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SENIOR EDUCATIONAL STUDENTS' PERCEPTIONS OF THEIR MASTER SCIENCE TRAINEE EDUCATIONAL TEACHING INTERNSHIPS IN PHYSICS FOR IMPROVING AND CREATING ATTITUDE SKILLS FOR SUSTAINABLE DEVELOPMENTS IN THAILAND

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Abstract:
To investigate of students' perceptions of their physics classroom learning environments with the instructional internships in teaching physics of the master science trainee educational students for improving and creating scientific attitude skills toward physics in upper secondary educational students in Thailand. Associations between these perceptions and students' attitudes toward physics were determined. The learning environment perceptions were obtained using the 35-item *Physics Laboratory Environment Inventory* (PLEI), the 25-item *Individualized Classroom Environment Questionnaire* (ICEQ), the 48-item *Questionnaires on Teacher Interaction* (QTI), and with the *Test Of Physics-Related Attitude* (TOPRA) were assessed which convention on individualized open and inquiry-based education, teacher-student interactions, and students' creating science attitude skills. Both these questionnaires have an Actual Form and a Preferred Form. The questionnaires were administered in three phases with the Custer Random Sampling technique to a sample consisted of 989 students in 28 physics classes from 10 schools at the grade 10-12 levels in the Secondary Educational Service Area 26 and Area 27. Statistically significant differences between students' perceptions of actual-1, actual-2 and preferred environments of their physics laboratory, distinguish individualized classrooms, and teacher interpersonal behaviours with their improving and creating attitudes skills' sustainable development were also found. Predictions of

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the monitoring and evaluation of master science trainee educational students of their internships; students' skills developments of their physics achievements' sustainable for the set of actual and preferred environments as a whole and physics related attitudes also were correlated. The R^2 values indicate that 58%, 67%, and 84% of the variances in students' attitudes to their actuale-1, actual-2 and preferred for the PLEI; 42%, 63%, and 72% for the ICEQ, and 38%, 59%, and 68% for the QTI in physics classes were attributable to their perceptions of their actual-1, actual-2 and preferred environments and their developing creative science skills' sustainable toward physics, consequently.

Keywords: monitoring and evaluation, Master of Science education, trainee student, internships in teaching physics, improving and creating, attitude skills' sustainable, development, physics, upper secondary students

1. Introduction

The standardizations' framework of the curriculum of Master of Education Program in Science Education, Faculty of Education, Rajabhat Maha Sarakham University is personalized content which it followed as the Secretariat of the Teachers Council of Thailand onto published in the Royal Thai Government Gazette in the quality of graduate educational students who are trainees students and must be training professional learning participation on school practices, and teaching internship I and II in the two semesters in secondary educational schools in the academic year 2015. Most of trainee educational students who were going on their instructional administrations, completely whose were kept under their supervisors in fields of physics, biology, chemistry, and general science were unstructured in their school classes.

Focusing on master physics trainee educational students who must be Observed and collaborated in instructional planning for variety purposes of teaching, environment setting, teaching observation in situation or in school, supplementary activities for students; practices of dharma or voluntary activities organization, and developing of professional teacher; setting plans for learning management in order to learners construct knowledge by themselves, setting learning environment, practices on teaching in simulative and real situation, practices on teaching in school with expertise teachers and advisors collaborative; instruction; design the test or assessment tools, test scoring, performance test and grading; research for solving student's problems; study of academic works in schools, support system for academic affairs, system of instructional management, media, and learning sources; schools' evaluation,

and implementation in real situations on training professional learning participation on school practices.

In terms of Teaching Internship I and II, physics trainee educational students were observed of the general status in school, practices on teaching major subject, practices of teacher's duties; in classroom administration, practices on other tasks as assigned, learner analysis, preparation of school curriculum, preparation of lesson plans, learning environment, selection of media and learning sources, construction of assessment tools, setting activities for learners development, learning measurement and evaluation and using these results for learner development, classroom management, testing, scoring, performances test, and grading with school teachers and advisors, evaluation, update, research for learner's development and solving learner's problems, study on school academic affair, academic support system, instruction system, media and learning resources, school's evaluation, and using to practice in real situations, setting project for school development in various parts, seminars on professional experience, discussion or sharing knowledge in educational seminar.

Monitoring and evaluation (M&E) is a process that helps improve performance and achieve results. Its goal is to improve current and future management of outputs, outcomes and impact. M&E establishes links between the past, present and future actions (United Nations Development Programme Evaluation Office, 2012[1]). The M&E is, as its name indicates, separated into two distinguished categories: Evaluation and Monitoring, an evaluation is a systematic and objective examination concerning the relevance, effectiveness, efficiency and impact of activities in the light of specified objectives. According to the master trainee educational students in their instructional physics laboratory class inventories, physics trainee teacher interpersonal behaviours, and individualizations of students' outcomes were assessed.

