ANALYTICAL STUDY OF KNOWLEDGE PREFERENCE USING THE PEDAGOGICAL EPISTEMOLOGY OF EDUCATION FRAMEWORK OF QUANTITATIVE, QUALITATIVE, AND PERFORMATIVE KNOWING AMONG SECONDARY SCHOOL STUDENTS IN THAILAND

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Abstract

The basic research dilemma of the present study relates to the assumption that every individual can learn, not based on a personal innate intelligence but what and how a person learns to acquire intelligence. The investigation involved developing an instrument to detect the trait of basic knowledge through knowing factors that form a student's knowledge preference. Furthermore, the study attempted to analyze the association between knowledge preference and the student's nurturing culture and environmental influential factors. The assessment of tacit knowledge is to gain information that has been influent student's learning formally or informally. Student early characteristics of the knowledge learning preference can be derived from different sources of knowing, for instance, the biological heredity procession in family, language, thinking process, perception, and frames of thought. A test named the Knowledge Preference Test was developed, and it consisted of 50 items. It statistically received a reliability coefficient of 0.91. The study participants included 2 017 secondary school students in Thailand. The study found significant association patterns among knowledge preference, student biological and cultural status, and some areas of student achievement.
Key words: *basic knowledge, biological matrices, cultural matrices, learning styles, pedagogical epistemology of education, performative knowing, qualitative knowing, quantitative knowing.*

Introduction

A basic knowing is not uncommonly recognized by educators as a foundation of learning through sensational reception from the beginning of life, especially later on before and during the school age. However, in reality, societies surge the demands for school systems to focus on the otherwise. The cognitive status of basic knowing is that characterize a unique entity are its qualities; basic knowing yields qualitative knowledge: recognitive, acquaintive,

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and appreciative. When these types of knowing are considered from the learner's perspective, a certain requirement specifies the necessary and sufficient conditions of evident to judge that a learner has come to know. Furthermore, basic knowledge is the kinds of knowledge that a student processes from the beginning. It cannot be directly taught but it can be brought to realization. This fundamental asset, it gradually helps his/her learning be formulated a trait of preferences via teaching and the studenting process. The learning product is being delivered through education settings in the forms of quantitative, qualitative, and performative knowledge (Steiner, 1988). Including the basic and non-basic classifications of knowing, three kinds of the knowledge preference are elements for investigation in associations with student performances and personal backgrounds. Therefore, the framework of this study was derived from the work of Maccia (1973) in pedagogical epistemology of education model which had set forth the property in a theoretical characteristics and classifications of knowing.

An expecting required product of a pedagogical process is student learning as psychical development. The give-and-take process between teaching and studenting has evolved for individuals and societies from the beginning of humankind. Sources and contents of the pedagogical objective were often deterred by the contemporary demands of the society. However, different individuals and groups have and do hold different beliefs as to what is true, both with respect to what is good-for, good-of, what ought to be, and what it is. Different people do believe different things in a society. Yet one might observe that, in a sophisticated community immune from outside influences, all do embrace the same beliefs. There are as many schools of thought as people and everyone is locked into their own world of knowing. However, more often persons do not inquire but rather settle belief on the basis of tenacity or authority or reason, for few persons are possessed by the "will to learn" (Steiner, 1988, p. 27). Along the same line of thought as introduced by John Dewey in the *Logic: Theory of Inquiry*, 1938, acclaimed that influential factors of biological and cultural matrices of learning rooted due to their basic knowledge derivation of students which are influenced by biological factor and environment values. In an extension to these literatures, this study intended to discover the associational kinds of knowing and the influential matrices that are nurtured in students by family culture and the immediate environment.

Using the framework kinds of knowing, several questions were proposed attempting to settle and verify regarding knowledge preference under an assumption that there are different contents in the three kinds of knowledge (qualitative, quantitative, and performative) for learning preference. The properties of knowing as tacit knowledge were explicated and induced as a model for the conceptual framework of this study. Deductive kinds of knowledge were sorted into observational variables; the instrument items were categorized into factors according to its kind aiming to be validated, and employed to examine the associations among student achievement and status of student profiles.

General Background of Research

According to Dewey (1938), human thinking factors are conditioned by the matrices of biological necessity and cultural enforcement. Deductively, thinking and learning are dual processes of inquiry that nurture each other. Like thinking activity, learning profile may be shaped by consistent patterns of biological and cultural constraints. Human learning has been interpreted through many different approaches that often ignore influential factors related to human thinking. This study is also attempting to classify learning preference on the basis of what the learner perceives and interprets and how he or she conceptualizes knowing the information in the light of cultural and biological dimensions.

In environments where teaching and learning events take place, as part of the teaching-studenting process, learners receive information from teachers by means of various teaching

strategies used to present different subjects. As posited in Maccia's (1973) pedagogical epistemology theory, connecting to an educational process that includes objectives for bringing persons to knowing is patent. Knowing is viewed in light of tutorial requirements. According to Maccia (1973), from an epistemological perspective, knowing is classified into qualitative, quantitative, and performative knowing. Learning subject matter or knowledge becomes a product of perceptive knowing. In Maccia's view, the terms related to knowing can be reduced to operational properties that are observable and measurable. Thus, his theoretical proposition can be implemented in connecting learning preferences.

Culture on the other hand, according to Kroeber and Kluckhohn (1952), requires a definition in which learning is emphasized, as derived from the work of the anthropologist Wissler (1916), who was educated in psychology. Kroeber asserted that the evolution of culture's definition grows and that "cultural behavior is always learned behavior, but not all learned behavior is cultural; conversely, learning is only one of a number of differentia of culture" (p. 59). Despite the differences in cultural emphasis existing throughout education, Steiner (1988) cautioned that "some claim that there cannot be one true opinion, but that truth is relative to the individual or the culture. For example, most Americans believe it is true that competitive action is good but the other cultures may believe otherwise" (p. 10). The research on learning behavior should be considered in relation to the differences.

