differences for Students' Pre and Post-Achievement Tests

	Results of Students' Pre-Achievement tests		Results of Students' Post-Achievement tests			
Chapter	Mean scores (μ)	Standard deviations (σ)	Mean scores (μ)	Standard deviations (σ)	Paired Sample Correlation (*t*-test)	Mean different of statistically significant correlation
Chapter 1	7.13	2.88	12.62	2.97	12.82***	.00***
Chapter 2	8.82	3.64	12.58	2.61	7.01***	.00***
Chapter 3	9.33	4.17	15.80	5.75	8.56***	.00***
Chapter 4	9.09	3.99	12.93	2.96	6.84***	.00***
Chapter 5	9.08	3.99	15.20	2.19	10.57***	.00***
Chapter 6	9.07	3.11	12.00	1.33	6.72***	.00***
Chapter 7	10.78	3.15	17.64	3.28	14.29***	.00***
Chapter 8	7.11	2.65	15.13	1.78	22.90***	.00***
Chapter 9	7.11	3.58	17.18	1.98	19.90***	.00***
Chapter 10	7.16	2.84	13.96	2.28	13.83***	.00***
Chapter 11	5.31	3.57	17.40	1.92	26.26***	.00***
Chapter 12	8.24	3.11	13.24	1.48	10.13***	.00***
Chapter 13	10.71	2.72	19.47	1.20	22.19***	.00***
Total	106.36	20.49	195.16	15.73	40.29***	.00***

*Correlations is significant at the 0.05 level

**Correlations is significant at the 0.01 level

***Correlations is significant at the 0.001 level

The score means ranged from 5.13 to 10.78 on the Pre-Achievement Tests, and from 12.00 to 19.47 on the Pre-Achievement Tests. Standard deviations for the Pre-Achievement Tests from 2.75 on Chapter 5 to 4.17 on Chapter 3, whereas on the Post-Achievement Tests, Standard deviations ranged from 1.20 on Chapter 13 to 5.75 on Chapter 3. The mean differences between the students' learning achievements to the Pre and Post Achievement Tests were analyzed with the Paired Sample Correlation (t-test) ranges from 6.72 to 40.29. Table 2 reveals that the differences between the students' learning achievements of the Pre and Post-Achievement Tests were statistically significant at the 0.001 level for all of the thirteen chapters.

In most cases, the standard deviations of the Pre-Achievement Tests are higher than the standard deviations of the Post-Achievement Tests for eleven of the thirteen chapters. The presence of more variation in the majority of the Pre-Achievement Tests than in the majority of Post-Achievement Tests may indicate that students' learning achievements are more developing about learning achievement, successfully.

Figure 1 presents a pictorial comparison of the Pre-Achievement Tests with the Post-Achievement Tests and indicates that students would Post-Achievement Tests more all chapters' tests.

The finding also further supports answering the first research question in that variety of this study indicates that students' learning achievements of their assessment by the post-Achievement Tests a more positive learning achievement than their Pre-Achievement Tests to be present.

Validation and reliability of the GLEI. A summary of these values obtained separately for the Actual and Preferred versions of the GLEI is report in Table 3, the reliability coefficients for the different GLEI scales ranged from 0.70 to 0.79 when using the Actual Form and from 0.75 to 0.90 for the Preferred

Form when using the individual student as the unit of analysis. On the whole, these results are acceptable although somewhat same in value than obtained previously in the original validation sample (Fraser et al., 1992b).

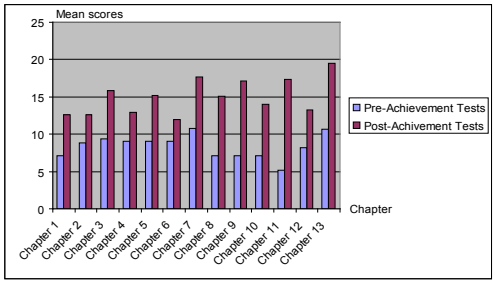

Figure 1. Significant differences between students' learning achievements of their pre and post achievement score tests on each chapter of geology course.

The 35-item GLEI was also subjected to a series of one-way analyses of variance. As shown in Table 3, the eta2 statistic ranged from 0.23 to 0.52 for different scales. It was confirmed that each scale differentiated significantly ($p < 0.05$) between perceptions of students in different classrooms for the sample in this study.

Table 3.

Scale Means, Standard Deviations and Mean Differences for Actual and Preferred Forms of the GLEI.