This research study into supporting students' science attitudes toward physics for sustainable development (SD) was conducted from the Master Education Program in Science Education. The researcher was designed on monitoring and evaluation for assessing upper secondary students' sustainable development contributes to advance policy recommendations of physics trainee educational students ' instructional management to their instructional policy, physics laboratory classroom climate change, measurement and assessment, and natural resources management in their classes. Designing instructional methods both formal and non-formal education from physics trainee educational students are indispensable to changing upper secondary students' attitudes so that they have the capacity to assess and address their sustainable development concerns.

2. Methodology and Materials

2.1 Previous Some Educational Instruments in Science Classroom Learning Environments

This research procedure was investigated of the previous research instruments in science classroom environments for assessing classroom environment had been developed the *Individualized Classroom Environment Questionnaire* (ICEQ) assesses those dimensions which distinguish individualized classrooms from convention (Rentoul & Fraser 1979). To assess the nature and quality of interpersonal relationships between teachers and students in science classes with the *Questionnaire on Teacher interaction* (QTI) (Créton, Hermans & Wubbels 1990; Wubbels, Brekelmans & Hooymayers 1991; Wubbels & Levy 1993) was improved and developed in the USA (Wubbels& Levy 1993), Australia (Fisher, Henderson & Fraser 1995), Thailand (Santiboon and Fisher, 2005; Santiboon, 2013). Adapted versions from the SLEI original to the *Physics Laboratory Environment Inventory* (PLEI) (Santiboon and Fisher, 2005; Santiboon, 2012) was assessed students' perceptions of their physics classes in Thailand. The 25-item *Individualized Classroom Environment Questionnaire* (ICEQ) with an equal number of items belonging to each of the five scales, the 48-item *Questionnaire on Teacher Interaction* (QTI) which was developed to assess student perceptions of eight behaviour aspects. The 35-item *Physics Laboratory Classroom Environment Inventory* (PLEI) adapted version from the *Science Laboratory Classroom Environment Inventory* (SLEI)

A. Science Laboratory Classroom Environments

There has been continuous concern about the situation in educational laboratories among educators in Thailand (Kijkosol and Fisher, 2005; Santiboon, 2011, 2012, 2013, 2014; Santiboon and Fisher, 2005; Sitthikosol and Malone, 2008; Wanpen and Fisher, 2005). They reported that laboratory activities are not effectively conducted in schools, which was against the recommendations from curriculum. It was also pointed that the situation in primary, secondary, and higher education systems were worst, which meant the least likely conducted laboratory lessons. This study intended to extend this notion in order to obtain more comprehensive picture of physics laboratories within upper secondary educational level students at the 10^{th} – 12^{th} for the foundational physics curriculum which they have kept from physics trainee teachers of the Master of Science Program, focusing on students' perceptions of their own laboratories in physics laboratory classroom environments.

B. Actual and Preferred Forms of the ICEQ, QTI, and PLEI

These research instruments, the actual (assesses the class as it actually is) and preferred (asks the students what they would prefer their class to be like - the ideal situation) forms which is different from other instruments which compare the personal and class version. Upper secondary students were selected the actual and the preferred learning environments in their physics laboratory. The difference between the actual and the preferred learning environment could be used as information for trainee teachers to choose the appropriate strategies to minimize the differences. Therefore, the using of ICEQ, QTI, and PLEI could be used for school-based professional development and guiding to improve the effectiveness of physics laboratory teaching to their monitoring and evaluation to their internships in instructional physics for improving and creating attitude skills' sustainable development toward physics on upper secondary students.

2.2 Using the Science Educational Instruments in this Study

A. The Individualized Classroom Environment Questionnaire (ICEQ)

The *Individualized Classroom Environment Questionnaire* (ICEQ) was designed to measure student or teacher perceptions of classroom learning environment along dimensions which differentiate individualized classrooms from conventional teaching (Bell & Aldridge, 2014; Rentoul & Fraser 1979). The final published version of the ICEQ contains 25 items altogether, with an equal number of items belonging to each of the five scales, namely; *Personalization, Participation, Independence, Investigation, and Differentiation* 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.

B. The Questionnaire on Teacher Interaction (QTI)

Research which originated in The Netherlands focuses on the nature and quality of interpersonal relationships between teachers and students (Créton, Hermans & Wubbels 1990; Wubbels, Brekelmans & Hooymayers 1991; Wubbels & Levy 1993). Drawing upon a theoretical model of proximity (cooperation-opposition) and influence (dominance-submission), the QTI was developed to assess student perceptions of eight behaviour aspects, namely; *Leadership, Helping/Friendly, Understanding, Student Responsibility/Freedom Uncertain, Dissatisfied, Admonishing and Strict behaviour* scales. Each item has a five-point response scale ranging from Never to Always. The final version of the QTI contains of 48 items in eight scales for using in this study.

C. The Physics Laboratory Classroom Environment (PLEI)

The *Physics Laboratory Classroom Environment* (PLEI) was adapted version from the *Science Laboratory Environment Inventory* (SLEI) (Fraser, Giddings & McRobbie 1995; Fraser & McRobbie 1995, Santiboon, 2012, Santiboon & Fisher, 2005). The PLEI has five scales (each with seven items). This instrument is appropriate for the upper secondary education which contains 35 items and five scales which are *Student Cohesiveness (SC), Open-Endness (OE), Integration (I), Rule Clarity (RC), and Material Environment (ME)*, and the five response alternatives are Almost Never, Seldom, Sometimes, Often and Very Often.

