

Original Research Article

Designed of Instructional Associations between Individual Students' Perceptions of their Science Classroom Learning Environments Responsibility and their Science-Related Attitudes toward Science at the Eight-Grade Level

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Abstract

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Using the international research instruments; the *Individualized Classroom Environment Questionnaire* (ICEQ) measure science classroom learning environments for students' individual outcomes? Researchers are to describe and answer for using data from 55 lower secondary school students at the Eight-Grade level in 2 science classes in Burapha Pittayakharn Municipal School on the Individualized Classroom Environment Questionnaire (ICEQ) were associated their students' attitude with the Test Of Science-Related Attitude (TOSRA) toward science studies were analyzed. Comparisons of mean difference, factor analysis, scale inter-correlations, multilevel variance components models, and standardized regression coefficient to derive interaction class correlations to determine the degree to which ICEQ scores may validly be said to measure aspects of science classroom learning environments as against individual student attitude were assessed. The results showed that the class variable accounted for large and noteworthy proportions of overall variance in all five of the ICEQ scales. Subsequent analyses showed that significant proportions of variance were attributable to the school variable. In these terms, the ICEQ may be considered to be a relatively good measure of science classroom environment. The multiple correlation R is significant for the Actual Form of the ICEQ and shows that when the five scales are considered together there is significant ($p < 0.05$) association with the TOSRA. The multiple correlations R^2 is significant for the ICEQ and considered associations with the TOSRA, and value indicates that 35% of the actual form and 75% of the preferred form of the variance in students' attitude was also determined attitude to their science class was attributable to their perceptions of their individual classroom learning environment in science classes, providently.

Key Words: Actual form, associations, students' perceptions, students' outcomes, Individualized Classroom Environment Questionnaire (ICEQ), the Test Of Science-Related Attitudes (TOSRA), science classroom learning environment.

INTRODUCTION

Background of Science Educational System in Thailand

The Thai education system for more than three years and

during this time learned quickly how bad the education system in Thailand. To be plagued by inadequate funding, huge class sizes (more than 50 students to a class), terrible teacher training, lazy students and a

system that forces teachers to pass students even though they've actually failed – there doesn't seem to be much hope education in Thailand will improve any time soon. In a private bi-lingual school, so had many less problems than exist in government schools were compared? Even though, the school falls under Ministry of Education bureaucracy, which is one of the most ridiculously inept in the world. Rules change every semester, new guidelines are handed down to teachers regarding course content, lesson plans, testing etc at the beginning of each new semester, then change again the following semester. Teachers are told to pass students, even though they've failed, and a blind eye is turned to serious problems like plagiarizing.

Every year, the Ministry of Education brings into effect another bright idea for improving education in Thailand. This year's bright idea is to force every Western teacher teaching in Thailand to take a Thai Culture course. Admission to an upper secondary school is through an entrance exam. On the completion of each level, students need to pass the NET (National Educational Test) to graduate. Children are required to attend six years of elementary school and at least the first three years of high school. Those who graduate from the sixth year of high school are candidates for two decisive tests: O-NET (Ordinary National Educational Test) and A-NET (Advanced National Educational Test). The school year is divided into two semesters. The first begins in the beginning of May and ends in October; the second begins in November and ends in March.

Most students attend formal educational institutions administered by the Ministry of Education and about half of these children enroll in learning childcare/development centers of the formal education system, mainly administered by the Department of Local Administration. The Office of Basic Education Commission (OBEC) prepares the basic core curriculum and disseminates it to all Educational Service Area (ESA) Offices for distribution to parents, guardians and teachers, so as to ensure that all key stakeholders combine efforts to provide school children with quality education. The 10-Year Plan and Policy for the Basic Educational Secondary Development (2006-2015) provides a blueprint for achieving universal student education for all Thai children. The 10-Year Plan and Policy gives priority to three main strategies, namely; (1) to support youth development; (2) to support parents and other stakeholders; and (3) to promote an environment that facilitates secondary educational learners.