Scales	Forms	Mean scores	Standard deviations	Alpha Reliability	Mean Differ.	*t*-test	ANOVA (*Eta*^{2})
Student Cohesiveness	Actual	28.49	3.03	0.73	2.31*	4.27***	0.29*
	Preferred	30.80	3.83	0.75			
Open-Endedness	Actual	24.27	3.34	0.73	5.60***	7.16***	0.23*
	Preferred	29.13	4.66	0.80			
Integratin	Actual	30.22	5.67	0.89	0.69*	2.01*	0.52**
	Preferred	31.18	5.76	0.90			
Rule Clarity	Actual	25.47	2.94	0.70	4.86***	9.11***	0.26*
	Preferred	30.33	5.18	0.87			
Material Environment	Actual	23.80	5.15	0.86	6.56***	7.65***	0.43**
	Preferred	30.36	5.86	0.90			

*Correlations is significant at the 0.05 level

**Correlations is significant at the 0.01 level

***Correlations is significant at the 0.001 level

From the analyses, the GLEI has been found to be a reliable and valid instrument for assessing students' perceptions of their geology laboratory classroom environment, and provides validation support for the SLEI for use specifically in Thailand, in both its Actual and Preferred Forms.

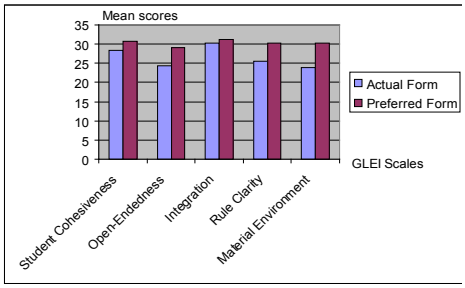

Figure 3 illustrates the differences between the Actual and Preferred Forms and indicates would prefer more student cohesiveness, open-endedness, integration, rule clarity and an enhanced

material environment in their geology laboratories.

Validation and reliability of the GLEI

Table 4 reports the internal consistency reliability of the QTI, which ranged from 0.71 to 0.82 when using the students' actual scores and from 0.75 to 0.84 when using the students' preferred scores. This characteristic was explored using a series of one-way analyses of variance on the scales of the QTI, Which suggests that each scale of the QTI was able to differentiate

Figure 3. Significant differences between students' perceptions of their actual and preferred scores on GLEI.

significantly ($p < 0.01$) between students' perceptions in actual and preferred classroom environments in the same classes. The eta2 statistic, which is the ratio of "between" to "total" sums of squares and represents the proportion of variance in scale scores are statistically significant between students' perceptions of their actual and preferred teachers' interpersonal behavior in geology classes.

On comparing differences between the students' perceptions of their actual and preferred teacher interpersonal behavior in geology classes in Figure 4, it was found that students' preferred perceptions an environment with upper levels of Leadership, Helping/ Friendly, Understanding and Student Responsibility/Freedom behaviors than students' actual perceptions. However, there were found that they were lower levels of Uncertainty, Dissatisfied, Admonishing and Strict behaviors in their actual perceptions. It is clear from a comparison of the preferred people for geology teacher with the actual that Thai students would preferred their teachers to be friendlier, more understanding, more student responsibility and freedom, and demonstrate leadership behaviors. They would also prefer their teachers to be less admonishing, dissatisfied, uncertain, and strict behaviors. A visual comparison of the results from this study of students'

perceptions of in the geology teachers in Thailand with students' perceptions of science teachers in Netherlands and Australian indicates that Thai geology teachers could be classified as Authoritative (see in Figure 4).

Table 4

Scale Means, Standard Deviations and Mean Differences for Actual and Preferred Forms of the QTI.

Scales	Forms	Mean scores	Standard deviations	Alpha Reliability	Mean Differ.	*t*-test	ANOVA (Eta^2)
Leadership	Actual	18.73	1.96	0.77	4.56**	7.46**	0.33**
	Preferred	22.29	3.89	0.83			
Helping/Friendly	Actual	17.80	1.90	0.74	3.51**	7.23**	0.37**
	Preferred	21.31	3.15	0.78			
Understanding	Actual	17.60	2.58	0.78	4.80**	8.69**	0.41**
	Preferred	22.42	3.13	0.84			
Student	Actual	18.98	3.24	0.79	2.20**	6.03**	0.38**
Responsibility	Preferred	21.18	3.52	0.84			
Uncertain	Actual	8.82	3.57	0.71	-3.78**	-7.30**	0.48**
	Preferred	4.04	3.75	0.75			
Dissatisfied	Actual	5.24	2.84	0.82	-3.42**	-6.44**	0.41**
	Preferred	1.82	3.05	0.84			
Admonishing	Actual	9.96	3.56	0.73	-5.23**	-10.34**	0.55*
	Preferred	4.73	4.33	0.76			
Strict	Actual	11.29	3.80	0.74	-8.11***	-12.14***	0.59*
	Preferred	3.18	4.02	0.83			

*Correlations is significant at the 0.05 level, **Correlations is significant at the 0.01 level, ***Correlations is significant at the 0.001 level

Student's Achievement Grade Level Outcomes.