D. The Test of Physics-Related Attitude (TOPRA)

The *Test of Physics-Related Attitude* (TOPRA) (Santiboon and Fisher, 2005) was adapted and validated from the original of the *Test of Science-Related Attitude* (TOSRA) (Fraser, 1981[13]) was designed to measure and assess physics-related attitudes along seven dimensions.

2.3 Steps on Assessing Upper Secondary Students' Perceptions with the ICEQ, QTI, PLEI and TOPRA Questionnaires

Because the four instruments selected for this study were the ICEQ, QTI, PLEI, and the TOPRA, one of the reasons for selecting these instruments. Researcher conducted a project on encouraging physics students, physics trainee teachers, and physics laboratory to assess the environments of physics classrooms and laboratories and to assess of trainee teachers' monitoring and evaluation to their internships in instructional physics for improving and creating attitude skills' sustainable development toward physics on upper secondary students' activities which they could be utilized in order to improve students' achievements and outcomes. This project research was conducted with three phases with 989 students in 28 classes from 10 upper secondary schools in two semesters. Students' perceptions were assessed with the Preferred Forms of the ICEQ, QTI, and PLEI questionnaires at the first phase in from July to August, the second phase would be conducted with the Actual-1 Forms in October to November, and the Actual-2 Forms were assessed in January to February. However, the TOPRA would be conducted for assessing students' attitudes in December. The results showed that there were associations between students' perceptions of the physics classroom learning environment as measured by the scales of the ICEQ, QTI, and PLEI to make it more suitable to the physics laboratory.

2.4 Sample

The main study involved monitoring and evaluation to trainee educational students who have trained into physics trainee teachers of their internships in instructional physics for improving and creating attitude skills' sustainable development toward physics on upper secondary students. The four science classroom environments' questionnaires were administered in three phases with the Custer Random Sampling technique to a sample consisted of 989 students in 28 physics classes from 10 schools at the grade 10, 11, and 12 levels in the Secondary Educational Service Area 26 (Maha Sarakham) and Area 27 (Roi-Et). The setting up of the sample and the consequent collection of data were then able to proceed.

2.5 Data Analysis

Quantitative data were obtained using the four questionnaires (ICEQ, QTI, PLEI and TOPRA). Appropriate statistical procedures were selected to determine whether the Thai versions of these questionnaires are valid and reliable. These were those tests traditionally used with learning environment questionnaire: internal consistency reliability, and ability to differentiate between students in different classrooms. Simple and multiple correlation analyses were used with the actual and preferred versions. A *t*-test for correlated samples was used for each individual the ICEQ, QTI, PLEI scales to investigate whether students have significant different perceptions of their actual and preferred classrooms. Associations between upper secondary students' perceptions of their physics classes and their science attitudes toward physics were assessed with the Linear Regression analysis that it would be indicated in term of the predictive efficiency value (R^2). All data collected remained confidential and all respondents were volunteers and had given signed permission.

3. Research Aims

1. To analyze the validity and reliability of the *Individualized Classroom Environment Questionnaire* (ICEQ), the *Questionnaire on Teacher Interaction (QTI)*, the *Physics Laboratory Environment Inventory (PLEI*) and the *Test of Physics-Related Attitude* (TOPRA) instruments for use in this study.
2. To compare between upper secondary students' perceptions of their actual 1, actual 2, and preferred individualized classroom laboratory environments to their trainee educational students' interpersonal behaviours in 28-upper

secondary physics classes from 10 schools from the Secondary Educational Service Area 26 (Maha Sarakham Province) and Area 27 (Roi-Et Province)

3. To associate between students' perceptions of their actual 1, actual 2, and preferred distinguish individualized physics laboratory classes from instructional convention with the model of inquiry 5E, trainee educational students' interpersonal behaviours, and physics classroom environment inventories and their attitudes toward physics in upper secondary classes in the Secondary Educational Service Area 26 (Maha Sarakham Province) and Area 27 (Roi-Et Province).

4. Results

4.1 Validations of the ICEQ, QTI, and PLEI

Description of quantitative data of analyzing responses for upper secondary students' assessments is reported in Table 1, Table 2, and Table 3 for the ICEQ, QTI, and PLEI. Internal consistency (Cronbach alpha coefficient) and the mean correlation of each scale with the other scales were obtained for the sample in this present study as indices of scale reliability and discriminant validity for the Actual 1, Actual 2 and Preferred Forms of the ICEQ, QTI, and PLEI, consequently.

The actual-1, actual-2 and preferred perceptions of 989 upper secondary students of their individualized participants' activities in physics laboratory classes were measure with the ICEQ. The results given in Table 1 show the mean scores for each of the five ICEQ scales. As each scale has five items, which ranged from 16.72 to 18.64 and from 19.74 to 21.56 when using the actual-1 and actual-2 scores and from 22.21 to 23.42 when using the preferred scores. The average mean scores (μ) ranged from 3.34 to 3.73 and from 3.95 to 4.31 when using the actual-1 and actual-2 scores, and from 4.44 to 4.68 when using the preferred scores, respectively.