In order to familiar with the epistemology of education in learning preference framework, hereby, the proposition was being briefly explicated. Maccia (1973) had set forth the dimensions of knowing that constitute what he called "pedagogical epistemology" and further classified cognitive educational objectives in comparison with those of Bloom (1956) and Scriven (1967). The dimension of knowing is concerned with teaching in order to bring someone to know. According to Maccia (1973), knowing can be divided epistemologically into *knowing that one*, *knowing that*, *knowing how to do*, and *knowing what to do*.

Knowing that one and *knowing that* arise from the distinction between basic and non-basic knowing. The cognitive status of basic knowing is that of *knowing that one* rather than of *knowing that*. Since what characterizes a unique entity are its qualities, basic knowing yields qualitative knowledge. There are three types of qualitative knowledge: recognitive, acquaintive, and appreciative. When these types of knowing are considered from the learner's perspective, a definition specifies the necessary and sufficient conditions of measurement to judge that a learner has come to know.

Also, there are three types of non-basic *knowing that* can be defined from a tutorial perspective: testimonial knowing, structural knowing, and criterial knowing. Testimonial knowing appears to be a clear understanding of the evidence of testimony that rests on an adequate social theory of knowledge. Structural knowing or knowledge of structures assures a cognitive grasp that is more than mere recitation of facts. The condition of a learner is to be able to explicate or exhibit the material he has learned. The knowledge domain of criterial knowing is that of describing or explicating standards governing arguments, and such knowledge is philosophical. However, criticisms in the knowledge domains of art as well as science are domains of criterial knowledge.

The distinction between *propositional knowing* and *procedural knowing* has been scrutinized carefully in epistemological research. Based on the work of Lehrer and Paxon (1968), the semantics of knowing from a tutorial perspective has the propositional sense of *knowing what to do* as well as the procedural sense of *knowing how to do* something. Maccia has characterized four kinds of procedural knowing: protocolic, conventional, innovative, and creative knowing (see Schema 1).

Knowing how to do, or *protocolic performance*, involves smoothly executing a single-pathed performance where there is evidence of carrying out the required condition in one pass (e.g., the reactive character of motor conditioning). The *knowing how to do* of *conventional*

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performance involves being able to repeat or perform a multi-pathed execution knowing that the required conditions are met.

Knowing what to do involves a distinction between *innovative knowing* and *creative knowing* as propositional requirements. Knowing how to innovate involves integrating a performance into the whole of another performance. Learning to innovate is coming to know how to transfer pathways of one performance to another. From the propositional aspect, innovative know-how is setting forth procedural rules for doing a given thing in a different way. Knowing how to create involves transforming elements of a performance into another performance without including a part or all of the previous performance with respect to the new performance. Maccia (1973) noted that the innovative and the creative procedures are open-ended like the advancement of knowledge. They cannot be taught but only realized. However, the structures of realized innovation and creation can be taught. To be familiar with the classification and adequacy of knowledge preference based upon the dimensions of knowing as presented in Figure 1, the concept was operationally formulated using the notion of knowing and is briefly introduced and further discussed in the following section.
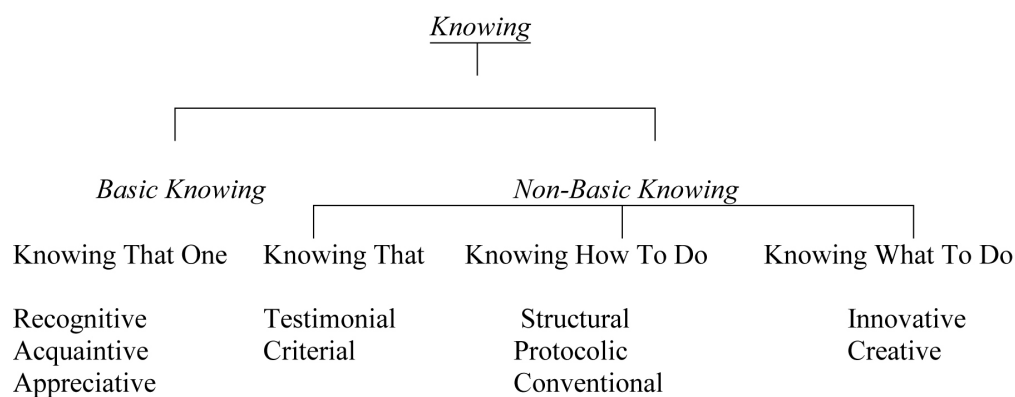

Figure 1: Dimensions of Knowing.

Knowing that one is a completely justified true belief about the quality of a singular state of affairs. Knowledge is manifested by enactment in the absence of justificatory statements of beliefs.

Recognitive knowing is discrimination of an entity as it is. It is manifested by denoting or selecting a singular object, person, universal, representation, or category.

Acquaintive knowing is discrimination of the qualities of entities and their connection that uniquely constitutes the configuration of a singular whole. It is manifested by iterating or selecting related parts that are peculiar to a singular object, person, universal, representation, or category.

Appreciative knowing is discrimination of the qualitative order of a singular entity with respect to relevant standards of qualitative ordering or with respect to a rank order of singular entities within a class of entities.

Knowing that is an undefeated, completely justified, true belief about the existential attributes of a state of affairs. Such knowledge is manifested by witness, evidential argument, or proof.

Testimonial knowing is an assertion warranted by good authority that establishes a person's right to be sure. It is manifested by referencing adequate authority as backing for truth claims. *Structural knowing* is an assertion that is warranted by evidential argument. It is manifested by assertions that characterize the force and reach of evidential claims. *Criterial*

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knowing is an assertion of the adequacy of an evidential argument, proof, or witness. It is manifested by assertions that characterize the force and reach of justificatory claims.

Knowing how to do involves smoothly executing some specified performance. It is manifested by completion of a performance in an appropriate manner that can be repeated. *Protocolic knowing* how to do involves smoothly executing a single-pathed performance. It is manifested by goal attainment through invariant sequences of movement.

Conventional knowing how to do involves smoothly executing a multi-pathed performance. It is manifested by goal attainment through adaptive sequences of movement.

Knowing what to do is specifying the manner by which some performance is altered in realizing a goal. It is manifested by mapping or iterating sequences for executing novel performances.