Selected the Classroom Learning Environment

Research on selected the classroom learning environment during the past 35 years, the study of classroom environments has received increased attention

by researchers, teachers, school administrators and administrators of school systems. The concept of environment, as applied to educational settings, refers to the atmosphere, ambience, tone, or climate that pervades the particular setting. Focused historically on researches in psychosocial dimensions, those aspects of the environment concerned with human behaviour in origin or outcome (Boy and Pine, 1988). Fraser (1998b), Dorman (2002), Goh and Khine (2002) and Khine and Fisher (2003) reviewed of classroom environment research have delineated at least 10 areas of classroom environment research including: associations between classroom environment and outcomes, evaluation of educational innovations, differences between students' and teachers' perceptions of classrooms, comparisons of actual and preferred environments, effect on classroom environment of antecedent variables, transition from primary to secondary school, school psychology, teacher education, educational productivity research, and using environment instruments to facilitate changes in classroom life, sincerely.

Science Classroom Learning Environments for these Studies

The Individualized Classroom Environment Questionnaire (ICEQ)

The Individualized Classroom Environment Questionnaire (ICEQ) is designed to measure student or teacher perceptions of actual and preferred classroom learning environment along dimensions which differentiate individualized classrooms from conventional ones. These dimensions are Personalization, Participation, Independence, Investigation, and Differentiation. This paper reports data analyses which provide information about: (1) the validity of the ICEQ; (2) differences between scores on different forms of the ICEQ; (3) relationships between student learning outcomes and perceptions of classroom individualization; and (4) relationships between student learning outcomes and actual/preferred congruence. A copy of the ICEQ is appended.

Context of Burapha Pittayakharn Municipal School

Burapha Pittayakharn Municipal School is a rural or government school located in downtown Talat of Subdistrict and Mueang district) Maha Sarakham, Thailand. It admits from lower to (lower secondary) students (Grade level at of Primary School-12) and has the largest yearly enrolment in (Talat of district) in (Mueang of Province) (the country. Founded in 1956 as a (Mueang of Province Maha Sarakham, Thailand) for

supported the household families who live in this local area, the school has long been regarded as one of the attracting students from their social community and daily life. Burapha Pittayakharn Municipal School has among the development, enhancement, and improvement entry rates for local Thai schools. The school has 5 buildings, 39 classrooms, 2 laboratory classes. This school composes with 882 students, 63 senior professional teachers, a schooling administrator is Dr. Sompong Mattan, sukanya chaemmo is the teacher trainer. The school follows the National Core Curriculum of Basic Education, BE 2551 (2008 AD), providing three years of lower secondary education and three years of upper secondary education. Subjects are grouped into eight basic subject areas, namely Thai language; mathematics; science; social studies, religion and culture; health and physical education; arts; vocations and technology; and foreign languages.

Science Secondary Educational Classroom Learning Environment in this study

In the past decade, Thailand's attempts to implement activities in education for all have steadily progressed, particularly the extension of compulsory basic education from six to nine years. In 1998, the rate of the transition to lower and upper secondary education levels was approximately 90 % and it tends to be on a continual increase. The provision of pre-primary education was obviously extended as the number of school age children having obtained this level of education was relatively higher from 1990 to 68.64%. The approaches of the provision of this level of education are offered through the Community Child Care Centers, Child Care attached to temples and mosques, and other non-governmental agencies. The transitional rate to primary education is 91.32% with equal opportunity in terms of gender. These are some of the successful models of education for all representing the efforts of mobilizing relevant agencies to jointly render their resources to undertake the national activities in providing education for all.