In Table 2, the results show the mean scores for each of the eight QTI scales. As each scale has six items, the minimum and minimum scores for each scale would be 0 and 24, which the scale means ranged from 11.88 to 19.32 and from 8.45 to 20.89 when using the actual-1 and actual-2 scores and from 5.67 to 23.02 when using the preferred scores.

Table 1: Scale Means' Score, Means, Variance, Standard Deviations, Scale Internal Consistency (Cronbach Alpha Reliability) and Ability to Differentiate Between Classroom (ANOVA) for Actual 1, Actual 2 and Preferred Forms for the ICEQ

Scale	Form	Means' score	Mean (μ)	Variance	Std. (σ)	Cronbach alpha reliability	Discriminant validity	Paired sample forms	*t*-test	ANOVA (eta^2)
Personalization	Actual 1	16.72	3.34	8.53	2.92	0.73	0.74	Actual II-Actual I	4.84**	0.41**
	Actual II	20.21	4.04	7.67	3.04	0.78	0.79	Preferred-Actual I	9.85***	0.59***
	Preferred	23.22	4.64	6.43	3.89	0.84	0.83	Preferred-Actual II	1.79*	0.24*
Participation	Actual 1	17.23	3.45	7.98	3.01	0.76	0.73	Actual II-Actual I	5.32**	0.46**
	Actual II	20.01	4.00	6.66	4.56	0.83	0.78	Preferred-Actual I	8.89***	0.58***
	Preferred	22.89	4.58	5.82	7.81	0.88	0.82	Preferred-Actual II	1.34*	0.25*
Independence	Actual 1	17.23	3.45	8.04	2.83	0.71	0.75	Actual II-Actual I	4.79**	0.40**
	Actual II	19.93	3.99	7.90	3.45	0.76	0.80	Preferred-Actual I	10.21***	0.61***
	Preferred	22.21	4.44	6.88	4.22	0.79	0.84	Preferred-Actual II	2.02*	0.27*
Investigation	Actual 1	16.98	3.40	8.92	2.76	0.72	0.74	Actual II-Actual I	5.55**	0.43**
	Actual II	19.74	3.95	7.65	3.58	0.76	0.80	Preferred-Actual I	11.23***	0.63***
	Preferred	22.67	4.53	6.78	4.67	0.80	0.84	Preferred-Actual II	2.78*	0.29*
Differentiation	Actual 1	18.64	3.73	7.56	3.21	0.77	0.73	Actual II-Actual I	4.69**	0.43**
	Actual II	21.56	4.31	6.54	4.67	0.81	0.82	Preferred-Actual I	9.23***	0.60***
	Preferred	23.42	4.68	5.66	5.69	0.83	0.83	Preferred-Actual II	1.21	0.10

N = 989, *ϱ < *.05*, **ϱ < *.01*, ***ϱ < *.001*

In keeping with previous learning environment studies, the following analyses were conducted to determine the reliability and validity of the ICEQ. The internal consistency of each scale was determined by using the Cronbach alpha reliability. Table 1 reports the internal consistency, which ranged from 0.71 to 0.77and from 0.77 to 0.83 when using the actual-1 and actual-2 scores, and from 0.79 to 0.88 when using the preferred scores. A successful evaluation of discriminant validity on each scale shows that a scale of the ICEQ is correlated with other scales designed to measure theoretically different four scales.

The internal consistency reliability of the QTI version used in this study was determined by calculating Cronbach alpha coefficients for the scales of the QTI using actual-1, actual-2, and preferred upper secondary students' scores. Table 2 reports the internal consistency of the QTI, which ranged from 0.66 to 0.74 and from 0.70 to 0.80 when using the students' actual-1 and actual-2 scores, and from 0.76 to 0.85 when using the students' preferred scores, except for discriminant validity data which are based on 28 physics class meansand attested to each scale's discriminant validity for the QTI.

In Table 3, the results show the mean scores for each of the five PLEI scales. As each scale has six items, the minimum and minimum scores for each scale would be 7 and 35, which the scale means ranged from 26.78 to 19.32 and from 28.39 to 31.22 when using the actual-1 and actual-2 scores and from 29.87 to 33.56 when using the preferred scores.

Table 2: Scale Means' Score, Means, Variance, Standard Deviations, Scale Internal Consistency (Cronbach Alpha Reliability) and Ability to Differentiate Between Classroom (ANOVA) for Actual 1, Actual 2 and Preferred Forms for the QTI

