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Student's Perceived Level and Teachers' Teaching Strategies of Higher Order Thinking Skills; A Study on Higher Educational Institutions in Thailand

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Abstract
Higher order thinking skills (HOTS) has portrayed immense industry demand and the major goal of educational institution in imparting education is to inculcate higher order thinking skills. This compiles and mandate the institutions and instructor to develop the higher order thinking skills among students in order to prepare them for effective performance and meet the employers' expectations (Heong at all,2011). Role of teaching strategies plays vital role in such inculcation where students can analyze, interpret, reason out, synthesize, evaluate and create. The current study signifies the perceptual understanding of higher order thinking skills of the graduate passing through the higher educational institutions in Thailand. The study also contributes to the literature with bridging the conceptual gap with examining the relationship between Teachers' professional components with teaching strategy of higher order thinking skills. The study has explored the perceived level of HOTS among students and its difference between genders. It has also attempted to know the teaching strategies for the inculcation of HOTS being practiced in Thailand and its relations with teachers' professional component such as designation, educational qualifications, teaching experience, research experience and training and workshop exposure. The research participants into the study are 126 teachers and 659 students. This incorporates survey within various courses of leading International higher educational institutions and universities in Bangkok. Two survey instruments was employed; the first survey was administered on teachers intending to measure the teaching strategies to impart higher order thinking skills and teacher's professional component. The second; instrument has undertaken the Mazaro's rubric for specific task and situation to assess the perceived level of higher order thinking skills among students. The finding of the study revealed that students have shown medium level of higher order thinking skills. The teachers are using more knowledge development and application strategies. The teachers' professional components such as designation, teaching experience and qualification are significantly correlated with strategies used for imparting higher order thinking skills. Based on the observation study has furnished suggested measures and future dimensions of the research.
Key words: Higher order thinking skills, Teaching Strategies, Teacher's Professional component.

1. Introduction

Higher order thinking skills has portrayed immense industry demand and the major goal of educational institutions in imparting education is to inculcate higher order thinking skills. This compiles and mandate the institutions and instructors to develop the higher order thinking skills in order to prepare their students for effective performance and meet the employers' expectations (Heong at all,2011). It is a need of 21st century where student learn more than reading, writing or numerical ability and responsiveness, they are rather required to possess Higher Order Thinking skills such as critical literacy, critical numeracy and cross-cultural competencies (Foester, 2004). Higher order thinking skills allow students to see the concept holistically and make the student reflect the effective thinker's attitude. The effective thinker attitude is distinguished with meta-cognitive abilities; they possess underlying traits and values (Ritchhart, 2002). Smith (2013) asserted that they are curious, skeptical, open minded, and mentally flexible, able to revise their belief in light of new evidence. Being analytical and persevering they think deeply about the issues; being sensitive to the context, they think broadly and see "big-picture". Teaching strategies that propagates Higher Order Thinking Skills among students leads to increase meta-cognition (Robert and Erdos,1993). Hence strategies should comply with effective

thinker's attitude. The higher order thinking skills can be facilitated in two context, first where the thought process are needed to solve the problems and make everyday decisions and second, where mental process are needed to benefit from instruction, including comparing, evaluating, justifying and making inferences (Wheeler and Haertel,1993). Role of teaching strategies plays vital role in such inculcation where students can analyze, interpret, reason out, synthesize, evaluate and create. Teaching higher order thinking skills required time and persistent effort of the instructor which may be contextually strengthen and conceptually analyzed. Jere Brophy (1992) emphasizes, teaching and higher order thinking requires commitment to class-discussion, debate and problem solving, all of which take time. Teaching involves inducing conceptual change in students, not justifying information into a vacuum and it will be facilitated by the interactive discourse during lessons and activities. Clear explanation and modeling from the teachers are important, but so are the students' opportunities to answer questions about the content and discuss or debate with meaningful implications or application in authentic problem solving or decision making context. Teaching strategies are important in the context of higher order thinking skills inculcation. Teachers' involvement in creating participative culture during the course of learning plays important role in students' conceptual interpretations, analyzing capabilities and problem solving abilities and in reconstruction of thinking. In addition to several other research (Constrantinon and Kuy (2013); Karami, Pakmehr and Aghili (2012); Thitima and Sumalee (2012); Saido,Siraj and Nordin, (2015) the current study focuses to explore the students' perception of the their higher order thinking level and various higher order teaching strategies being practiced by the instructors of the higher educational institutions in Thailand . The study has also investigates the relationship between teachers' professional component such as educational qualification, designation, teaching and research experience, training and workshop exposures with the HOTS teaching strategies.