Innovative knowing involves transferring elements of one performance into another such that the latter performance is altered. It is manifested by improvising or inventing different ways for realizing the same goal.

Creative knowing involves transforming elements of performances such that a uniquely novel performance is realized. It is manifested by uniting disparate ways of realizing goals.

As illustrated by Maccia (1973), a given classification of cognitive educational objectives is achieved more adequately through a pedagogical epistemological perspective than through an educational psychology (Bloom, 1956) or a logical one (Scriven, 1967). Therefore, the knowledge preference that derives from an epistemological perspective can account for the characteristics of completeness, reducibility, and strength (Steiner, 1972).

In this decade, research on learning preference is not as active as compared to the past few decades, perhaps because of lack of interest in the compromise of the emerging new media technology. The recent argument on learning preference, reflected by Coffield (2004), was that it was relatively less important to design learning programs than matching the nature of the subject to individual learning preferences. However, the comment did not suggest to what extent the sources and content intended for individual learning preference were articulated, especially for the younger learners. With the new methods of using technology, the study by Constantindou and Baker (2002) suggested that the method of using visual presentation as pictorial model was advantageous for both of high or low learning preference, especially for verbal processing preference. It could lead to the argument that the visual materials may be so specific in presentation that it could be so limited on a certain context; and they may not covey to other alternative preference features. Perhaps, an adequate pedagogical theory in learning was not well examined so that learning preference has not been advanced into the satisfactory level of a better universally generalization for research exploration. The whole issue may need to be re-examined to expanding extended theoretical model.

Learning preference in educational research has been widely emphasized since the 1950s. The basic premise of learning style theory is that people differ in the domain where they learn best. This coincides somewhat with research in aptitude treatment interaction (ATI), wherein subjects who have a particular identified aptitude are observed in a specific type of environment and their performances are diagnosed. Learning preferences, which are a pervasive part of the personality, remain stable over time and cross content lines (Witkin, 1977). Witkin had characterized and claimed that general intelligence achievement has no relationship with certain types of learning preference.

The main question addressed in learning preferences research focuses on effective strategies for learning that can be maximized for all students. In 1890, Chamberlin suggested that the search for instructional methods has often proceeded on the presumption that there is a definite patent process through which all students can be put so as to arrive at results that maximize their potential excellence. Hence, the pedagogical inquiry of "the special values of different method; and what the several advantageous applicabilities are in the varied work of

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instruction" has arisen (Chamberlin, 1965, p. 757). These observations were originally written over one hundred years ago, but the same issues are still being addressed today by learning preference researchers.

According to Ferrel (1981), in educational settings, *aptitude* is generally termed *learning preference*. The underlying assumption in this approach is that students learn best if they are arranged in an educational environment that matches their preferred learning preferences. Every classroom teacher knows that students are unique individuals, and educators and teachers should design instruction accordingly. Regarding instruction, Keefe (1979) observed that "previous efforts have been unsuccessful because they were based on a false epistemology, on a misunderstanding of how students learn" (p. 124). Until now, with emerging new technologies and ideas, a need for powerful epistemology in education to serve school communities vividly stands out. Clarification and refinement of the understanding of learning preference can be attributed to work in the epistemology of education (Maccia, 1976). Decades later since mid 70's, an appropriate extension of more adequate theory of knowledge for the development of an effective model to respond to individual learning preference was worth attempting.

Methodology of Research

This study focused on accomplishing two tasks: first, to develop an instrument having a highly acceptable statistical reliability and second, to analyze the data to settle answering the statement of the proposed problems including (1) is there a relationship between knowledge preference and school academic achievement? (2) Is there a difference in the knowledge preference associations with family backgrounds of students? (3) Is there a difference in knowledge preference related to student biological gender? And (4) is there a relationship between biological left- or right-handedness and knowledge preference? To confirm the answers to the problems, statistical procedures were employed and designed to analyze and verify an outcome. This study was intended on secondary school students in Thailand for a sole purpose of the familiarity in setting and their literacy ability in communication that the study result could yield for a better generalizability. Schools were randomly selected, and the participants in the study volunteered. According to the research designed, the study was interested in the basic knowledge profiles imbedded in students that lead them to comfortably learn the subject matters, the observational data was based on student self-reports.

From the onset of the framework, for relevancy, the operational terms were drawn out and searched for through the literature and recently done studies. There was no study implemented from such a framework. Discussion with colleagues, short written essays about learning experiences by volunteer students, and interviews with teachers and students were part of developing the instrument for a pilot study. SPSS was a statistical tool for the standardized instrument. The reliability procedure, RELIABILITY, was applied for item analysis technique and computed the reliability coefficients. Cronbach's alpha value and standardized item alpha reliabilities were computed for each item, scale, and subscale constructing the Knowledge Preference Test (KPT).

To analyze the data for this study, several SPSS procedures were also applied. Descriptive procedures, DESCRIPTIVES, helped to illustrate the characteristic description of the survey. Variance analysis procedures of DISCRIMINANT and ANOVA were used to examine differences between/among determinant variables and also used to identify the differences among background groups and independent variables. A criterion of the statistical significant level of confidence was predetermined at 0.05.

Correlation analysis procedure of CORRELATIONS computing Pearson correlation matrices was used to determine the coefficient values of associations among student learning profiles. Students' learning achievement and learning profiles used self-reported grade point

averages (GPAs) in each subject area and cumulative GPAs as the analyzing units. For investigating a relationship between a student learning profile and his/her biological linkage to knowledge preference, correlation analysis was used to determine coefficient values of the relationship between learning preference's profile and student biological gender and the use of hands and arms. The linear discriminant function provides the criterion for minimizing the probability of misclassification from a multivariate normal population (Norusis, 1990), so in this study, the analysis was used for differentiating gender groups.