Scale	Form	Means' score	Mean (μ)	Variance	Std. (σ)	Cronbach alpha reliability	Discriminant validity	Paired sample forms	*t*-test	ANOVA (eta^2)
Leadership	Actual 1	19.32	3.22	7.63	2.74	0.72	0.71	Actual II-Actual I	5.64**	0.40**
	Actual II	20.89	3.48	5.43	3.67	0.78	0.77	Preferred-Actual I	12.03***	0.61***
	Preferred	23.02	3.84	4.59	8.56	0.84	0.81	Preferred-Actual II	3.45*	0.23*
Helping/Friendly	Actual 1	18.32	3.05	8.72	3.02	0.74	0.71	Actual II-Actual I	5.67**	0.41**
	Actual II	20.04	3.34	6.03	5.46	0.77	0.77	Preferred-Actual I	10.23***	0.58***
	Preferred	21.88	3.64	5.11	7.44	0.79	0.82	Preferred-Actual II	3.24*	0.22*
Understanding	Actual 1	17.45	2.91	8.64	2.93	0.71	0.72	Actual II-Actual I	6.01**	0.43**
	Actual II	20.48	3.41	6.89	4.33	0.77	0.77	Preferred-Actual I	14.43***	0.64***
	Preferred	22.67	3.78	5.34	7.34	0.85	0.81	Preferred-Actual II	4.32*	0.26*
Student	Actual 1	18.56	3.09	8.23	2.84	0.69	0.72	Actual II-Actual I	6.38**	0.46**
Responsibility/	Actual II	20.72	3.45	6.58	5.45	0.75	0.77	Preferred-Actual I	13.11***	0.62***
Freedom	Preferred	23.01	3.84	4.67	7.89	0.81	0.82	Preferred-Actual II	4.54*	0.27*
Uncertain	Actual 1	13.26	2.22	6.45	5.45	0.73	0.72	Actual II-Actual I	-6.84**	-0.47**
	Actual II	10.45	1.74	7.66	4.44	0.78	0.77	Preferred-Actual I	-16.45***	-0.65***
	Preferred	7.34	1.22	7.87	3.22	0.82	0.82	Preferred-Actual II	-6.88**	-0.47**
Dissatisfied	Actual 1	12.56	2.09	5.66	3.98	0.73	0.71	Actual II-Actual I	-5.98**	-0.42**
	Actual II	9.78	1.63	6.34	4.77	0.79	0.76	Preferred-Actual I	-13.22***	-0.62***
	Preferred	6.94	1.16	7.31	6.01	0.83	0.83	Preferred-Actual II	-6.12**	-0.43**
Admonishing	Actual 1	11.78	1.96	5.11	2.22	0.74	0.71	Actual II-Actual I	-6.98**	-0.48**
	Actual II	8.45	1.41	5.48	3.58	0.80	0.76	Preferred-Actual I	-17.23***	-0.66***
	Preferred	5.67	0.95	6.42	5.87	0.85	0.81	Preferred-Actual II	-5.33*	-0.37*
Strict	Actual 1	14.64	2.44	6.02	2.22	0.66	0.72	Actual II-Actual I	-10.88**	0.59***
	Actual II	12.45	1.74	6.46	3.56	0.70	0.78	Preferred-Actual I	-14.55***	0.64***
	Preferred	9.82	1.66	6.99	4.78	0.76	0.83	Preferred-Actual II	-0.76**	0.14

N = 989, *ϱ < *.05*, **ϱ < *.01*, ***ϱ < *.001*

Table 3: Scale Means' Score, Means, Variance, Standard Deviations, Scale Internal Consistency (Cronbach Alpha Reliability) and Ability to Differentiate Between Classroom (ANOVA) for Actual 1, Actual 2 and Preferred Forms for the PLEI

Scale	Form	Means' score	Mean (μ)	Variance	Std.(σ)	Cronbach alpha reliability	Discriminant validity	Paired sample forms	*t*-test	ANOVA (eta^2)
Student	Actual 1	26.78	3.82	6.73	3.67	0.69	0.71	Actual II-Actual I	4.33	0.39**
Cohesiveness	Actual II	30.32	4.33	5.67	5.68	0.78	0.78	Preferred-Actual I	10.56	0.56***
	Preferred	33.56	4.79	4.98	7.82	0.83	0.82	Preferred-Actual II	4.37	0.40**
Open-	Actual 1	25.71	3.67	7.03	4.56	0.71	0.70	Actual II-Actual I	4.44	0.41**
Endness	Actual II	28.99	4.14	6.13	5.34	0.77	0.78	Preferred-Actual I	8.01	0.52***
	Preferred	31.46	4.49	5.78	8.24	0.81	0.82	Preferred-Actual II	3.78	0.33*
Integration	Actual 1	26.11	3.73	7.98	4.11	0.72	0.70	Actual II-Actual I	4.46	0.40**
	Actual II	29.78	4.25	7.12	5.79	0.79	0.77	Preferred-Actual I	9.23	0.51***
	Preferred	32.01	4.57	6.79	6.77	0.84	0.81	Preferred-Actual II	3.66	0.30*
Rule Clarity	Actual 1	27.87	3.98	8.04	5.56	0.68	0.70	Actual II-Actual I	4.47	0.42**
	Actual II	31.22	4.46	6.89	6.78	0.76	0.78	Preferred-Actual I	9.59	0.53***
	Preferred	33.02	4.72	5.65	7.82	0.79	0.83	Preferred-Actual II	3.45	0.29*
Material	Actual 1	26.76	3.82	7.14	4.32	0.71	0.70	Actual II-Actual I	3.39	0.27*
Environment	Actual II	28.39	4.06	6.45	6.78	0.78	0.78	Preferred-Actual I	6.76	0.47**
	Preferred	29.87	4.27	5.34	8.32	0.82	0.82	Preferred-Actual II	3.40	0.23*