The PISA tests of all know that Thai students don't belong in the same class as the world-class East Asian. Of course Thailand has a few of our own some stellar students who win medals at the math and science Olympiads but their scholastic achievements are at odds with the general performance of their peers in the Thai education system. Thai students' performance in international standardized tests is generally below average. That's not a surprise given such appalling scores they get in national standardized tests like O-NET, although the word standardized may be a bit misleading in the O-NET case. Thai students' scores in most international tests can be described as mediocre or poor. However, as appalling as the O-NET scores? To answer

that we'll need to get into some details. As the focus is on school students, the international test that is the most relevant and highly regarded for measuring performance of school students is the PISA test. These scores put Thailand at No. 50 (out of 65) in the PISA 2014 score ranking by country/economy. In other words, Thailand stands right at the top of the poorest performers in the bottom 25%. Thailand's scores are on par with those of Mexico, Romania and Uruguay, above 15 countries in the developing world such as Columbia, Brazil, Indonesia, Tunisia, Argentina, Kazakhstan, Albania, Peru, and Azerbaijan, and below other countries in comparable stages of economic development such as Chile, Turkey and Romania.

Thailand has tried to do quite a lot of things in the past decade setting up the NIETS to organize O-NET was among them, but evidently the initiatives haven't yielded good results. Thailand's PISA scores over the past nine years have shown no discernable progress whatsoever. A lot of money has been put into the Thai education system: 20% of overall national budget or 4% of GDP. That rate of spending puts Thailand among the top spenders on education-more than what Singapore and Japan spend relative to size, although other top performers such as Hong Kong and South Korea, and neighboring countries such as Malaysia and Vietnam, also spend around 4-5% of their GDP on education. Yet, as this situation has seen, Thailand's results leave much to be desired.

Focusing on this research study, science classroom environment dimensions have been used as criterion variables in research aimed at identifying how the classroom environment varies with such factors as teacher personality, class size, grade level, subject matter, the nature of the school-level environment and the type of school. This study will be established associations between teacher personality and classroom environment, and will report differences in the Science classroom environment perceptions of Maha Sarakham students, the individual cultural differences in student perceptions of teacher-student interaction and their classroom learning environments.

This study will also several have attempted to bring the fields of classroom environment and school environment together by investigating links between classroom and school environment. To be administered a classroom environment instrument to a sample Science students in 12 classes and a school environment instrument to 35 teachers of these classes, only weak associations between classroom environment and school environment will be associated. Although school rhetoric often will suggest that the school ethos would be transmitted to the classroom level, it appears that classrooms are somewhat insulated from the school as a whole. Importunately, this study is going to seek for

answering many problems on education in secondary school classes.

Research purposes

1. To compare between students' perceptions of their science classroom learning environments to their responses on actual and preferred individualized student toward their science attitude at the 8th Grade level.
2. To associate between students' perceptions of their science classroom learning environments to their responses on actual and preferred individualized student and students' attitudes toward science.

Previous research

Lim (2006) assessed of students' perceptions of classroom environment and their learning styles provided a framework within which to study factors related to perceptions of students in learning. Two instruments, the *Individualized Classroom Environment Questionnaire* (ICEQ) and the Learning Style Inventory 1985 (LSI), were administered in Singapore to a stratified random sample of 1733 Secondary 4 students (equivalent to Grade 10) from nine secondary schools (good, average and below average schools). The study showed that school type (the category of schools that the students come from), had the most influence on the students' perceptions of both actual and preferred classroom environment. Gender had an influence too, but mainly on perceptions of actual classroom environment. Learning styles of students had the least influence.

Fraser, (1981) used the *Individualized Classroom Environment Questionnaire* (ICEQ), Constructivist Learning Environment Survey (CLES), Test of Mathematics-Related Attitudes (TOMRA), and concept map tests were administered to two groups of fifth-grade students as pretests and posttests over an academic year were assessed. To enrich the data collected from those questionnaires, three case studies (one for the experimental group and two for the control group) were undertaken based on observations and interviews of selected students. Relative to non-students, students experienced more favorable changes in terms of mathematics concept development, attitudes to mathematics, and perceived classroom environments on several dimensions of the CLES (e.g., Personal Relevance, Shared Control) and the ICEQ (e.g., Participation and Differentiation). Qualitative information based on classroom observations and student interviews reinforced and enriched the patterns of results obtained from the concept test and questionnaires.