Instrument and Procedures

After the pilot study, the final product was an instrument of 50 items that were developed and designed to focus on detecting student learning perception of self-analytical knowing. This instrument can be administered to an individual or a group. The instructions given to the students suggested they pay attention to read each statement and respond truthfully. A student does not need to spend a lot of time on each item but rather clearly react to the first impression that triggers him/her to fall within the given scenario situation. There were three scales that consisted of 10 subscales and five questions on each subscale. Using a Likert scale, each question offered five possible responses based upon the degrees of comfort for a respondent regarding the perception of that matter that most fitted his/her preference. Respondents would choose from:

(1) It does not inspire me to grasp the matter (or have no interest in the matter),
(2) It inspires me a little to grasp the matter (or have a little interest in the matter),
(3) It inspires me to concern about the matter but I'm not intent to pursue the matter,
(4) It inspires me to consider the matter and like to pursue it if there is an opportunity, or
(5) It so inspires me to investigate the matter and I am willing to learn more.

Students were also asked to tell about themselves and completed answering personal information responding to the given choices for GPA, age, gender, family income, dialect spoken, and school location. In addition, they were asked whether they were right- or left-handed in writing, throwing, and arm strength. Participants in the present study included 2,017 secondary school students. The respondents that showed no variation or incomplete the necessary questions were eliminated, so the analysis of the study consisted of 1,770 students. According to Gorsuch (1983), for this type of study, a minimum ratio should be five respondents to every item and a minimum of 100 subjects for any analysis.

The questionnaire was reviewed and approved by the review board and administrators before being distributed to students. A version of the questionnaire written in Thai was delivered in person or by mail to the school setting. Participating schools were conveniently selected which was considered a warranted of cultural differences. Questionnaire administrators were instructed through written instructions or discussion sessions. One period of 30 minutes was suggested to answer the questions, a total of 50 items. Concerning on the clarification of the terminology and intended question, subject advised to ask the test administrator for better understood.

Over a period of 16 months, final data collection was concluded to be audited and verified using the SPSS package. Some minor incomplete data were included in the master data file, but in some cases, they would be automatically eliminated through the statistical procedures. The descriptive statistic procedures were used providing descriptive information.

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Data Analysis

Constructing the Knowledge Preference Test (KPT) Results

The analysis of the instrument construction, the study revealed that the overall reliability coefficient of the Knowledge Preference Test (KPT) was 0.91. The reliabilities of qualitative knowing (QUALIT), quantitative knowing (QUANTI), and performative knowing (PERFOR) were 0.80, 0.71, and 0.87, respectively. The five items of each subscales of QUALIT were recognitive knowing (RECOGN), acquaintive knowing (ACQUAI), and appreciative knowing (APPREC) yielded reliability coefficients of 0.63, 0.60, and 0.58. For the subscales of QUANTIT, testimonial knowing (TESTIM), structural knowing (STRUCT), and criterial knowing (CRITER) were 0.55, 0.51, and 0.69. For PERFOR subscales of innovative knowing (INNOVA), creative knowing (CREATE), protocolic knowing (PROTOC), and conventional knowing (CONVNT) were 0.66, 0.66, 0.63, and 0.80. From the analysis, the results confirmed that the KPT was statistically reliable to measure the designed content. However, each subscale that consisted only five items could reflecting that smaller item could yield lower coefficient of reliability but it should not be acceptable if it lower than 0.30.

Results of Research

The Associations between Knowledge Preferences and Student Status Results

The initial analysis is to determine the associations between knowledge preferences and academic achievements, geographical representations, family monthly incomes, family spoken dialects, genders, and preference of using hands. The analysis of variance determined the difference among student achievement levels with the knowledge preferences and also student statuses affecting biological and cultural factors. Those variables included residential region, family spoken dialect, family income, school setting, and the preferences in hand for writing, throwing, and lifting.

To verify the relationship between the knowledge preference and student achievement, the self-reported GPA, ranging from 1.00 to 4.00, was classified into four levels: (1) low, (2) moderately low, (3) moderately high, and (4) high. Using self-reported GPA as a criterion of student achievement, the survey found that the GPA was significantly correlated to the family income and school districts. There were significant differences at the 0.01 level of confidence in each subject area and the overall. In every category, female performances were statistically significantly higher than that of males. It was revealed that GPA was significantly different to QUANTI and CRITERI with their F-values of 5.22 and 5.14, respectively, and where the higher achievement groups had higher average scores (see Table 1).

Table 1. Means Comparison of Student Achievement in GPA.

	Male	Female	Mean	F-value	Sig.
GPA: Overall	2.63	2.83	2.7	37.11	0.00
Thai Language	2.58	2.91	2.77	85.21	0.00
Social Study	2.68	2.87	2.79	22.16	0.00
Physical Educ.	3.02	3.22	3.14	29.43	0.00
Science	2.53	2.78	2.67	29.78	0.00
Career Educ.	2.94	3.38	3.19	118.09	0.00
English Lang.	2.45	2.87	2.70	82.09	0.00
Mathematics	2.41	2.58	2.51	11.56	0.00

In addition, there were significant differences among achievement levels with respect to cultural variables, such as geographical region, spoken dialect, family income, and school district at the 0.01 level of confidence, where their F-values were 16.23, 8.04, 5.14, and 10.41, respectively. Regarding family income, there was a pattern that indicated students from the higher income family attained better grades than students from the lower income family. For hand preference, only among English-language achievement levels was there a significant difference in throwing objects at the 0.01 level of confidence and an F-value of 5.68. Students using the right hand and both hands had higher GPAs than those with a left hand preference.

Regarding the analyses of achievement in each subject area associated with knowledge preference, the Thai language GPA was significantly correlated to ACQUAI and CRITER at the 0.01 level of confidence. Also, it was significantly correlated to residential region (REGION) and family spoken dialect (DIALEC) at the 0.01 level. Social study achievement was significantly correlated to CRITER and REGION at the 0.01 level. English language achievement had a similar profile in relation to CRITER. As presented in Table 3, there was a significantly reverse correlation between English subject achievement and the INNOVA. Unlike science, mathematics achievement was significantly correlated to the APPREC, CONSTRU, QUALIT, and QUANTI at the 0.01 level of confidence. Science achievement also showed a significant correlation to DIALEC.