To assess students' learning achievement with the 13-Post-Achievement Tests, 82-Learning Work Sheets, Reported from the10- Experimental Laboratory Works, Special Reports from field trips and external laboratory at the Dinosaur, Mineral and Rock Museums, National Parks, Mineral Sources, Mineral Industrials, and Discovery at the mineral sources at the local areas, and using the 100-items test at the final examination. A table 5 details the scores of assessing students' learning achievements in geology course.

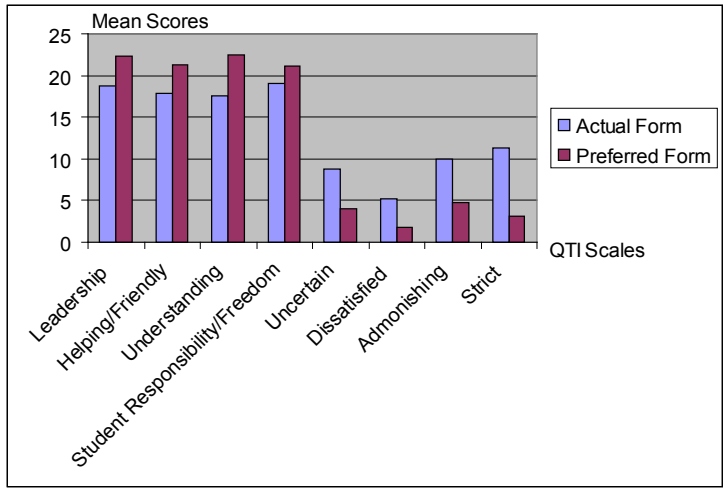

Figure 4. Significant differences between students' perceptions of their actual and preferred scores on QTI.

Table 5.

Shows Students' Leaning Achievements with the Post-test, Work sheets, Laboratory works and Final examination.

	Students' code	Post-test 280	Post-test 100%	Total 30%	Work sheets 260	Work sheets 20%	Lab 200	Lab 20%	Final Exam 100	Final Exam 30%	Results 100%	Grade Level
1	50040248103	200	71.43	21.43	235	18.08	182	18.2	68	20.4	78.11	B+
2	50040248104	191	68.21	20.46	226	17.38	172	17.2	62	18.6	73.65	B
3	50040248105	195	69.64	20.89	228	17.54	171	17.1	62	18.6	74.13	B
4	50040248106	189	67.50	20.25	231	17.77	176	17.6	64	19.2	74.82	B
5	50040248108	190	67.86	20.36	211	16.23	172	17.2	54	16.2	69.99	C+
6	50040248109	193	68.93	20.68	221	17.00	170	17.0	63	18.9	73.58	B
7	50040248110	235	83.93	25.18	233	17.92	168	16.8	58	17.4	77.30	B+
8	51100148101	188	67.14	20.14	239	18.38	172	17.2	78	23.4	79.13	B+
9	51100148102	183	65.36	19.61	220	16.92	153	15.3	60	18.0	69.83	C+
10	51100148104	201	71.79	21.54	232	17.85	172	17.2	58	17.4	73.98	B
11	51100148105	195	69.64	20.89	236	18.15	161	16.1	79	23.7	78.85	B+
12	51100148106	231	82.50	24.75	223	17.15	171	17.1	55	16.5	75.50	B+
13	51100148107	207	73.93	22.18	230	17.69	163	16.3	84	25.2	81.37	A
14	51100148108	218	77.86	23.36	235	18.08	157	15.7	85	25.5	82.63	A
15	51100148110	222	79.29	23.79	229	17.62	167	16.7	51	15.3	73.40	B
16	51100148111	214	76.43	22.93	233	17.92	168	16.8	88	26.4	84.05	A
17	51100148113	201	71.79	21.54	232	17.85	165	16.5	79	23.7	79.58	B+
18	51100148114	201	71.79	21.54	222	17.08	152	15.2	81	24.3	78.11	B+
19	51100148115	198	70.71	21.21	232	17.85	153	15.3	59	17.7	72.06	B
20	51100148117	211	75.36	22.61	222	17.08	163	16.3	62	18.6	74.58	B
21	51100148118	192	68.57	20.57	228	17.54	166	16.6	79	23.7	78.41	B+
22	51100148119	181	64.64	19.39	227	17.46	165	16.5	53	15.9	69.25	C+
23	51100148120	198	70.71	21.21	223	17.15	164	16.4	68	20.4	75.17	B+
24	51100148121	183	65.36	19.61	233	17.92	159	15.9	79	23.7	77.13	B+

Table 5. continued.