Fraser and Azmi (2003) studied in extensive research conducted in developed countries has established

classroom learning environment as a thriving field of study. The present investigation makes a contribution to classroom environment research in that it involved the translation into Indonesian of scales previously available only in English, and the subsequent validation and use of these translated scales among Indonesian students. The new Indonesian instrument consists of nine seven-item scales based upon the Individualized Classroom Environment Questionnaire and the Classroom Environment Scale. Analyses of data collected from a sample of 373 Indonesian students from nine schools supported the new instrument's internal consistency, discriminant validity, ability to differentiate between classrooms, and predictive validity (i.e. ability to predict student outcomes). Potential applications of the new instruments in Indonesian classrooms are suggested.

MATERIALS AND METHODS

Research Procedures

Using the ICEQ was follows as for assessing students' perception of their actual form on the 5th week, and the TOSRA on the 5th week for associating science classroom learning environments in science classroom learning environment for upper secondary educational students at Grade 8 in Burapha Pittayakharn Municipal School, MahaSarakharn, and Province. Each scale of the ICEQ were composed with the 5-item, minimum scoring is 5 and maximum is 25. Each scale of the ICEQ were composed with the 5-item, minimum scoring is 5 and maximum is 25. The first scale, Cohesiveness is composed the item of 1, 6, 11, 16 and 21; the second scale, Friction is composed the item of 2, 7, 12, 17 and 22; the third scale, Difficulty is composed the item of 3, 8, 13, 18 and 23; the fourth scale, Satisfaction is composed the item of 4, 9, 14, 19 and 24; the fifth scale, Competitiveness is composed the item of 5, 10, 15, 20 and 25.

Research Instrument

The Individual classroom Environments Questionnaire (ICEQ)

Basically, the Individualized Classroom Environment Questionnaire (ICEQ) is designed to measure student perceptions of actual and preferred classroom learning environment along dimensions which differentiate individualized classrooms from conventional ones. These dimensions are Personalization, Participation, Independence, Investigation, and Differentiation. This paper reports data analyses which provide information, such as the validity of the ICEQ; differences between

scores on different forms of the ICEQ; relationships between student learning outcomes and perceptions of classroom individualization; and relationships between student learning outcomes and actual/preferred congruence. A copy of the ICEQ is appended.

The ICEQ assesses those dimensions which distinguish individualized classrooms from conventional ones. The initial development of the ICEQ was guided by: the literature on individualized, open and inquiry-based education; extensive interviewing of teachers and secondary school students; and reactions to draft versions sought from selected experts, teachers and junior high school students. The final published version of the ICEQ (Fraser, 1990) contains 50 items altogether, with an equal number of items belonging to each of the five scales. Each item is responded to on a five point scale with the alternatives of Almost Never, Seldom, Sometimes, Often and Very Often. The scoring direction is reversed for many of the items. Typical items are "The teacher considers students' feelings" (Personalization) and "Different students use different books, equipment and materials" (Differentiation). The copyright arrangement gives permission to purchasers to make an unlimited number of copies of the questionnaires and response sheets. (Fraser, 1998).

The Test of Science-Related Attitudes (TOSRA)

To investigate of associations between students' perceptions of their science classroom environment constructivist and their attitudes toward science learning classes for lower secondary educational students at Grade 8 in Burapha Pittayakharn Municipal School. This study modified from the original of the *Test of Science-Related Attitudes* (TOSRA) (Fraser, 1981; Santiboon, 2011, 2013, 2014) was designed to measure eight distinct classroom-related attitudes among lower secondary educational students. The eight items are suitable for group administration and all can be administered within the duration of learning in science environment science. Furthermore, TOSRA has been carefully developed and extensively field tested and has been shown to be highly reliable that it has been translated to Thai version in this study.