Physical education achievement was significantly correlated to QUALIT and APPREC at the 0.01 level. As shown in Table 2, art and craft achievement was significantly correlated to QUALIT, PERFOR, and KNOWIN at the 0.01 level of confidence. Especially, in regard to these variables, it had significant correlations to all subscales in PERFOR: INNOVA, CREATI, PROTOC, and CONVENT at the 0.01 level. Art and craft achievement was also significantly correlated to the RECOGN, REGION, and hand preference in writing (WRITIN).

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Table 2. Correlations between Achievement Levels with Knowledge Preferences and Student Status.

	GPA	THAI	SOCIAL	PHYS	SCIEN	CAREER	MATH	ENGLISH	ART
RECOGN	0.005	0.004	0.006	0.036	0.007	0.035	0.049*	0.033	0.076**
ACQUAT	0.050*	0.062**	0.034	0.061*	0.036	0.010	0.040	0.025	0.017
APPREC	0.042	0.037	0.034	0.062**	0.048*	0.034	0.078**	0.041	0.057*
TESTIM	0.023	0.000	0.009	0.007	0.010	0.028	0.043	0.002	0.044
STRUCT	0.046	0.001	0.004	0.052*	0.017	0.027	0.088**	0.026	0.056*
CRITER	0.083**	0.081**	0.070**	0.049*	0.075**	0.033	0.060*	0.063**	0.025
PROTOC	0.040	0.027	0.031	0.001	0.020	0.014	0.022	0.066**	0.063**
CONVEN	0.058*	0.051*	0.023	0.022	0.033	0.041	0.010	0.054*	0.153**
QUALIT	0.025	0.021	0.032	0.015	0.053*	0.022	0.039	0.011	0.090**
QUANTI	0.037	0.046	0.030	0.075**	0.041	0.041	0.075**	0.010	0.077**
PERFOR	0.007	0.001	0.002	0.033	0.005	0.006	0.038	0.037	0.122**
KNOWIN	0.023	0.026	0.010	0.048*	0.023	0.012	0.056*	0.005	0.096**
REGION	0.054*	0.111**	0.071**	0.000	0.049*	0.059*	0.030	0.027	0.078**
LANGUA	0.040	0.141**	0.061*	0.031	0.099**	0.047*	0.015	0.053*	0.048*
INCOME	0.222**	0.199**	0.162**	0.136**	0.230**	0.135**	0.083**	0.203**	0.073**
WRITIN	0.011	0.001	0.012	0.012	0.022	0.014	0.038	0.023	0.065**
THROWI	0.022	0.011	0.027	0.017	0.034	0.023	0.013	0.021	0.043
STRENG	0.021	0.023	0.038	0.019	0.039	0.029	0.028	0.057*	0.008
REGION	0.199**	0.249**	0.229**	0.196**	0.255**	0.208**	0.091*	0.176**	0.094**

Note: * = Significance Level at 0.05   ** = Significance Level at 0.01
REGION = School Region, DIALEC = Family Spoken Dialect, INCOME = Family Income,
KNOWIN = Knowledge Preference Scale, QUALIT = Qualitative Knowledge Scale,
QUANTI = Quantitative Knowledge Scale, PERFOR = Performative Knowledge Scale
RECOGN = Recognitive Knowing Subscale, ACQUAI = Acquaintive Knowing Subscale,
APPREC = Appreciative Knowing Subscale, TESTIM = Testimonial Knowing Subscale,
STRUCT = Structural Knowing Subscale, CRITER = Criterial Knowing Subscale,
INNOVA = Innovative Knowing Subscale, CREATI = Creative Knowing Subscale,
PROTOC = Protocolic Knowing Subscale, CONVEN = Conventional Knowing Subscale.

Analyses of Variance in Subject Area of Achievement levels and Knowledge Preferences

The Thai language (THAI) was significantly different than ACQUAI and CRITER at the 0.01 level, where their F-values were 8.82 and 11.20, respectively. Social study was significantly different than CRITER at the 0.01 level, where its F-value was 8.08. Students with higher achievement in social studies attained higher scores on CRITER (see Table 3).

Regarding physical education, there were significant differences at the 0.01 level of confidence in QUALIT, QUANTY, and KNOWIN, where their F-values were 22.43, 12.58, and 4.83, respectively. Physical education (PHYS) was shown to be significantly different in three of its subscales: ACQUAI, APPREC, and CRITER at the 0.01 level, where their F-values

were 9.37, 13.20, and 10.76, respectively. Furthermore, in QUANTI, there was a significant difference between achievement levels where the higher achievement groups had higher average scores.

In science, there were significant differences at the 0.01 level of confidence in CRITER, and its F-value was 4.47. In mathematics, there was a significant difference at the 0.01 level of confidence in QUANTI and CRITER, where its F-values were 4.09 and 4.94, respectively, and the higher achievers had the higher scores. Concerning career studies, there were significant differences at the 0.01 level of confidence in CRITER and CONVEN, where their F-values were 7.70 and 4.78, respectively. However, in CONVEN, the moderate-low and moderate-high achievers had the highest scores, but the highest achiever had the lowest.

With English language, there were significant differences at the 0.01 level of confidence in APPREC and CRITER, where their F-values were 4.18 and 4.40, respectively. The moderate-low and moderate-high achievement groups had the highest scores on APPREC, and the low achiever group had the lowest. In CRITER, the higher achievement groups had higher average scores than the lower. In art and craft, there were significant differences at the 0.01 level of confidence in KNOWIN, ACQUAI, APPREC, CRITER, and INNOVA, where their F-values were 4.46, 8.61, 10.23, 5.73, and 4.99, respectively.

Table 3. The Knowledge Preference Mean Scores and Overall Grade Point Average (GPA).

