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Using the assessment model for developing learning managements in enrichment science classrooms of upper secondary educational students' outcomes in Thailand

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The aim of this work is to develop and investigate the model for assessing learning management on the enrichment science classrooms in the upper secondary education of the Development and Promotion of Science and Technology Talents Project in Thailand. Using the research methodologies with the four phases: to investigate the background of the theory and thinking on learning management for enrichment science classes was assessed; to invent and build the enrichment science classes learning management model for trying out this model at school class was developed; using the 5-ranking questionnaire scale of the quantitative data for responding students', teachers', and schooling administrator' perceptions were used; and using qualitative data; students' interviews were selected of 5% students were interviewed and the at Grade 10, 11, and 12 level at their learning environment classes were observed at Sarakham Pittayakom School, a enrichment science classes. Statistically significant with the frequency, percentage, mean, and standard deviation were analyzed. It was found 7-Factor assessments, namely; heading assessment, purposing assessment, assessing goal, typing assessment, assessor, criteria assessment, and user of information communication. Focused on the factors assessing goal and typing assessment were the most important assessment scale for suitability, truth, possibility, and using opportunity, indicated at highest level.

Key words: Assessment model, enrichment science classrooms, enrichment science students, learning management, upper secondary education, Thailand.

INTRODUCTION

Education system in Thailand

Education in Thailand is provided mainly by the Thai government through the Ministry of Education from pre-school to senior high school. A free basic education of twelve years is guaranteed by the constitution, and a minimum of nine years' school attendance is mandatory. Formal education consists of at least twelve years of

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basic education, and higher education. Basic education is divided into six years of primary education and six years of secondary education, the latter being further divided into three years of lower- and upper-secondary levels, respectively. Kindergarten levels of pre-primary education, also part of the basic education level, span 2–3 years depending on the locale, and are provided variable (Ministry of Education, 2010).

School structure in Thailand

The school structure is divided into four key stages: the first three years in elementary school, the first primary level or Prathom 1–3, are for age groups 7–9 (Grade 1-3); the second primary level or Prathom 4 through 6 are for age groups 10–12 (Grade 4-6); the third lower secondary level or Matthayom 1–3, is for age groups 13–15 (Grade 7-9). The upper secondary level of schooling consists of Matthayom 4–6 for age groups 16–18 (Grade 10-12), and is divided into academic and vocational streams. There are academic upper secondary schools, vocational upper secondary schools and comprehensive schools offering academic and vocational tracks. Students who choose the academic stream usually intend to enter a university. Vocational schools offer programs that prepare students for employment or further studies.

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.

The years from 2001 to 2006 showed some improvements in education, such as computers in the schools and an increase in the number of qualified native-speaker teachers for foreign languages. Experiments with restructuring the administrative regions for education or partly decentralizing the responsibility of education to the provinces were conducted. By 2008, however, little real change had been made, and many attempts to establish a clear form of university entrance qualification had also failed due to combinations of political interference, attempts to confer independence (or to remove it) on the universities, administrative errors, and inappropriate or mismatched syllabuses in the schools.

Thai student IQs

On 27 May 2015, the Ministry of Public Health released Thai student IQ survey results. They indicate that the IQ of Grade 1, students have dropped from 94 in 2011 to 93. The international standard is 100. It is highly possible that Thailand's education system is harming student IQs. While the IQ of pre-school students is acceptable, IQ drops as primary schooling commences, suggesting a need for changes at schools. The IQ of students in rural areas is considerably lower, at just 89. This difference persists at university. While studies have found the IQ of Bangkok university students averages 115, the IQ of provincial university students is 5-8 points lower (Maxwell and Kamnuansilpa, 2015). Alarmingly, the low IQ levels in the recent survey confirm continuing high levels of intellectual disability: IQ levels lower than 70, also termed "mildly impaired or delayed". The average global percentage of such students is 2%. However, a previous 2011 survey found that 6.5% of Thai students scored in this range. The recent results suggest intellectual disability in some rural areas could now be up to 10% (Maxwell and Kamnuansilpa, 2015).

One cause of lower IQs might be traced to nutrition. WHO research suggests iodine deficiency accounts for losses of between 10–15 IQ points. However, according to Thailand’s 2012 Multiple Indicator Cluster Survey, only 71% of Thai households consume enough iodised salt, falling to 54% in the poorest households. There is again a huge regional disparity, with 82% of households in Bangkok and only 54% of households in Thailand's northeast consuming adequately iodised salt. The regions with the lowest IQs are those same areas with the highest iodine deficiency. Students in ethnic minority areas score consistently lower in standardized national and international tests. This is likely due to unequal allocation of educational resources, weak teacher training, socio-economic factors (poverty) and lower ability in the Thai language, the language of the tests (Draper, 2014).

An assessment of the quality of secondary education students

An assessment of the quality of secondary school education has indicated that only 40% of 3 secondary learners received adequate preparation for readiness in learning before attending university. Although Thailand has a very high percentage of youth learners attending child development centers, if such centers are not supported properly through strengthening capacity and management, the quality of secondary development and young children’s preparation for primary and secondary schooling can be seriously affected (UNESCO, 2011). 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.