N = 989, *ϱ < *.05*, **ϱ < *.01*, ***ϱ < *.001*

As reported in Table 3, the reliability coefficients for different PLEI scales, these figured suggest that the scales of the PLEI measure district although somewhat overlapping aspects of the physics laboratory environment. The distinct of the scales also was checked with the Cronbach alpha coefficient and discriminant validity. The validity and reliability of the PLEI reports the internal consistency, which ranged from 0.66 to 0.72 and from 0.76 to 0.78 when using the students' actual-1 and actual-2 scores and from 0.79 to 0.84 when using the students' preferred scores.

4.2 Validation of the TOPRA

To measure upper secondary students' attitudes towards physics laboratory studies, using internal consistency reliability the TOPRA had a value of 0.86 which was considered satisfactory for further use in this study. The TOPRA consists of 8 items in 5-point Likert scale (Strongly agree, Agree, Undecided, Disagree, Strongly disagree).

4.3 Comparisons between Upper Secondary Students' perceptions of their Actual-1, Actual-2, and Preferred Responses for the ICEQ, QTI, and PLEI

Using students' perceptions to study educational environments can be contrasted and defined the classroom or school environment in terms of the shared perceptions of the students has the dual advantage of characterising the setting through the eyes of the participants themselves and capturing data which students are at a good vantage point to make judgements about classrooms because they have encountered many different learning environments and have enough time in a class to form accurate impressions. In fact, the main purposes of this research were to use the ICEQ, QTI and PLEI to obtain validation data on its three separate forms and to investigate differences between perceptions on the three different forms.

The ICEQ, QTI, and the PLEI data from the actual-1, actual-2 and preferred scores each of the five ICEQ scales, eight scales of the QTI, and five scales of the PLEI. Results for the Form effect indicate that significant differences ($p < .05$) existed among the instrument's three forms on all ICEQ scales. As show in Table 1-3, the *t*-test and the eta^2 statistic show for different between actual 2 and actual 1 forms, preferred and actual 1 forms, and for different between preferred and actual-2 forms. They were confirmed that each scale differentiated significantly ($\varrho < 0.05$) between perceptions of physics' students in different laboratory classes, significantly.

The interpretation of the profiles shown in Figure 1 is made easier by the fact that results are identical for the first five scales of Personalization, Participation, Independence, Investigation, and Differentiation. For each of these five scales, the

highest scores emerged for the student preferred form, the next highest scores for the student preferred forms, and the lowest scores for the student actual-1 form.

Fig. 1, Fig. 2 and Fig. 3 illustrate the differences between the Actual 1, Actual 2 and Preferred Forms and indicates that students would prefer more than actual and enhanced in all of scales in the laboratories, which were significantly different from for comparing between paired sample forms and indicates that students would prefer more than actual and enhanced in all of scales in physics laboratories. The average item Mean for the actual-1, actual-2, and preferred QTI scales for the three unit of analysis. The results showed that upper secondary school physics trainee teachers run their classes with fairly strong leadership, accompanied by and somewhat helping, friendly and understanding, student responsibility and freedom behaviours, and with fairly weak strict behavior, but that they do not display uncertain and admonishing behaviors. They were confirmed that each scale differentiated significantly ($\rho<0.001$) between perceptions of upper secondary students in different physics classrooms. As reported in Figure 1, 2 and 3, reliability coefficients for different the ICEQ, QTI and the PLEI scales.

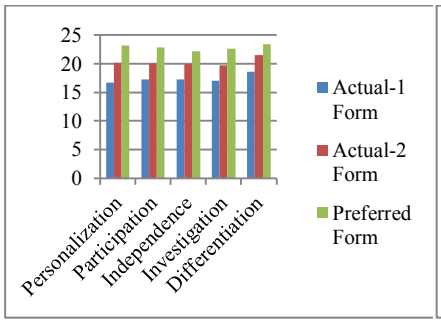

Fig. 1: Significant differences between upper secondary educational students' perceptions of their actual-1, actual-2, and preferred scores on the ICEQ

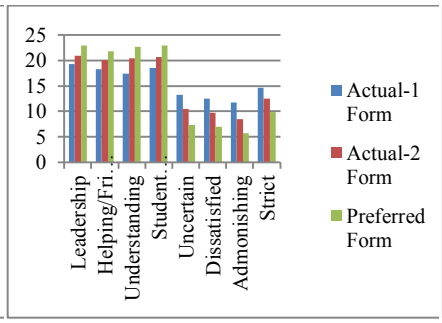

Fig. 2: Significant differences between upper secondary educational students' perceptions of their actual-1, actual-2, and preferred scores on the QTI