	Students' code	Post-test 280	Post-test 100%	Total 30%	Work sheets 260	Work sheets 20%	Lab 200	Lab 20%	Final Exam 100	Final Exam 30%	Results 100%	Grade Level
25	51100148122	173	61.79	18.54	214	16.46	140	14.0	70	21.0	70.00	B
26	51100148124	228	81.43	24.43	216	16.62	144	14.4	46	13.8	69.24	C+
27	51100148125	186	66.43	19.93	232	17.85	156	15.6	86	25.8	79.17	B+
28	51100148126	209	74.64	22.39	207	15.92	162	16.2	73	21.9	76.42	B+
29	51100148127	199	71.07	21.32	218	16.77	167	16.7	76	22.8	77.59	B+
30	51100148128	163	58.21	17.46	220	16.92	138	13.8	72	21.6	69.79	C+
31	51100148129	185	66.07	19.82	240	18.46	149	14.9	37	11.1	64.28	C
32	51100148130	188	67.14	20.14	208	16.00	167	16.7	39	11.7	64.54	C
33	51100148131	194	69.29	20.79	221	17.00	168	16.8	51	15.3	69.89	C+
34	51100148135	189	67.5	20.25	229	17.62	154	15.4	79	23.7	76.97	B+
35	51100148136	191	68.21	20.46	235	18.08	161	16.1	68	20.4	75.04	B+
36	51100148137	167	59.64	17.89	225	17.31	157	15.7	68	20.4	71.30	B
37	51100148139	197	70.36	21.11	225	17.31	167	16.7	74	22.2	77.31	B+
38	51100148142	175	62.5	18.75	223	17.15	160	16.0	80	24.0	75.90	B+
39	51100148143	184	65.71	19.71	230	17.69	149	14.9	39	11.7	64.01	C
40	51100148144	173	61.79	18.54	228	17.54	138	13.8	50	15.0	64.87	C
41	51100148146	179	63.93	19.18	234	18.00	138	13.8	72	21.6	72.58	B
42	51100148147	193	68.93	20.68	220	16.92	162	16.2	38	11.4	65.20	C+
43	51100148148	181	64.64	19.39	207	15.92	161	16.1	47	14.1	65.52	C+
44	51100148149	184	65.71	19.71	227	17.46	151	15.1	48	14.4	66.68	C+
45	51100148150	238	85.00	25.50	238	18.31	142	14.2	46	13.8	71.81	B

Associations between Students' Learning Motivations of their Geology Laboratory Classroom Learning and their Learning Achievement Grade Level Outcomes for the GLEI.

The simple correlation values (r) are reported in Table 6, which show significant correlations ($p<0.01$) between students' learning achievement grade level outcomes and student's motivations of their actual geology laboratory classroom environments on all scales. These associations are positive for the scales of Student Cohesiveness, Open-

Endedness, Integration, Rule Clarity and Material Environment scales. That is, in geology classes where the student perceived greater student cohesiveness, open-ended, clear rules and a satisfactory material environment there was a more favorable student's learning achievement toward their geology classes.

Table 6.

Associations between GLEI Scales and Student's Learning Achievement to Geology Classes in Term of Simple and Multiple Correlations (R) and Standard Regression Coefficient (β)

Scale	Simple Correlation Assessment *(r)*	Standardized Regression Weight students' learning achievement grade level outcomes (β)
Student Cohesiveness	0.56***	0.48**
Open-Endedness	0.49**	0.41**
Integration	0.55***	0.47**
Rule Clarity	0.47**	0.38**
Material Environment	0.51***	0.42**
Multiple Correlation *(R)*		0.80**
R^2		0.64

The multiple correlations R is significant for Actual Forms of the GLEI and shows that when the scales are considered together there is a significant ($p<0.01$) association with the Student's Learning Achievement Grade Level Outcomes. The R2 value indicates that 64% of the variance in student's learning achievement grade level outcomes student's Learning Achievement Grade Level Outcomes to their geology class was attributable to their achievement

motivations for their perceptions of their geology laboratory classes.