The Institute for the Promotion of Teaching Science and Technology (IPST)

There is an institute of the Ministry of Education in Thailand, the Institute for the Promotion of Teaching Science and Technology (IPST) was established in 1972 supported by UNDP. Now an agency under the direction of the Ministry of Education; to research, develop and advocate science, mathematics and technology, such as; curricula, teaching/learning process, media and materials then publicize them to all relevant organizations, to develop teachers and education personnel in science, mathematics and technology to help they gain cutting-edge knowledge and capacity in using technology and planning lessons effectively focusing on learner's development, To research, develop and promote the standard evaluation to enhance the quality of teaching and learning science, mathematics and technology, and to promote the culture of science and technology in Thai society especially among new generations (IPST, 2011).

The Development and Promotion of Science and Technology Talents Project (DPST)

The Development and Promotion of Science and Technology Talents Project (DPST) has been founded in 1984, aimed to produce talented personnel in Science and Technology who will make innovations contributed to the development of Thailand. Science and Technology play an important role in the development of the country and have become more and more important. Less and less science talented students enroll in the faculty of science. Most students choose the subjects which will lead to careers with high income e.g. Medicine, engineering. The DPST project encourages more students to choose science as their major by means of financial and academic supports that aimed to produce scientists/researchers in the fields of immediate need for the country and hope to produce 120 scientists/ researchers each year. The project partners are the Office of the Basic Education Commission, Office of the Higher Education Commission, Ministry of Science and Technology, and the Institute for the Promotion of Teaching Science and Technology (IPST).

DPST centers are at the 8 upper secondary schools throughout of Thailand; such as Bodindecha (Sing Singhaseni) school, Bangkok, Samsenwittayalai school, Bangkok; Sriboonyanon school, Nontaburi; Phrapathom Witthayalai school, Nakornpathom; Yupparaj Wittayalai school, Chiangmai; Kaennakorn Wittayalai school, Khonkaen; Suranaree School, Nakhorn Rajchasima,; and Hatyai Wittayalai school, Songkha; and DPST students automatically enroll to their relative universities from 195 enrichment science classes from 195 upper education schools on enrichment programs in science and mathematics will enter the DPST Centre Universities; Chulalongkorn University, Mahidol University, Kasetsart University, Silpakorn University, Chiangmai University, Khonkaen University, and Prince of Songkla University. The Outcomes of DPST Projects Organisations in Thailand provide more scholarships to study science and mathematics, the Ministry of Education promotes the science enrichment class. Pathways into DPST, Enter the competition at the end of grade 9 to upper educational center school, and enter the competition at the end of grade 12 to the center higher educational universities (Sangtong and Kreetong, 2011).

Definition of assessment

Assessment may refer to education assessment; the process of documenting, usually in measurable terms, knowledge, skills, attitudes, and beliefs. Assessment can focus on the individual learner, the learning community (class, workshop, or other organized group of learners), the institution, or the educational system as a whole (also known as granularity). The final purpose of assessment practices in education depends on the *theoretical framework* of the practitioners and researchers, their assumptions and beliefs about the nature of human mind, the origin of knowledge, and the process of learning (Wikipedia, the Free Encyclopedia, 2014).

Assessment is vital to the education process. In schools, the most visible assessments are summative. Summative assessments are used to measure what students have learnt at the end of a unit, to promote students, to ensure they have met required standards on the way to earning certification for school completion or to enter certain occupations, or as a method for selecting students for entry into further education. Ministries or departments of education may use summative assessments and evaluations as a way to hold publicly funded schools accountable for providing quality education. Increasingly, international summative assessments – such as OECD's Programme for International Student Assessment (PISA) – have been important for comparing national education systems to developments in other

countries, but assessment may also serve a formative function.

Important problems of the DPST Project for Enrichment Science Classrooms

What does this project get in assessing a DPST student? In enrichment science classrooms, Tuition fee waiver, to allowance for personal expenses and books, science camps, day trips to see local scientists/researchers at work, summer work experience with a researcher. A DPST room equipped with laboratory instruments for a DPST to do lab work at their own leisure, social events organized by DPST students, learning for the learning sake, DPST students are expected to get at least a master degree in the following disciplines: Mathematics, Chemistry, Biology, Physics, Computer, and Geology. The DPST students have been assessed formative assessment refers to frequent, interactive assessments of student progress and understanding to identify learning needs and adjust teaching appropriately.

Generally, teachers using formative assessment approaches and techniques are better prepared to meet diverse students' needs – through differentiation and adaptation of teaching to raise levels of student achievement and to achieve a greater equity of student outcomes. But there are major barriers to wider practice, including perceived tensions between classroom-based formative assessments, and high visibility summative tests to hold schools accountable for student achievement, and a lack of connection between systemic, school and classroom approaches to assessment and evaluation (Nevo, 1983).

This type of an assessment is used to know what the student's skill level is about the subject. It helps the teacher to explain the material more efficiently. These assessments are not graded. There are seven practices to effective learning; one of them is about showing the criteria of the evaluation before the test. Another is about the importance of pre-assessment to know what the skill levels of a student are before giving instructions. Giving a lot of feedback and encouraging are other practices (Black and William, 2009).

Assessment for learning is best described as a process by which assessment information is used by teachers to adjust their teaching strategies, and by students to adjust their learning strategies. Assessment, teaching and learning are inextricably linked, as each informs the others. Assessment is a powerful process that can either optimise or inhibit learning, depending on how it's applied. Assessment for learning helps teachers gather information to: plan and modify teaching and learning programmes for individual students, groups of students and the class as a whole pinpoint students' strengths so that both teachers and students can build on them identify students' learning needs in a clear and constructive way so they can be addressed involve parents, families in their children's learning.