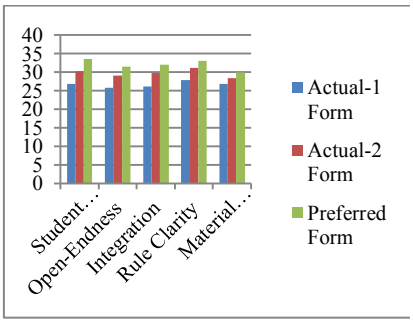

Fig. 3: Significant differences between upper secondary educational students' perceptions of their actual-1, actual-2, and preferred scores on the PLEI

4.4 Associations between Upper Secondary Educational Students' Perceptions of their ICEQ, QTI, and PLEI on Physics Trainee Teachers in Physics Laboratory Learning Classroom Environments with the TOPRA

Given the potential for students' perceptions to enhance their attitudes about, interest, and understanding in physics, other student, teacher, and classroom qualities have been explored to determine their relationship with students' perceptions of their laboratory-

learning environment. Correlation's studies have identified significant differences in students' perceptions according to achievement and others.

In this study, it was also considered important to investigate associations between upper secondary students' perceptions of their individualized participants, relationships between trainee teachers' interpersonal behaviours and their students in physics laboratory classroom learning environment with their attitude toward physics. The Cronbach Alpha Reliability of the selected TOPRA was 0.86, when using individual student as the unit of analysis. This suggests that the scale is reliable for measuring students' attitudes in physics laboratory classes with the ICEQ, QTI, and PLEI. These involved: simple correlation and multiple regression analyses of relationships between the set of actual-1, actual-2, and preferred environment scales as a whole and the TOPRA that they have reported in Table X, XI, and XII.

Simple correlation and multiple regressions analyses were conducted to examine whether associations exists between students' perceptions of learning environment and the students' affective outcomes. Table 4 shows as the Actual-1, actual-2, and preferred correlations between attitude towards physics and ICEQ learning environment among five scales, when using a simple correlation analysis (r). The multiple regressions, R, were 0.64, 0.79, 0.85, and the predictive efficiency (R^2) values indicate that 42%, 63%, and 72% of the variances in students' attitudes to their physics classes were attributable to their perceptions of their individualized classroom environments. The beta weight (β) show that in physics classes where the students perceived greater all of five scales for the ICEQ.

Table 4 shows as the actual-1, actual-2, and preferred correlations between attitude towards physics and QTI learning environment among five scales, when using a simple correlation analysis (r). The multiple regressions, R, were 0.62, 0.77, 0.83, and the predictive efficiency (R^2) values indicate that 38%, 59%, and 68% of the variances in students' attitudes to their physics classes were attributable to their perceptions of their individualized classroom environments. The beta weight (β) show that in physics classes where the students perceived greater leadership, helping/friendly, understanding, and student responsibility and freedom behaviours and less uncertain, admonishing, dissatisfied, and strict behaviours in their physics trainee teachers, there was a more favourable attitude towards their physics classes.

Table 4: Associations between ICEQ, QTI and PLEI Scales and TOPRA Attitudes to Physics Laboratory Classes in Term of Simple Correlation (r) And Multiple Correlations (R) and Standardized Regression Coefficient (β)

Scale	Actual-1 Form		Actual-2 Form		Preferred Form	
	r	β	r	β	r	β
PER	0.21	0.18	0.23	0.22	0.25	0.24
PAR	0.19	0.17	0.24	0.22	0.24	0.22
INV	0.18	0.17	0.22	0.21	0.26	0.25
INF	0.20	0.18	0.24	0.23	0.25	0.24
DIF	0.19	0.18	0.25	0.23	0.27	0.26
R	0.6422**		0.7912**		0.8478***	
R^2	0.4178**		0.6260**		0.7187***	
Associations between ICEQ Scales and TOPRA						

Scale	Actual-1 Form		Actual-2 Form		Preferred Form	
	r	β	r	β	r	β
Lear	0.14	0.13	0.23	0.22	0.26	0.25
HFr	0.16	0.16	0.22	0.22	0.27	0.26
Und	0.15	0.14	0.20	0.19	0.27	0.25
SRf	0.17	0.15	0.24	0.23	0.26	0.25
Unc	-0.14	-0.13	-0.23	-0.22	-0.25	-0.24
Dis	-0.13	-0.12	-0.21	-0.20	-0.24	-0.23
Adm	-0.15	-0.14	-0.24	-0.23	-0.25	-0.24
Str	-0.11	-0.12	-0.19	-0.18	-0.22	-0.21
R	0.6178*		0.7710**		0.8267***	
R^2	0.3816*		0.5944**		0.6834***	
Associations between QTI Scales and TOPRA						

Scale	Actual-1 Form		Actual-2 Form		Preferred Form	
	r	β	r	β	r	β
SCI	0.31	0.28	0.33	0.33	0.40	0.40
OEN	0.29	0.27	0.33	0.32	0.40	0.42
Int	0.28	0.27	0.32	0.31	0.46	0.45
RCT	0.30	0.28	0.33	0.33	0.40	0.40
MEA	0.29	0.28	0.35	0.33	0.47	0.46
R	0.7608**		0.8172***		0.9149***	
R^2	0.5788**		0.6678***		0.8370***	
Associations between PLEI Scales and TOPRA						

In Table 4 three main methods of data analysis were used to investigate this environment-attitude relationship. The sample correlation values (r), the multiple correlations R for actual-1, actual-2, and preferred forms of the ICEQ, QTI, and PLEI and show that when the scales are considered together there are significant ($\rho<.05$) associations with the TOPRA were correlated.