GPA	RECOGN	ACQUAI	APPREC	QUALIT	TESTIM	STRUCT	CRITER
1	12.23	13.71	13.52	39.47	14.21	13.15	13.36
2	12.04	13.50	13.46	39.01	12.78	12.28	13.53
3	12.04	13.74	13.80	39.59	13.30	12.69	13.99
4	11.69	13.80	13.76	39.25	13.28	12.50	14.36
Total	11.97	13.69	13.68	39.36	13.18	12.55	13.93

GPA	QUANTI	INNOVA	CREATI	PROTOC	CONVEN	PERFOR	KNOWIN
1	40.73	12.47	16.39	15.78	11.92	56.52	136.73
2	38.60	11.82	15.39	15.23	11.08	53.54	131.17
3	39.99	12.26	15.46	15.60	11.31	54.65	134.23
4	40.15	12.48	15.20	15.08	10.69	53.46	132.87
Total	39.67	12.19	15.41	15.39	11.13	54.14	133.18

Note: 1 = low GPA, 2 = moderately low, 3 = moderately high, 4 = high

Associations between Knowledge Preference and Family Background

As presented in Table 1, cultural background of students included the residential region, spoken dialect, and family income. As for geographical representation of the six residential regions, the northeastern region had the highest number of participants as over one half of the country's population is located in this area. The diversity of local culture and speaking dialects in the northeast are much more different in comparison with other regions. The survey sample showed the proportion of males (41.15%) to females (58.85%) reflected the national population ratio.

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The family average monthly income was classified into six categories from low to high. The self-reported figure indicated that 50% of participants had income relatively higher than the national average, and 18% had income lower. The family spoken dialects that could be a barrier for verbal expression to conforming with the central national mandated that was different of student using at home was classified into ten usages. It was often a contributing factor to some learning activities for a student who would be forced to adjust in the classroom. As reported in Table 3, the majority (55.9%) of respondents spoke the written Central Thai dialect. The Northeastern has several dialects: Laos, Cambodian, Sauy, and Korat, a total of 18.2%. However, Cambodian and Sauy are totally different in vocabulary, wording, and syntactic structure with the rest of the other dialects. Northern and Southern dialects are spoken by 8.1% and 9.5%, respectively. The far eastern and far western regions, where dialects are closely common to that of the Central dialect, each reported 3.1%. Some other dialects share in varying degrees the vocabulary and toning of the standard Thai central dialect.

Table 4. Distributions of Genders and Family Spoken Dialects.

Speaking Dialects	Female		Male		Total	
	#Cases	%Frequency	#Cases	%Frequency	#Cases	%Frequency
Others	16	0.9	21	1.2	37	2.1
Northern	113	6.3	30	1.8	143	8.1
Laos	159	8.8	101	5.9	260	14.7
Cambodia	2	0.1	1	0.1	3	0.2
Sauy	5	0.3	4	0.2	9	0.5
Korat	26	1.5	24	1.3	50	2.8
Central	538	29.5	452	26.4	990	55.9
Far East	32	1.8	23	1.3	55	3.1
Far West	26	1.4	29	1.7	55	3.1
Southern	119	6.7	49	2.8	168	9.5
Total	1036	58.5	734	41.5	1770	100

Analysis of variance between knowledge preference with the three variables of INCOME, REGION, and DIALEC, the main effects for all scales showed significant differences at the 0.01 level of confidence, where their F-values were 5.86, 4.16, and 4.93, respectively, See Table 6. There was only one main effect regarding the STRUCT subscale that was not significantly different as a cultural factor. With respect to the spoken dialect variable, the analysis found that there were significant differences to QUANTI and PERFOR, where the F-values were 3.00 and 4.56, respectively. Also, there were significant differences with ACQUAI, INNOVA, PROTOC, and CONVEN, where F-values were 3.10, 3.94, 4.54, and 3.31.

In ACQUAI, students who spoke the Sauy, Southern, and Far East dialects were among the highest average scores, whereas students who spoke the Cambodian and Far West dialects had the lowest scores. This finding indicated that students with high scores would respond well when the subject content involved identifying the configurations of unique objects, persons, and any indescribable feature. In INNOVA, students who spoke the Sauy and Southern dialects had the highest average scores, whereas students speaking the Cambodian, Far West, Far East, and Northern dialects were among the lowest scores. This result suggested that students who had higher scores preferred to deal with learning materials involving what needs to be modified in existing ideas or practices into other forms.

As shown in Table 5, regarding PROTOC, students who spoke the Southern and Sauy dialects had the highest average scores, whereas students speaking the Cambodian dialect had the lowest score. Students with the higher scores would prefer learning contents related to how to make up new models or forms. Last, in CONVEN, students who spoke the Southern and Sauy dialects had the highest average scores, and students who spoke the Laos dialect had the lowest score. It could be concluded that students who spoke the Southern and Sauy dialects would do better in dealing with learning materials related to modifying existing procedures or routines to fit in with other situations.

Table 5. Analysis of Variance on Knowledge Preference Subscale Associations with Regions, Spoken Dialects, and Incomes.

Source of Variation	df	Mean-Sqr	F-Ratio	Sig.
Main Effects (RECOGN)	18	17.01	2.076	0.005
REGION	5	37.68	4.599	0.000
DIALEC	8	18.42	2.249	0.022
INCOME	5	1.40	0.172	0.973
Main Effects (ACQUAI)	18	52.33	6.177	0.000
REGION	5	114.99	13.575	0.000
DIALEC	8	23.10	2.727	0.005
INCOME	5	29.27	3.455	0.004
Main Effects (APPREC)	18	43.81	4.994	0.000
REGION	5	111.83	12.747	0.000
DIALEC	8	20.52	2.339	0.017
INCOME	5	16.65	1.899	0.092
Main Effects (TESTIM)	18	13.69	1.320	0.165
REGION	5	15.14	1.460	0.200
DIALEC	8	7.08	0.683	0.707
INCOME	5	15.35	1.480	0.193
Main Effects (STRUCT)	18	36.34	4.705	0.000
REGION	5	75.29	9.748	0.000
DIALEC	8	12.27	1.589	0.123
INCOME	5	26.26	3.401	0.005
Main Effects (CRITER)	18	55.89	6.467	0.000
REGION	5	128.85	14.907	0.000
DIALEC	8	17.50	2.025	0.040
INCOME	5	32.09	3.713	0.002
Main Effects (INNOVA)	18	31.61	3.412	0.000
REGION	5	36.70	3.961	0.001
DIALEC	8	31.24	3.371	0.001
INCOME	5	16.50	1.781	0.114
Main Effects (CREATI)	18	43.61	3.183	0.000
REGION	5	97.40	7.110	0.000

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DIALEC	8	33.69	2.459	0.012
INCOME	5	6.33	0.462	0.804
Main Effects (PROTOC)	18	67.81	5.582	0.000
REGION	5	131.56	10.829	0.000
DIALEC	8	76.39	6.288	0.000
INCOME	5	8.43	0.694	0.628
Main Effects (CONVEN)	18	54.00	4.170	0.000
REGION	5	79.30	6.123	0.000
DIALEC	8	41.40	3.197	0.001
INCOME	5	23.71	1.831	0.104

Table 6. Analysis of Variance on Knowledge Preference Scale Associations with Region, Spoken Dialect, and Income.