Assessment for learning provides students with information and guidance

To assess for learning provides students with information and guidance so they can plan and manage the next steps in their learning. Assessment for learning uses information to lead from what has been learned to what needs to be learned next. Assessment for learning should use a range of approaches. These may include: day-to-day activities (such as learning conversations) a simple mental note taken by the teacher during observation student self and peer assessments a detailed analysis of a student's work assessment tools (which may be written items, structured interview questions or items teachers make up themselves). What matters most is not so much the form of the assessment, but how the information gathered is used to improve teaching and learning.

The policy of Thailand to support the enrichment science students

The policy of Thailand has been supported from the time a student has met criteria and signed the agreement in the first year of upper secondary school (Grade 10) until the student secured employment. In the agreement of the scholarship, any DPST grantee must earn at least a Master's degree or Doctoral degree from enrichment students at Grade 9 with a Grade Point Average (GPA) in mathematics and science of at least 3.00, and a GPA of all school subjects at least 3.00 are eligible to apply for a DPST scholarship. Applicants have to take a paper-and-pencil exam before being screened by a practical laboratory examination and an interview to improve and develop students to researchers, inventors, and thinkers in field of science and technology whose standard quality throughout of Thailand.

Most popular schools in districts or provinces that agreed with the local social and higher education were selected and indicated that are too high standard and quality on learning management and invention educational Medias in science, mathematics, and technology, representational international awards were guaranteed. Enrichment classroom learning for science and mathematics enrichment students should be have a class in each school that it's supported of 400,000 THB per 40 students in 5 years, a school is the local area of students' homes for less outcome, and this project is benefited to one who is poor and disadvantaged child (Researcher: Translated from website: 2013). Recently, there are administrations on the project of enrichment science classroom are explored in the network at the 9

educational regions and 195 enrichment classes in 195 enrichment schools that they are learning management curriculum on the basic educational curriculum in 2008.

In Thailand, the government has focused their efforts and policies on the national development of science, mathematics, and technology through the promotion of high caliber students in these areas by means of a project named “The Development and Promotion of Science and Technology Talented Project (DPST)”. This project was approved by the cabinet and first launched on March 6, 1984 and was jointly administered by the Ministry of Education, the Ministry of University Affairs, the Ministry of Science, Technology and Environment, and the Institute for the Promotion of Teaching Science and Technology (IPST). This project has had to express concern about the critical phenomenon that there was a lack of high performing students participating in science and mathematics. It was hard to imagine the future of the nation without expert scientists who create and invent tools for developing new technologies for Thailand. As the institute which is directly responsible for mathematics, science and technology education, IPST has worked very hard to establish an infrastructure for DPST until it was approved by the cabinet in 1984. After 14 years of implementation, DPST has been granted status as a permanent routine activity in 1998 in order to enhance the government’s aims for national sustainable development. At present, the DPST project is one of the departments of IPST and is operated by IPST’s staff (Tama Duangnamol, website: 2012).

Most of the DPST graduates work in universities, which are affiliated with the Ministry of Education. There are 112 out of 785 scholars who graduated in mathematics, which represents about 14% of the DPST graduates. This is a good representation, even though the scholarships do not specifically target mathematical giftedness. Because of the flexible nature of the DPST programs, however, some students come to realize their real passion for mathematics only after they have begun the program.

The enrichment science curriculum

In terms of enrichment curriculum, School’s programme is an integral part of the Secondary School curriculum and provides students with an opportunity to develop through experience. One of the main aims is to involve students in activities or situations which they may not have experienced before and which encourage them to think about the values they are applying and the attitudes they adopt. The one-week, residentially take place in November each year and involve Year groups and tutors travelling to different locations around Thailand. Each visit is designed with a specific programme to help enhance the mainstream curriculum and to provide opportunities for personal and social development. Each visit and its related activities are planned to accomplish the following aims: exploration of cultural, historical and/or physical environments with specific targets linked to the school’s curriculum, reinforcement of self-esteem and positive interaction amongst students and staff within a unique setting. Great teachers are always looking for new ways to expand their instruction and engage their students. Innovative teaching is important--but it can be expensive. Luckily, there are a wide variety of sources available for funding educational initiatives. Grants, fellowships and scholarships are available for teachers who want to help their students.

Generally, most standardized tests are not designed to evaluate the individualized growth and development taking place in the classroom. But there are assessments tools that do; many educators are uncomfortable with the idea of testing the students they work with. This is because the assessment tools they know were designed primarily for school’s students. Students taking these tests are assessed on isolated skills in ways that are unfamiliar to them, and the test results often do not reflect student's personal experiences or knowledge (Meisels, 2015). In recent years, however, a new approach to assessment has been gaining acceptance among enrichment science classroom students with primary grade better teachers. Known as "performance" or "authentic" assessment, these new tools have many benefits that standardized tests do not. For example: firstly, they systematically document what students know and can do based on activities they engage in on a daily basis in their classrooms. Standardized test items, in contrast, barely approximate actual classroom tasks. In addition, performance assessment evaluates thinking skills such as analysis, synthesis, evaluation, and interpretation of facts and ideas skills which standardized tests generally avoid. Secondly, they are flexible enough to allow teachers to evaluate each student's progress using information obtained from ongoing classroom interactions with materials and peers. In other words, they permit an individualized approach to assessing abilities and performance. Thirdly, they are a means for improving instruction, allowing teachers to plan a comprehensive, developmentally oriented curriculum based on their knowledge of each student. Fourthly, they provide valuable, in-depth information for parents, administrators, and other policy makers. Finally, they put responsibility for monitoring what children are learning and what teachers are teaching in the hands of teachers, where it belongs, this five phases are the actual assessments for enrichment science classroom leaning management (IPST, 2013).