Sample

This study is improved and developed science classroom learning environment for lower secondary educational students at Grade 8 in Burapha Pittayakharn Municipal School classes of their science learning classroom environments to actual and preferred student's perceptions with sample size of 55 students in 2 classes at Grade 8 in Burapha Pittayakharn Municipal School,

Maharakham Province.

Data Analysis

Assuming the scales of the items approximated a 5-point ranking scale, internal consistency reliabilities (alpha coefficients) were computed for each of the derived factors of the actual and preferred ICEQ forms and the Attitude scale as specified in Santiboon (2014)^[12]. Factorial validity and adequacy of fit for the dimensionality of the ICEQ were assessed through principal component analyses. The multiple correlations were significant of students' perceptions of their school climate for the Actual Form of the ICEQ with students' attitudes to associate were analyzed.

RESULTS

Validity and Reliability of Research Instruments

Validation of the ICEQ

Description of quantitative data of analyzing responses for Master of Science teacher student's assessments is reported in Table 1.

The results given in Table 1 shows that on average item means for each of the five ICEQ scales, that they contain five items, so that the minimum and maximum score possible on each of these scales is 5 and 25, respectively. Because of this difference in the number of items in the five scales, the average item mean for each scale was calculated so that there is a fair basis for comparison between different scales. These means were used as a basis for constructing the simplified plots of significant differences between forms of the ICEQ. For the remaining five scales, namely; *Personalization*, *Participation*, *Independence*, *Investigation*, and *Differentiation* scales.

The internal consistency reliability of the version ICEQ used in this study was determined by calculating Cronbach alpha coefficient for the 25 items of the ICEQ using both actual and preferred environmental climates' perceptions scores. And reports the internal consistency of the ICEQ, which ranged from 0.54 to 0.76, This characteristic was explored using a series of one-way analyses of variance on the scales of the ICEQ, which suggests that each scale of the ICEQ was able to differentiate significantly ($p < 0.001$) between students' perceptions in my school and my dream school environmental climates in the same school.

Factor loading Analysis of the ICEQ

The Actual Form of the ICEQ were subjected to separate

Table 1. Scale Mean Scores, Means, Variance, and Standard Deviations for Actual Form of the ICEQ

Scale	Mean score	Mean	Variance	Standard deviation	Cronbach's alpha reliability	Discriminant validity	t-test
Personalization	17.17	3.55	1.01	0.98	0.54	0.69	3.55***
Participation	17.85	3.57	1.24	1.24	0.55	0.69	4.12***
Independence	17.40	3.48	0.99	0.85	0.88	0.61	4.12***
Investigation	18.11	3.62	2.07	0.79	0.57	0.68	9.23***
Differentiation	17.80	3.56	2.27	0.87	0.76	0.56	11.26***

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

***Correlation is significant at the 0.001 level (2-tailed)

Table 2. Factor Loading for Items in the Actual Form of the ICEQ.

Item	Personalization	Participation	Independence	Investigation	Differentiation
11	0.90				
21	0.77				
16	0.76				
6	0.69				
1	0.67				
17		0.73			
2		0.60			
12		0.49			
7		0.46			
22		0.44			
18			0.83		
23			0.83		
13			0.70		
8			0.58		
3			0.52		
4				0.79	
19				0.64	
14				0.53	
24				0.53	
9				0.41	
25					0.77
20					0.73
15					0.63
10					0.52
5					0.38
%of variance	29.35	29.27	37.52	37.22	34.30
Eigen value	1.47	1.46	1.88	1.86	1.72

*Loading smaller than .30 omitted. The sample consisted of 55 students

principal components factor analyses (with varimax rotation) involving the individual student's score. (Table 2)

Factor loadings were examined for the total sample of 55 school students in 2 classes, for actual and preferred versions, and for the individual student and the class mean as the unit of analysis. With the individual as the unit of analysis for the actual version and for either the school student sample, each of the 25 items had a factor loading greater than 0.30 with its a priori scale and less than 0.30 with each of the other five scales. This pattern

was similar for the preferred version, although the Material Environment scale overlapped somewhat with the Student Cohesiveness scale for both the school sample.