Associations between Students' Learning Motivations of their Teacher's Interpersonal Behaviours in Geology and their Learning Achievement Grade Level Outcomes for the QTI.

The simple correlation values (r) are reported in Table 6, which show significant correlations ($p<0.01$) between students' learning achievement grade level outcomes and teachers' interpersonal behavior on eight scales. These associations are positive for the scales of Leadership, Helping/Friendly, Understanding, and Student Responsibility/Freedom, and negative for the scales of Uncertain, Admonishing, Dissatisfied and Strict. That is, in classes where the students perceived greater leadership, helping/friendly, understanding Student responsibility and freedom behaviours in their teachers, there was a more favourable students' learning achievement grade level outcomes towards their geology class. The converse was true when the teachers were perceived as uncertain, admonishing, dissatisfied and strict behaviours.

The second type of analysis consisted of the more conservative standardized regression coefficient (β) which measures the association between students' perceptions on each scale of the QTI and students' learning achievement grade level outcomes towards geology when the effect of relationships between the scales is controlled.

The multiple correlations R is significant for Actual Forms of the QTI and shows that when the scales are considered together there is a significant ($p<0.01$) association with the students' learning achievement grade level outcomes. The R2 value indicates that 77% of the variance in students' learning achievement grade level outcomes to their geology class was attributable to their perceptions of their teachers' interpersonal behavior. The beta weights (ฺBi) show that in classes where the

students perceived greater leadership, helping/friendly, understanding, and student responsibility/freedom behaviors and less uncertain, admonishing, dissatisfied and strict behaviors in their teachers, there was a more favorable students' learning achievement grade level outcomes towards their geology classes (see in Table 7)

Table 7.

Associations between GLEI Scales and Student's Learning Achievement to Geology Classes in Term of Simple and Multiple Correlations (R) and Standard Regression Coefficient (β).

Scale	Simple Correlation Attitude *(r)*	Standardized Regression Weight students' learning achievement grade level outcomes *(β)*
Leadership	0.46**	0.38**
Helping/Friendly	0.76**	0.50**
Understanding	0.92**	0.71**
Student Responsibility/Freedom	0.73**	0.49**
Uncertain	-0.51**	-0.34**
Dissatisfied	-0.60**	-0.37**
Admonishing	-0.36*	-0.29*
Strict	-0.28*	-0.21*
Multiple Correlation *(R)*		0.88**
R^2		0.77

CONCLUSION

This study is investigated to arrangement of classroom learning environment research for developing students' learning achievements that controlled by the forms of learning administration plans for students' center in Geology course. To describe the study's sample, procedures for administrating the instruments, and statistical procedures for data analysis, the study involved 45 students in the physics and science

programs at the Science Faculty, Udon Thai Rajabhat University in Thailand in the second semester in academy year 2008. The instrument researches were also determined with the 13 chapters of the forms of the Learning Administration Plans, the Achievement Tests, and the Learning Work Sheets. To be motivated by the teacher-student interactions with the 48-item Questionnaire on Teacher Interaction (QTI) (Wubbels & Levy, 1993) and the learning environment perceptions were obtained using the 35-item Geology Laboratory Environment Inventory (GLEI) modified from the original Science Laboratory Environment Inventory (SLEI) (Fraser, McRobbie, & Giddings, 1993). Most of the QTI and GLEI questionnaires have an Actual Form and a Preferred Forms. Students' learning achievements were assessed with a Student's Achievement Grade Level Outcomes.

Statistically significances were analyzed with the advance analysis and the results of this study are comparison between the students' learning achievement of their Pre and Post-Achievement Tests are correlated significant at the 0.001 level. Statistically significant differences were found between the students' achievement motivation of actual and preferred environments and teacher interpersonal behaviors in geology class.

Associations between student's learning achievement and student's achievement motivations of their students' perceptions and teacher interpersonal behaviours with their learning achievement towards their geology course at the 0.05 level on leadership, helping and friendly, understanding, student responsibility and freedom, uncertain, dissatisfied, admonishing, and strict behaviors. The multiple correlations were significant for the Actual Form of the QTI and the learning achievements, 77% of the variance in student's achievements to their perceptions are attributable to achievement motives and development for students' learning achievement.

Associations between students' learning achievement and learning environment perceptions of their geology laboratory class were also related correlations significant at the 0.05 level in term of the student cohesiveness, open-endedness, integration, rule clarity, and material environment, and 64% to geology learning environments were attributable to develop of their learning achievement.

Statistically significant differences were found between the students' achievement motivations of their perceptions of actual and preferred classroom learning environments and teacher interpersonal behavior in geology class.

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