Focused on actual assessment, Nevo (Nevo, 1983) was reported to their thinking on development of the 5 questions to assess student’s learning: Why do teachers do assessment and valuation? What is assessment and evaluation? Who is assessed and evaluated? and How is assessment and evaluation done? Khamjanawasee (2009) reported on his website the 4-question on

performance assessment; Why do teachers do assessment and valuation? What is assessment and evaluation?, and How is value judgment?. Focused on this study, researchers were going on to plan from the 2-Educators' thinking for the basically development on this research instrument to invent the assessing and valuating model, namely; *the Questionnaire on Enrichment Science Classroom (*QESC) for assessing students' perceptions of their controlling positions, assessing process evolutional framework, and the position of educational context satisfaction. These model is the instrument that it has been explored and developed the body of knowledge on learning assessment in school and not only this assessment is the processes of assemble and using of communication and information to educator's decisions to educational development, this research is shown and revealed to investigate the enrichment science school classes as a pictorial assessment format to indicate that improving quality of the national education instrument, exactly.

On graduating from upper secondary school, students need to pass the CUAS (Central University Admission System) which contains 50% of O-NET and A-NET results and the other half of the fourth level GPA (Grade Point Average). Many changes and experiments in the university admissions system have taken place since 2001, but by late 2007 a nationwide system had yet to be accepted by the students, the universities, and the government. On returning to democracy in early 2008, after the December election, the newly formed coalition led by the People's Power Party (a party formed by the remnants of deposed Taksin Shinwatra's Thai Rak Tai party) announced more changes to the national curriculum and university entrance system. At present, state-run universities screen 70% of their students directly, with the remaining 30% coming from the central admission system. The new system gives 20% weight to cumulative grade point average, which varies upon a school's standard. Some students have voiced distrust of the new system and fear it will encounter score counting problems as happened with the A-NET in its first year. The new aptitude test, to be held for the first time in March 2009 and which will be supervised by the National Institute of Educational Testing Service, will replace the Advanced National Education Test (A-net). Students can sit for the aptitude test a maximum of three times, with their best scores counted. After the first tests in March 2009, the next two are scheduled for July and October. Direct admissions are normally held around October. The new test includes the compulsory General Aptitude Test (GAT), which covers reading, writing, analytical thinking, problem solving and English communication. The voluntary Professional Aptitude Test (PAT) has a choice of seven subjects. Students in ethnic minority areas score consistently lower in standardized national and international tests. This is likely due to unequal allocation of educational resources, weak teacher training, socio-economic factors (poverty) and lower ability in the Thai language, the language of the tests (Draper, 2014).The science classroom enrichment students' learning from exploration of the virtual environment is supported with a range of other learning experiences. How each of these experiences targets different aspects in the development of students' scientific literacy will be discussed. Participating teachers will have time to consider how to adapt or extend these learning experiences to meet the needs of their students. By the end of the session teachers should be able to use the resources and learning experiences in the classrooms. However, students ought to be entered to pass the CUAS (Central University Admission System) which contains 50% of O-NET and A-NET results and the other half of the fourth level GPA (Grade Point Average) similar as the normal student at upper secondary school too, meanwhile the opportunities of this student group are more pass to the higher. In order to assess the classroom learning management in the enrichment science school class project at the upper secondary school that it has never found on the methodology for educational management at the last decades, therefore, the development of educational assessment model obtains with the research and development to take this results and developments for exchanging the framework of assessing quality of school learning environment in enrichment science class-room at the upper secondary school class and the results of this study are revealed to find that it's going on to be developed and rectified, school should be stimulated themselves to understanding knowledge, to due to the greatest teaches who are able to have many skills to manage of their enrichment science classroom learning management that it has indicated that this class is the high quality and efficiency, satisfaction interestingly from this study.

Research objectives

1. To describe the enrichment science schooling class learning management and to assess the enrichment science schooling classroom learning managements.
2. To develop the methodological assessment and evaluation on the enrichment science classroom learning managements in the upper secondary education enrichment school classes.
3. To assess the methodological assessment and evaluation on the enrichment science schooling class learning management in upper secondary education with the experimental assessment model.

METHODOLOGY

Approaches to studying educational environments

Limited framework and schedule time

Researchers limited the framework and time schedule in this study

in four phases.

The First Phase: To Investigate the Management of Learning Environment and Learning Assessment on Enrichment Science Schooling Class

This phase was administered with the investigating documents and interviewed the personnel concerns on learning management and learning outcome assessment of the enrichment science schooling classes. The aims of this phase are to describe and assess the learning management, to involve the students' and teachers' perceptions of their learning assessment to their communication and information of interview and analysis foundational data with a sample size of nine persons from three groups of school administrators, undertakers or teachers, and academicians.

The Second Phase: To Invent and Verify the Assessing Learning Management Model.