Source of Variation	df	Mean-Square	F-Ratio	F-sig.
Main Effects (KNOWIN)	18	2629.09	6.188	0.000
REGION	5	5554.09	13.073	0.000
DIALEC	8	2007.16	4.724	0.000
INCOME	5	511.66	1.204	0.305
Main Effects (QUALIT)	18	264.41	5.865	0.000
REGION	5	675.97	14.994	0.000
DIALEC	8	133.24	2.955	0.003
INCOME	5	78.64	1.744	0.121
Main Effects (QUANTI)	18	171.29	4.165	0.000
REGION	5	362.77	8.820	0.000
DIALEC	8	81.86	1.991	0.044
INCOME	5	66.64	1.620	0.151
Main Effects (PERFOR)	18	649.95	4.934	0.000
REGION	5	1143.28	8.679	0.000
DIALEC	8	633.36	4.808	0.000
INCOME	5	123.46	0.937	0.456

Knowledge Preference and Student Biological Gender

There are differences related to student gender in knowledge preference. According to the analysis, females were superior to males in every category of academic achievement. But for the knowledge preference score, the average male score was significantly higher than the female score at the 0.01 level, where the F-value was 24.95. Through discrimination analysis on the knowledge preference scores to determine the classification power of groupings between males and females, it was found that females were more predictable than males. A total of 66.7% of cases were correctly classified as females, whereas 58.1% of males were correctly classified.

In analysis of each scale of knowledge preference at the 0.01 level of confidence, there were significant differences between males and females in QUANTI and PERFOR, where the F-values were 22.14 and 36.01, respectively. It was found that six subscales were also significantly different. There was no significant difference in QUALIT; however, within this scale, RECOGN was found to be significantly different where the F-value was 23.43.

In QUANTI, there were significant differences between males and females at the 0.01 level of confidence, where the F-value was 22.14. The male average mean score was higher than female. Also, there were significant differences in TESTIM and CONSTR. In PERFOR, there were significant differences between males and females and in all subscales, and the male average score was significantly higher than the female score.

Table 7. Comparison of Variance Analysis between Students' Gender and Learning Preference Scales and Subscales.

Variables	df	Sum-Sqr	F-Ratio	F-sig
Main Effects on KNOWIN	1	10992.26	24.95	0.000
Main Effects on QUALIT	1	24.84	0.52	0.471
Main Effects on RECOG	1	189.72	23.43	0.000
Main Effects on ACCQUI	1	4.03	0.45	0.501
Main Effects on APPREC	1	45.99	5.08	0.025
Main Effects on QUANTI	1	933.50	22.14	0.000
Main Effects on TESTIM	1	344.30	33.25	0.000
Main Effects on STRUCT	1	166.67	21.28	0.000
Main Effects on CRITER	1	0.83	0.09	0.763
Main Effects on PERFOR	1	4805.08	36.01	0.000
Main Effects on INNOV	1	156.36	16.59	0.000
Main Effects on CREATI	1	267.26	19.42	0.000
Main Effects on PROTOC	1	275.44	21.93	0.000
Main Effects on CONVEN	1	569.76	43.76	0.000

Relationship between Biological Left- or Right-Handedness and Knowledge Preference

Hand-use preference in regular routines is an inductive way to observe factors related to biological influence that may reference brain function. This study designated the way that subjects used their hands in writing, throwing, and lifting as inferential of brain orientation. The survey revealed that the left hand was used by only 3.2% for writing, 6.5% for throwing objects, and 7.5% for lifting heavy objects. The survey found for comfortably using both hands were 0.8% for writing, 6.5% for throwing, and 8.6% for lifting.

There were significant correlations at the 0.01 level of confidence on two scales and five subscales for hand preference in throwing an object. There were significant correlations on two scales and one subscale for hand preference in lifting a heavy object (see Table 8). Hand preference in throwing objects had a positive significant correlation with QUALIT and PERFOR and with the subscales ACQUAI, APPREC, CREATI, and PROTOC. No correlation was found with hand preference for writing.

In variance analysis, there were significant differences between hand-preference groups in throwing objects with QUALIT and PERFOR at the 0.01 level of confidence, and their F-values were 6.76 and 7.29, respectively. Students who comfortably used both hands equally had

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the highest average score, and those who were right-handed had the lowest average score. The same pattern was found on the ACQUAI, CREATI, and PROTOC subscales. However, with CRITER, the left-handed students had the highest average score, and the right-handed students had the lowest score. For hand preference in lifting heavy objects, there was no significant difference among the knowledge preference scales and subscales.

Table 8. Relationship and Correlation Coefficients among Preference of Hand Use and Learning Pattern Scales.