5. Conclusions

The importance of science education, and the urgent need for its improvement at all educational levels, has been widely recognized in numerous government reports in education system in Thailand, is provided mainly by the Thai government through the Ministry of Education from pre-school to upper secondary school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine

years' school attendance is mandatory. However, in 2009 the Ministry of Education extended free education to fifteen years.

These problems as above, the Ministry of Education, the Institute for the Promotion of Teaching Science and Technology, and the Office of the Secretariat of the Council have set policy to be solved problems; one of the set policies is assigned to the Commission of Higher Education would be selected screening examination graduate students' admissions on the high quality in science, technology, engineering, and others from Bachelor level students. The Faculty of Education in Rajabhat Maha Sarakham has responded this policy and 31-student of the Master of Education in Science Education who would be spent time for study's schedule plans for one year and the second year they must be training professional learning participation on school practices and teaching internship I and II in the academic year 2015. A part of Master of Science Trainee for practicing teaching who will be changed to the trainee teacher in their training professional learning participation on school, there are 13 physics trainee teachers for teaching in 10 upper secondary schools in 28 physics laboratory classes which consisted of 989 students were instructed.

An investigation of differences between students' perceptions of the same actual-1, actual-2 physics laboratory environments and that preferred by students were reported of this study, using the ICEQ, QTI, and PLEI with the same sample of 989 students in 28 physics classes for the comparisons of student actual with the student preferred scored, students preferred a more positive physics classroom environment than was actually present for all five dimensions of the ICEQ. These dimensions are Personalization, Participation, Independence, Investigation, and Differentiation. The results of this study report data analyses which provide information about: the validity of the ICEQ; differences between scores on different forms of actual-1, actual-2, and preferred the ICEQ; relationships between student learning perceptions of classroom individualization; and associations between students' perceptions and their actual and preferred were predictive efficiency, congruently.

The following discussion shows how the QTI can be used to provide physics trainee teachers with a picture of their ideal teacher. The trainee teachers were identified as those whose students' perceptions were more than one standard deviation above the mean on the scales of Leadership, Helping/Friendly, Understanding, and Student Responsibility/Freedom behaviour scales and less than one standard deviation below the mean on the Uncertain, Dissatisfied, Admonishing, Strict behavior scales. Suggestions that students perceive their trainee teachers demonstrating high levels of positive interactive behaviours in the physics classes were correlated. For opposition-

dominance dimension of the QTI students that perceive their teachers demonstrating low levels of negative behaviours.

This study was determined how students assess the various components of their physics laboratory environment with the instructional designs of trainee teachers. It also identified how the laboratory environment affects students' learning outcomes. Findings revealed that students could assess the five components; such as; Student cohesiveness, Open-endedness, Integration, Rule clarity, and Material Environment of the laboratory environment. Student cohesiveness has the highest assessment while material environment has the least. The results also showed that the five components of the physics laboratory environment are positively correlated with students' perceptions.

6. Discussions

This research study reports typical validation data for selected classroom environment scales.The reliability and validity of the ICEQ, QTI, and PLEI instruments were checked. The internal consistency/reliability (Cronbach alpha reliability coefficient) and discriminant validity (using the mean correlation of a scale with the other scales in the same instrument as a convenient index), and the ability of a scale to differentiate between the perceptions of students in different classrooms(significance level and eta^2 statistic from ANOVAs) also were found.A summary of these values obtained separately for the actual and preferred versions of the ICEQ, QTI, and PLEI and for the three units of analysis (individual mean and class mean) are expected, reliability estimates were higher when the class mean was used as the unit of analysis. On the whole, the statistics obtained were acceptable, though somewhat higher in value than those obtained previously in the original validation.

This research investigating the associations between students' attitudes and their perceptions of the individualized physics classes, trainee teacher interpersonal behaviours, and physics laboratory environment inventories are also inconclusive, showing significant as an indicator of students' attitudes toward physics. Having a standardized set of items for the assessment of achievement has been shown to give more comparable within sample results. Physics laboratory classes' attitudes had a positive effect on both all on five scales of ICEQ and PLEI. In terms of the QTI scales, the influence and proximity: students in highly motivated classes had a more favourable perception of their trainee teachers. Finally, this study only found an association between students' perceptions and their science attitudes toward physics

variables were found to be associated to students' perceptions of their ICEQ, QTI, and PLEI, similarly.

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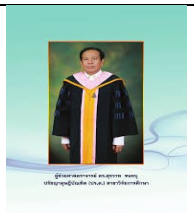	**Secondary Author, Surawat Thongbu**, Assist. Prof. Dr., Ph.D. in Educational Research and Evaluation from Ramkhamkheang University in Thailand. Dean of Faculty of Education, Rajabhat Maha Sarakham University.
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