To synthesis the data from the first phase to make the dummy of assessment model of the enrichment science classroom, satisfied testing and the quality of assessing model, possibility. Using the focus group discussion technique to invent this model and nine professional assessors, namely; professional assessors and evaluators, the curricular and scientist in education professors, and the undertakers or teachers were assessed with separated of three groups for description among groups. Researchers took the results of the season with the consensus of description among groups to invent the assessing model that it has obtains with the selecting factor and indicating assessment form. To improve this model which as the professional advice. On next step, researcher was to develop the assessing manual for the guideline of assessing position for controlling user. This assessing model was analyzed with the validity and reliability testing with the phase of the 9-professionsl discussion with their groups, statistically.

The Third Phase: To Try Out this Assessing Model to Assess an Upper Secondary School.

8 upper secondary education school classes for trying out the model was used. The schools like the enrichment science classroom, namely; satisfaction, validity and reliability, and the Cronbarch alpha reliability value was analyzed. The assessing committees who were represented from the science academicians, the schools at the Office of Secondary Educational Service Areas, and the Project of Enrichment Science Classrooms were reviewed from a sample of 29 science senior professional persons, adding with of 8 school administrators, 3 persons from the basic educational committee, 8 head of enrichment science classrooms, 24 greater science teachers, 5% of students' parent, and 240 enrichment classroom students were assessed of students' perceptions.

The Fourth Phase: To Use the Assessing Model to Assess an Enrichment Science Classroom.

This phase was to assess the assessing model for assessment on the enrichment science school classes in the upper secondary education that it was going on actual situation to experimental model for administering of the sample size, which as to investigate the assessing standardized efficiency of the 4-dimentions, namely; utility standards, feasibility standards, propriety standards, and accuracy standards (Stufflebeam and Shinkfield, 2007).

Research procedures

Research instruments

Using a combination of qualitative and quantitative data can improve an evaluation by ensuring that the limitations of one type of data are balanced by the strengths of another. This will ensure that understanding is improved by integrating different ways of knowing. Most evaluations will collect both quantitative data (numbers) and qualitative data (interview, observation), however it is important to plan in advance how these will be combined.

Selected the Questionnaire Instrument in this Study

The Questionnaire on Enrichment Science Classroom (QESC)

Using the *Questionnaire on Enrichment Science Classroom* (QESC) (Adapted original version from Nevo, 1983; Kanjanawasee, 2009) to measure students' perceptions of their social and laboratory climates to their enrichment science school classrooms was assessed. In particular, the version of the QESC included with 28 items slightly different from the original one to compose with the seven scales, namely; heading assessment, purposing assessment, assessing goal. Each scale of the QESC were composed with the 4-item, minimum scoring is 5 and maximum score is 20. The first scale, Heading Assessment is composed the item of 1, 8, 15, and 22; the second scale, Purposing Assessment is composed the item of 2, 9, 16, and 23; the third scale, Assessing Goal is composed the item of 3, 10, 17 and 24; the fourth scale, Typing Assessment is composed the item of 4, 11, 18 and 25; the fifth scale, Assessor is composed the item of 5, 12, 19 and 26; the sixth scale, Criteria Assessment is composed the item of 6, 13 20 and 27; and the seventh scale, User Information Communication is composed the item of 7, 14, 21 and 28.

More comprehensive statistical information about the QESC was provided, and published research involving the QESC was reviewed. The contents of this manual include a description of the initial development of the QESC; extensive normative and validation statistics for each instrument; reviews of relevant research using these instruments; and observations' ways in which students were observed toward students' learning environment managements by teachers, and curriculum evaluators ought to investigate of students' satisfaction.

Interview Instrument

The qualitative research interview seeks to describe and the meanings of central themes in the life world of the subjects. The main task in interviewing is to understand the meaning of what the interviewees say. A qualitative research interview seeks to cover both a factual and a meaning level, though it is usually more difficult to interview on a meaning level. Interviews are particularly useful for getting the story behind a participant's experiences. The interviewer can pursue in-depth information around the topic. Interviews may be useful as follow-up to certain respondents to questionnaires, e.g., to further investigate their responses. Using the interview technique to be responded by the enrichment science students' interviewees were interviewed (McNamara, 1999).

Data analyses

The scaling 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 QESC form analyzed.

Sample

This study is improved and developed the assessment model for assessing enrichment science school classroom environment with

administrations of the 4 groups of sample sizes for each research phase:

The 1st Phase: To investigate enrichment science classroom environments was intervened of a three groups of 9 interviewees; such as, schooling administrator, responsible men or teachers, and educationists.

The 2nd Phase: To invent and check the assessing learning management model of enrichment science classroom schools was used, the focus group discussion technique to synthesis of this model with a sample of 9 professional educationists of their assessment and evaluation, curriculum and instruction in science education, and responsible persons or teachers.

The 3rd Phase: Using the assessment model was to try out of the experimental assessment at the enrichment science classroom school in 2 times, suitability and possibility of this model with of three assessing committees, such as; a representative of science educationist, a representative from the Office of Upper Secondary School Service Area, and a representative from enrichment science classroom project. To administer with the 29 educational personnel, such as; a school administer, three persons from the basic educational committees, a head of enrichment science classroom project, 6 science teachers, and 30 talent science students, and 5 students parents were administered in this study.

The 4th Phase: Using the research instrument; *The Questionnaire on Enrichment Science Classroom (QESC)* were composed of 28 items in 7 assessment scales, minimum scoring is 5 and maximum score is 20. The scale namely as Heading Assessment, Purposing Assessment, Assessing Goal, Typing Assessment, Assessor, Criteria Assessment, and Information Communication User scales.