	WRITING	**THROWING**	**STRENGTH**
KNOWIN	0.0151	0.0932**	0.0564*
QUALIT	0.0037	0.0896**	0.0581*
RECOGN	0.0078	0.0512*	0.0376
ACQUAI	0.0097	0.0789**	0.0433
APPREC	0.0053	0.0740**	0.0537*
QUANTI	0.0319	0.0555*	0.0412
TESTIM	0.0157	0.0398	0.0039
STRUCT	0.0187	0.0172	0.0341
CRITER	0.0366	0.0616*	0.0498*
PERFOR	0.0135	0.0860**	0.0490*
INNOVA	0.0152	0.0515*	0.0047
CREATI	0.0080	0.1051**	0.0272
PROTOC	0.0006	0.0690**	0.0599*
CONVEN	0.0253	0.0561*	0.0667**

Note: * = Significance level at 0.05
      ** = Significance level at 0.01   (2tailed)

In summary of the analysis, the study first task was to develop an instrument having a highly acceptable statistical reliability coefficient at 0.91. And the second task was to analyze the data to settle answering the statement of the proposed problems: (1) there was no significant relationship between knowledge preference and school academic achievement. (2) There was a difference in the knowledge preference associations with family backgrounds of students. (3) There was a difference in knowledge preference related to student biological gender. And (4) there was relationship between biological left- or right-handedness and knowledge preference.

Discussion

The instrument, the Knowledge Preference Test, was confirmed and statistically verified as acceptable in evaluating knowledge preference through student self-perception that were reliable and sufficient to identify student learning profile. Student achievement, overall GPA, showed some degrees relating to the divisions of knowledge but found no statistically significant association. It was reflecting the earlier mentioned claiming by Witkin (1977) that knowledge preference and student achievement was likely independent. Regarding the results from examining the subscales of knowledge preference with GPA and each subject area, there were a few subscales significantly associated. Concerning the answers to the cultural and biological matrices, the results confirmed there were relationships to every knowledge scale and subscale

except for one. The finding indicated that differences in cultural background contributed to the various preferences in different kinds of knowledge. There are differences in student gender in knowledge preference on the quantitative and the performative scales and on six subscales. There were some relationships between left- or right-handedness and knowledge preference in hand use in throwing an object but not in writing.

As the assumption claimed by Witkin underlined that student intelligent inferring to school achievement was not likely factored associating to student learning styles. It was found in this study that learning preference only a couple subscales showed some association with self-report GPA. Knowledge preference in parallel to 'learning style or willing to learn' was considered an embedded trait of a student learning preference that it is a satisfactory resolution to anticipate in school curriculum activities. A comfort zone could be considered an important factor for student willing for engagement. As practice in general, school systems emphasized quantitative cognition subject areas such as mathematics and science to demonstrate the highest value of success. And in many societies, it was so institutionalized of quantitative approach to the point that some students decided to drop out because it was so far off to their comfort zone. As portrayed by the *Frontline* PBS TV Series programs aired on September 25, 2012 entitled "Dropout Nation" that students were at risk in crisis and the daily struggle to graduate in one of the Houston school system, Apollo 20 project. Basically, nearly 50% of students were dropout through the path of 4 years high school requirement.

Quantitative knowledge falls under the category of a cognitive condition which requires the ability for generalization, inductive or deductive roles of thought. The results indicated that the scale and subscale variables were associated to and differentiated from various student statuses, income, spoken dialects and family culture. Especially, spoken dialect or language code usages showed significant differences in grading achievement. Basically, variations of language usage in Thai leaded to stereotype reflecting in some degree of social segregations. Many schools and in classrooms would seek ways to discipline students who misspoken standard Thai dialect. This stereotype could become a force to limit or retreat from personal liberty procession in expressing publicly. Students often tend to afraid of mistake in speaking correctly and avoid moments of embarrassing when they asked to talk in front of the class. This 'avoidant' behavior would not only likely affect student achievement but also emotional disturbance which it is 'willing to engage'.

Reflecting the findings, qualitative and performative knowledge that involved other sensational mental dialectic along with cognitive analogue ability interacted to various activities. Therefore, qualitative and performative knowledge that requires additional mental dimensions (e.g., esthetic, recognition, appreciation, passion, attitude, or will power) executing physical activities that should be considered for attention in educational process. For example, to better a given learning goal toward creative, innovative, protocolic, or conventional knowledge, so the curriculum should be considered integrating contents and activities that suited recognizing in qualitative and performative knowledge as parts of success by system.

As mentioned in the review of related studies, this instrument could further lead to wider discovery of a variety of alternative needs for curricula by identifying an individual's talent in a wider spectrum, with it the least complicated learning diagnostic instrument available for individuals or a classroom setting. Practically, a teacher could have found a student who had an extraordinary score on the conventional knowing subscale of the performative scale. He or she would be encouraged to try out in performing tasks such a repeated multiple-pathed execution activities. This person could comfortably engage in physical movement skills (e.g., designing, drawing, singing, dancing, drama, spelling, gymnastics, or recognition skills in observation). In case of a student with an exceptional recognition ability found, school should also be ready to seek an accommodation for this student to enhance her/his performance. For instance, in case if a student embedded with talent to recognize a unique characteristic in nature (e.g.,

being able to identify unique orders of features, texture, smell, quality of color, taste, design, crafts, or drawing and so on), she/he should yield a high score in the area of qualitative knowledge preferences. As mentioned earlier, this knowledge cannot be taught directly but it can be structurally brought to grasp through realization.

There may be some limitations concerning the instrument itself. For example, the structural knowing subscale in quantitative knowledge may contain item(s) incurring face validity regarding terminology used. The terminology may be inappropriately selected to fully communicate with younger students. Further analysis and revision may help to enhance it for better understood. Furthermore, the framework using kinds of basic and non-basic knowing as the model in this study was the very first theoretical interpretation attempted to associate students learning preference. The actual implementation for teaching and learning instruction or curriculum put in place for classroom would be the next step proving that any change in energetic learning or school dropout was significance.

Conclusions

Overall, the diagnostic instrument yielded high reliability in performing a valid task to identify the student traits of knowledge preference, and it can be used by teachers or administrations. The score from this instrument should validly reflect the self-reported knowledge preference of a student. A school system or teacher could be able to match student needs by using or designing various methods, instructions, subject matter, and programs that would accommodate students' biological and cultural backgrounds. Each type of knowledge, quantitative, qualitative, and performative should regard as equally preference connecting to student basic knowing. The epistemology of education model of knowing could be brought to trial or experimented; at least it should identify some trouble learners who were desperately needed to help to retain themselves in the school system.

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