2. Literature Review

2.1 Higher Order Thinking Skills: In order to explore the construct of higher order thinking skills. Piaget's1936 development stages were pioneer for the cognitive development phenomenon. Piaget (1936) relates age with learning style and gives adulthood as mental picture of being logical, reasoned and understanding of self reflection and critical thinking. Bruner in support introduces new concept as "spiral curriculum" in which learner reflect the previous learned topic in new context and new information interface. The HOTS literature got remarkable value addition when Bloom's (1956) taxonomy came with three domains as cognitive, affective and psychomotor. It introduce the higher order thinking skills which had five levels of the thinking such as remember, understand, apply, analyze and evaluate though this taxonomy got revised by Anderson and Krathwohl (2001) with addition of one more level with create. Marzano's and Kendal (2007) has given new taxonomy in order to explore complex thinking they introduced various new domain and relate each level of difficulty with their respective process, retrieval, comprehension, analysis, knowledge utilization, meta-cognition, self study thinking where the difficulty depicted from lower to higher level. Goethals (2013) in his paper gives brief review on Higher Order Thinking Skills and summarizes the definitions of higher order thinking for past fifteen years.

Table 1

Source	Year	Definition
King et al.	1998	" (It) includes critical, logical, reflective, meta-cognition, and creative thinking. (it is) activated when individuals encounter unfamiliar problems, uncertainties, questions or dilemmas.
NCTM	2000	"Solving a routine problem"
Anderson and Krathwohl	2001	The processes- analyze, evaluate and create.
Lopez and Whittington	2001	"(It) occurs when a person takes a new information and information stored in memory and interrelates and or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situation.
Weiss E.	2003	"…..the strategy- the setting of meta objectives; where as critical, systematic and creative thinking are the tactics- the activities needed to achieve the proclaimed objectives.
Miri et al.	2007	"…the strategy the setting of meta-objectives; where as critical, systematic and creative thinking are the tactics- the activities needed to achieve the proclaimed objectives.

Rajendran N.	2008	The expanded use of the mind to meet new challenges.
Thompson, T.	2008	"Non-algorithmic thinking"
Thomas , A. and Thone, G.	2010	"……(it) takes thinking to higher levels than just restating the facts. (It) requires that we do something with the facts. We must understand them, connect them to each other, categorize them, manipulate them, put them together in new or novel ways, and apply them as we seek new solutions to new problems."
Kruger, K.	2013	It involves " concept formation, critical thinking, creativity/ brainstorming, problem solving, mental representation, rule use, reasoning and logical thinking.

Source: Goethals (2013)

On the above explanation various dimensions have been observed. It is assumed that instructional strategies that impart the higher order thinking skills have to be designed from knowledge acquisition to reflection. The instructors should starts with shaping the knowledge and then gradually indulge with students in creation of thinking perspective. Appropriate teaching strategies and learning environment that facilitate growth in thinking level often leads to reasoning, evaluating, problem solving, decision making and analyzing situations. Teaching higher order thinking skills is when the students

- Visualize a problem by diagramming it.
- Separate relevant from irrelevant information in a word problem.
- Seek reason and causes.
- Justify Solutions.
- See more than one side of a problem.
- Weigh sources of information based on their credibility.
- Reveal assumptions in reasoning.
- Identify bias or logical inconsistencies.

Marzano's higher order thinking skills elaborated various dimensions of learning. This says that learning process involves the interaction of following five types of thinking;

- Positive attitude and perception about learning.
- Thinking involved in acquiring and integrating knowledge.
- Thinking involved in extending and refining knowledge.
- Thinking involves using knowledge meaningfully.
- Produces a habit of mind.

Marzano dimensions of learning focuses on 13 skills of higher order thinking skills which are defined as follows;

1. Comparing: Identifying and articulating similarities and differences among items.
2. Classifying: Grouping things into definable categories on the basis of their attributes.
3. Inductive reasoning: Inferring unknown generalization or principles from information or observation.
4. Deductive reasoning: Using generalization and principles to infer unstated conclusions about specific information or situations.
5. Analyzing errors: Identifying and articulating error in thinking.
6. Constructing Support; Building systems of support for assertions.
7. Analyzing Perspectives: Identifying multiple perspectives on an issue and examining the reasons or logic behind each.
8. Abstracting: Identifying and articulating the underlying theme or general pattern of information.
9. Decision Making: Generating and applying criteria to select from among seemingly equal alternative.
10. Investigation: Identifying and resolving issues about which there are confusions or contradictions.
11. Problem Solving: Overcoming, Constraints or limiting Conditions and that are in the way of pursuing goals.
12. Experimental inquiry: Generating and testing explanations of observed phenomenon.
13. Invention: Developing unique products or processes hat fulfills perceived need.