RESULTS

The results of this study are as follows.

The 1st Phase: A Learning Environment Assessment on the Enrichment Science Classroom at the Upper Secondary

The enrichment science classroom learning in the upper secondary school environments was administered by the policies of the Institute for the Promotion of Teaching Science and Technology (IPST) that it was aimed to recruit, develop and support talented personnel in science, mathematics and technology to build up the human resource foundation for the future, and to produce talented personnel in Science and Technology who will make innovations contributed to the development of Thailand. This project has followed the condition of the Basic Education Core Curriculum B.E. 2551 (A.D. 2008), to administer the Development and Promotion of Science and Technology Talents Project (DPST) of the DPST's centers with a sample of 240 talented science students from 8 enrichment science classrooms in 8 representative enrichment science classroom centers throughout Thailand. In terms of research instruments and science laboratory environment inventory, students were supported of their tuition fee waiver and allowance for personal expenses and books from the three supporting sources, such as; the Office of the Basic Education Commission of Thailand, personal expenses waiver fee, and academy student fund. This DPST project has been never assessed on learning management of enrichment science school classes.

The 2nd Phase: An Invention and Verification of the Structure of the Learning Environment Assessment on the Enrichment Science Classroom at the Upper Secondary

The structure of the learning environment assessment on the enrichment science classroom at the upper secondary of the Development and Promotion of Science and Technology Talents Project (DPST) as seven factors of the structural relative chart, namely, topic of assessment, assessing purposes, assessing goals, assessing methods, assessors, criterion assessment, and information users. Focused on the assessing goals, the synthesis of the efficiency indicators were to procedure as the 5 point factors, namely; management of administration, the foundational factors for management, learning management process, learning management production, and administering management of the DPST's centers (Figure 1).

Normally, the most important indicating seven factors was assessing goals and assessing methods that composed within 5 factors as learning management processes. In terms of the three steps for assessing methods were composed with the assessing steps, assessing instrument and time schedule for assessment.

The 3rd Phase: Using the Model: the Questionnaire on Enrichment Science Classroom (QESC) to Assess the Schools of the Enrichment Science Classroom

The first result of learning management administering assessment of the enrichment science classroom at the upper secondary educational schools were investigated, this research has found that the learning management processes and the administration of the DPST's centers as highest confidence level, learning management of students' outcomes was the high confidence level. In the other hand, the poorly confidence level has shown with indicators of the foundational learning management and learning management production factors (Figure 1).

Table 1 shows mean score, means, variance, and standard deviations of actual students' perceptions of their development of learning management of the enrichment science classroom at the upper secondary educational schools as the high confidence level (66.44%). In terms of comparisons between the actual score for developing scores of assessing students' outcomes, it has found that statistically significant different as the second actual scores evidence higher than the first actual score this was indicated that this development of the learning management assessment model shown to develop and confirm the enrichment science classroom at the upper secondary educational schools within the concurrent validity. The results given in Table 1 show that on average item means for each of the