The Circumplex Nature of the ICEQ

To investigate the circumplex nature of the ICEQ correlations between the scales were calculated. The

Table 3. Scale Intero relations for the ICEQ Using the Actual Form

Scale	Personalization	Participation	Independence	Investigation	Differentiation
Personalization					
Participation	0.12				
Independence	0.20	0.14			
Investigation	0.08	0.17	0.04		
Differentiation	0.06	0.02	0.16	0.01	

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

***Correlation is significant at the 0.001 level (2-tailed)

Table 4. Associations between ICEQ scale and attitude scale to information communication technology class in term of simple and multiple correlations (r) and standardized regression coefficient (β)

Scale	Actual Form		Preferred Form	
	Simple Correlate Attitude (r)	Std. Regress Weight Attitude (β)	Simple Correlate Attitude (r)	Std. Regress Weight Attitude (β)
Personalization	0.13*	0.12*	0.31***	0.32***
Participation	0.23*	0.19**	0.28***	0.33***
Independence	0.12*	0.21**	0.17**	0.18**
Investigation	0.06	0.09	0.34***	0.35***
Differentiation	0.05	0.10	0.34***	0.34***
Multiple Correlation (R)		0.5709***		0.8677***
R^2		0.3502***		0.7529***

sample in Table 2 is presented the results show that the correlations between a scale and the next scale. (Table 3)

As expected, the results show that the correlation between a scale and the scale next it generally is high, and becomes higher for scales further away from that scale. This is illustrated using the five scales in Table 2. In generally, the circumflex nature of the ICEQ has been confirmed.

Validation of the TOSRA

To measure students' attitudes towards science classes, the present study adapted the tenth-item Attitude Scale (Santiboon, 2014), which was based on the Test Of Science-Related Attitude (TOSRA) (Fraser, 1981). Using internal consistency reliability the TOSRA had a value of 0.81 which was considered satisfactory for further use in this study.

Associations between Students' Perceptions of their Actual Science Classroom Learning Environments toward their Attitude (TOSRA)

In this study, it was also considered important to investigate associations between students' perceptions of their Science classroom learning environments with their

attitude toward physics laboratory classroom learning environments subject. The Cronbach alpha reliability of the selected TOSRA was 0.81, when using individual student as the unit of analysis. This suggests that the scale is reliable for measuring students' attitudes in physics laboratory classes. These involved: simple correlation and multiple regression analyses of relationships between the set of actual environment scales as a whole and the TOSRA that it's reported in Table 4.

DISCUSSION

Learning environment is an important aspect in education process. It not only influences the students' outcomes, but also instructor performances. Instructor could use the information from learning environment assessments to improve their education process. Furthermore, one instrument which could evaluate learning environments *Individualized Classroom Environment Questionnaire* (ICEQ). This instrument provides the Science environment classes of students' perceptions on actual Science environment classroom learning environments. The information from this instrument could be used for improvement and effectiveness teaching in Science environment classes.

As described in the results section, Burapha Pittayakharn Municipal School students show similar

answering patterns to those from other countries as reported in previous studies when they are asked to reply to the ICEQ questionnaire. Overall, Burapha Pittayakharn Municipal School students show relatively favorable perceptions of their Science environment classes, with the lowest score occurring for the Differentiation scale. It seems that Science environment classes' activities related to science laboratory environment classes are operated rather as supplementary to theory classes rather than being independently important in their own right.

CONCLUSIONS

Overall, this study replicated previous studies using the ICEQ, with the findings being consistent with the situation in Burapha Pittayakharn Municipal School in Thailand. It is also noteworthy that this study showed distinctive and more positive learning environment perceptions among students from the Science environment classes, interestingly.

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