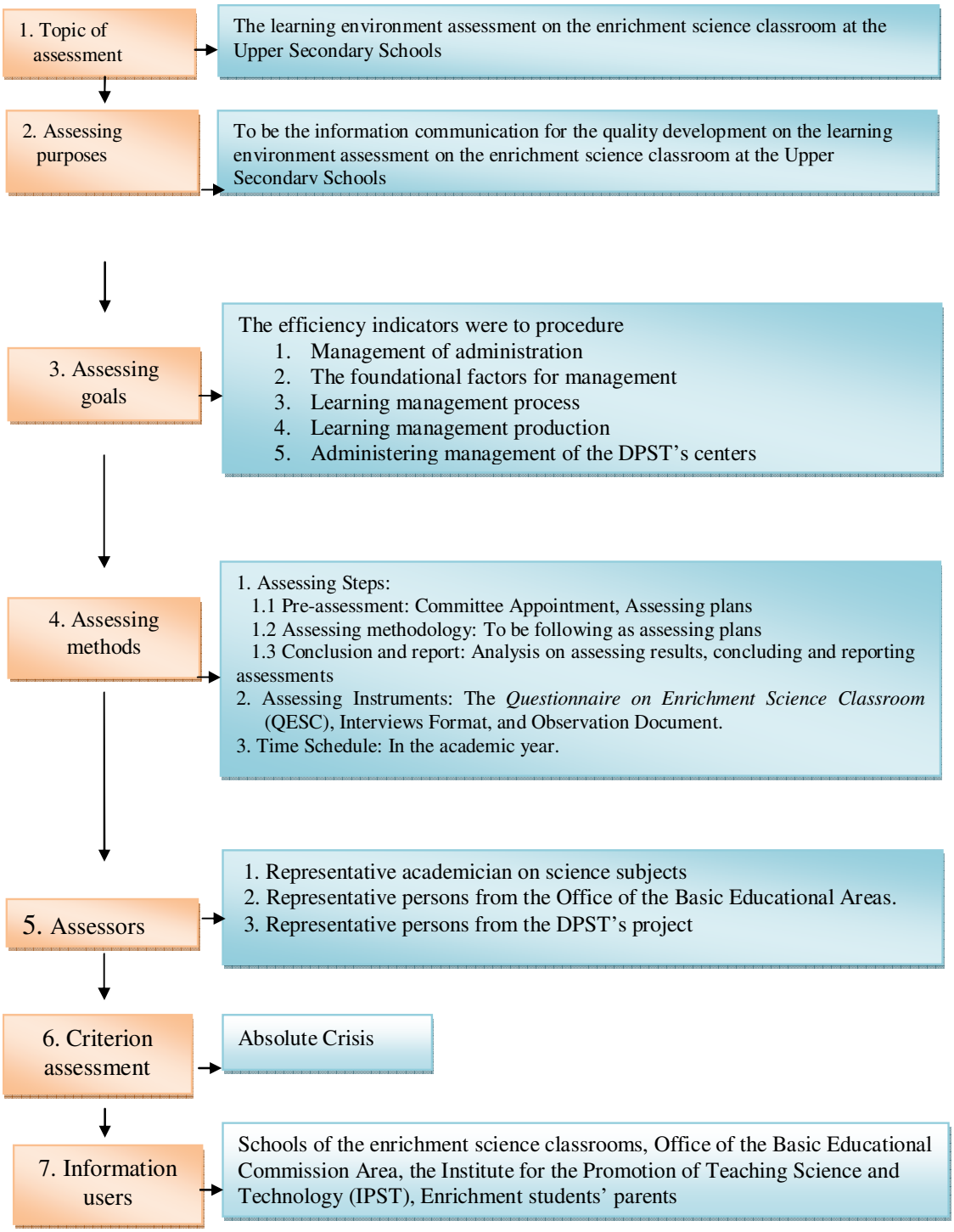

Figure 1. The learning management assessment model of the enrichment science classroom at the upper secondary educational schools

seven QESC scales, that they contain four items, so that the minimum and maximum score possible on each of these scales is 5 and 20, respectively. Because of this difference in the number of items in the seven 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 QESC. For the remaining seven scales, namely; *Topic of assessment, Assessing*

Table 1. Scale Mean Scores, Means, Variance, and Standard Deviations for Actual 1 and Actual 2 Forms of the QESC.

Scale	Form	Mean score	Mean	Variance	Standard validation
Topic of Assessment	Actual 1	13.21	3.30	0.43	0.19
	Actual 2	17.31	4.32	0.47	0.22
Assessing Purposes	Actual 1	12.56	3.14	0.58	0.33
	Actual 2	16.94	4.32	0.56	0.31
Assessing Goals	Actual 1	16.66	4.17	0.56	0.31
	Actual 2	18.84	4.71	0.55	0.30
Assessing Methods	Actual 1	15.09	3.77	0.57	0.33
	Actual 2	19.42	4.86	0.49	0.24
Assessors	Actual 1	16.50	4.12	0.66	0.44
	Actual 2	17.72	4.43	0.59	0.35
Criterion Assessment	Actual 1	14.36	3.59	0.56	0.34
	Actual 2	16.58	4.15	0.52	0.32
Information Users	Actual 1	14.23	3.56	0.57	0.35

purposes, Assessing goals, Assessing methods, Assessors, Criterion assessment, and Information users. The internal consistency reliability of the version QESC used in this study was determined by calculating Cronbach alpha coefficient for the 35 items of the SLEI using both actual and preferred environmental climates' perceptions scores. Table 2 reports the internal consistency of the QESC, which ranged from 0.64 to 0.81 when using the students' actual climate scores and from 0.70 to 0.85 when using the students' preferred climate scores. The QESQ was able to differentiate significantly (p<0.05) between students' perceptions in science laboratory environment. The *t-test* statistic which is the ratio of "between" to "total" sums of squares and represents the proportion of variance in scale scores accounted for class by membership, ranged from 2.51 to 21.74 for different scales, respectively.

Table 2 provides information about each scale's internal consistency reliability (alpha 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).

The 4^{thd} Phase: Learning Management Assessment Outcomes

The result of this phase was to confirmation of the learning management assessment model (*The Questionnaire on Enrichment Science Classroom* (QESC)) that it was invented and designed by researcher in this study. Using this model from experimental assessment to the two actual concurrently assessments, it has found that overall of this assessment was highest confidence level within the continually of possibility, truly, using and suitability factors, consequently.

DISCUSSION

The research of this study was developed the model of learning management assessment the *Questionnaire on Enrichment Science Classroom* (QESC) for assessing students' and components' perceptions on the quantitative data, and interviews and observations were qualitative data of this research.

The policy of the Institute for the Promotion of Teaching Science and Technology (IPST) has had an important project; the Development and Promotion of Science and Technology Talents Project (DPST) in 1984, this project aimed to produce talented personnel in Science and Technology who will make innovations contributed to the development of Thailand. Science and Technology play an important role in the development of the country and have become more and more important. Less and less science talented students enroll in the faculty of science. Most students choose the subjects which will lead to careers with high income e.g. Medicine, engineering. The DPST project encourages more students to choose

Table 2. Scale Internal Consistency (Cronbach alpha reliability), Discriminant Validity (Mean Correlation of a Scale with Other Scales) and Ability to Differentiate between Actual and Preferred Forms (ANOVA) for the QESC.

Scale	Form	Cronbach's alpha reliability	Discriminant validity	*t*-test	ANOVA Results (*eta*^{2})	Significant
Topic of assessment	Actual 1	0.64	0.76	15.39	0.23	0.00***
	Actual 2	0.70	0.76			
Assessing purposes	Actual 1	0.69	0.68	8.49	0.18	0.00**
	Actual 2	0.73	0.73			
Assessing goals	Actual 1	0.81	0.65	2.51	0.12	0.04*
	Actual 2	0.85	0.70			
Assessing methods	Actual 1	0.62	0.70	21.74	0.26	0.00***
	Actual 2	0.75	0.72			
Assessors	Actual 1	0.71	0.67	12.93	0.21	0.00***
	Actual 2	0.75	0.73			
Criterion assessment	Actual 1	0.71	0.74	8.92	0.19	0.00**
	Actual 2	0.80	0.77			
Information users	Actual 1	0.68	0.72	9.61	0.20	0.00***
	Actual 2	0.76	0.78			

*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.

science as their major by means of financial and academic supports to produce scientists/researchers in the fields of immediate need for the country and hope to produce 120 scientists/researchers each year. DPST centers are at the 8 upper secondary schools throughout of Thailand. The DPST students automatically enroll to their relative universities from 195 enrichment science classes from 195 upper education schools on enrichment programs in science and mathematics will enter the DPST Centre Universities. The Outcomes of DPST Projects provide more scholarships to study science and mathematics, the Ministry of Education promotes the science enrichment class. Pathways into DPST, enter the competition at the end of grade 9 to upper educational center school, and enter the competition at the end of grade 12 to the center higher educational universities.

To invent and check of the learning management assessment model for assessing the enrichment science classroom at the upper secondary educational schools were to relate of the structural chart on the 7 point relative factors, such as; topic of assessment, assessment objective, assessing goals, assessing method, assessor, criteria assessment, and information and communication user that this model was to development and synthesis from the developing thinking model of Nevo and Sirichai Kanjanawasee. In terms of the assessing goals were composed with the 5 point factor synthesizes and indicators of the efficiency of educational administration, such as; administrating management, fundamental factor of management, learning management outcome, and administration of learning management of DPST's centers that this model was developed and synthesized factors and affectingly administering indicators of the Office of National Education Standards and Quality Assessment (2012), the Institute for the Promotion of Teaching Science and Technology (IPST) (2007), Quality Assurance Division Education Bureau Hong Kong (2005), Japan Institution for Higher Education Evaluation (2013), and Korea Institute for Curriculum and Evaluation (2013) whereas the heart of educational reform on all countries

In terms of using the research instruments for assessing students' and partnerships' perceptions with the Questionnaire on Enrichment Science Classroom (QESC), Interviews format, and Observation document of the DPST project in the enrichment science classroom at the upper secondary educational schools, this research has found that the DPST's school projects were indicated that the affecting school climate as higher confidence level on learning management development. These determinants were to indicate disadvantage point for managing educational truly, knowing clearness, to be developed on simply understanding acknowledgement (Bardo and Hartman, 1982; Stoner and Wankel, 1986). The DPST schooling project was able to improve and

develop of their learning management, and developing students' project as conform to high quality and standardization on administration of learning management model of the enrichment science classroom, directly. This research results were revealed that this developing model was invented by researcher to concurrent validity, understandingly.

Assessment of the learning management model for the enrichment science classroom at the upper secondary educational schools were to worthiness, suitability, possibility, and supported the development of learning management on DPST schooling project. These school classes should be used the information communication for developing science skills and science processes of their learning achievement to their learning unity standards, and propriety standards, and accuracy standards were used that these standards are provided within the Joint Committee on Standards for Educational Evaluation (The Joint Committee on Standards for Educational Evaluation, 1994: Cite in Stufflebeam and Shinkfield, 2007). This assessing process was understood the indicating model to disadvantage point of educational management, directly. The enrichment science schooling classrooms with the DPST project were able to improve and develop, clearly. Students are provided their potential learning and achieving standardization with the learning management assessment model to their outcomes as the highest confidence level.

IMPLICATIONS FOR IMPROVING ENRICHMENT SCIENCE CLASSROOM IN THAILAND

This study has implications for enrichment science classroom students, science teachers, educators, the IPST, the DPST schooling project, administrators, and educational researchers in Thailand. The Questionnaire on Enrichment Science Classroom (QESC) was found valid and reliable to provide a means by which students' perceptions can be monitored by teacher to attempt to improve their classroom teaching practice and reviews of the administration of systematic educational reform of the DPST project. The Based on the findings, suggestions for improving the enrichment science classroom learning environment are needed. Science teacher should provide laboratory activities that promote enrichment science classroom cohesion, practical activities related to what students learn in theory classes, preview and connect to future classes, make a clearly organized plan for teaching, give definitions for vocabulary in science content, and vary the rate of delivery where appropriate.

SUGGESTIONS

Classroom environment research in Thailand is one of the reforms the Thai government has been providing in accordance with the Ninth National Education Development Plan (2002-2006) and the DPST schooling project has been built in 2008. Most of science teachers who are teaching in upper secondary education of enrichment science students in their classroom environments could improve their teaching by using the findings of this research. This present study is one of the first learning environment assessment studies in Thailand. The present research involved enrichment science students in upper secondary schools and the DPST schooling project; it could be replicated in different normal students who sat in the same educational grade level in government schools, private schools, religious affairs schools and demonstration schools of the university. Such study would provide information enabling a more comprehensive view for assessment of enrichment science classroom learning in Thailand.

Conflict of Interests

The authors have not declared any conflict of interests.

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