Several researches have investigated the phenomenon of higher order thinking skills is various levels (Heog, Othman and Yunus, 2011and Fisher, Bol and Pribesh, 2011).

2.3 Teaching strategies of Higher order thinking skills :

The various strategies being facilitated in different level of learning gives different learning and behavioral outcome where students may take cognition from one level to another level. There is earnest need of specific

instruction to develop the thinking skill. Ivie, S.D. (1998) asserted that teachers should address analysis, evaluation and synthesis using advance organizers that encourage students to operate at higher level of abstraction. Strengthening cognitive structures helps students retain information longer and assumptions provide students with basic structure on which to build new concepts. Various literature have studied that the environment and purposely teaching promote the higher order thinking skills (Miri, David and Uri, 2007). Rajendran N. (2001) asserted that imparting higher order thinking skills and attitude, continuous professional development of teachers; framework of teaching thinking and the taxonomy and terminology of teaching thinking. Though, meta-cognitive strength of the teachers also contributes to the practice of teaching higher order thinking skills (Zohar , 2009). Marzanos (2000) has given three systems; self system, meta-cognitive and cognitive systems making knowledge as fundamental dimension. These, literature has explained the conceptual dimensions of the higher order thinking skills and explored in the context of individual case and various other conceptual investigations. These studies however have not investigated the direct relationship between the teacher's professional component such as Educational qualification, teaching experience, designation, research experience and training and workshop exposure. This has also found that the current conceptual investigation has not been explored in the context of Thailand Higher education. Hence the current research is attempting to bridge the above identified gap.

3. Objective of the study

1] To explore the perceptual status of the level of higher order thinking skills among the graduates in higher educational institutions in Thailand.
2] To know the gender difference of eight skills of higher order thinking skills.
3] To examine the relationship between age, gender and higher order thinking skills.
4] To know the frequency of application of the various higher order thinking strategies in the various courses of the higher education's institutions.
5] To explore the relationship between teachers experience, designation and educational qualification with higher order thinking skills teaching strategies.

4. **Methodology**

The study being descriptive and empirical in nature consists of the survey method. The two sample groups have been studied and surveyed for the empirical investigation of the relationships and status brief. The four leading higher educational institutions in Thailand have been taken as area of study in Thailand. The appropriate sample calculation at 99 % confidence interval is 643 though, the current survey has utilized 659 students who are in final year of their graduation degree; are undertaken as students respondents and 126 instructors who are involved in teaching of these students have been taken as respondent for instructional strategies. The purposive convenient sampling has deployed to obtain the respondents. The students' respondents have shown complete participation with 31 percent of male and 69 percent of female participation. The statistical design of the study includes descriptive statistics, t- test, and correlation coefficients. The SPSS version 21 has been used for statistical analysis.

5. Instruments

5.1 Description of the Survey 1: The survey 1 was observed on students. The first sections has taken their demographic information where age, gender and educational discipline being taken, The second part has measured their perceived level of higher order thinking skills, Marzano's special Task or situation of rubric used with 27 items which was developed on the basis of Marzano's 13 higher order thinking skills. The scale was observed on 4 point scale response. The obtained reliability and validity scores for each skill are depicted in Table- 1. The obtained score for the entire scale is showing that the internal consistencies are in acceptable level.

5.2 Description of the Survey 2: The survey 2 has observed on teachers. The first part of which has taken demographic factors and professional component such as age, gender, educational qualifications teaching and research experience, training and workshop exposure etc, the second part has asked the preference of the teaching method the teachers incorporates and third sections has 22 items which has been exclusively developed as instructional strategies based on Marzano's taxanomy instructional strategies being enforced for assurance of each level thinking inculcation among the students. The four dimensions of teaching strategies; knowledge, cognitive, meta-cognitive and self system have been identified for the scale construction. The strategy of knowledge has measured through 6 items, such as "I organize the content structure in such a way that students knowledge flows from fundamental to specialized perspective of the course", cognitive dimension has been measured by 8 items such as "I encourage student to consider different and diverse perspective involved in and around topic", Meta-cognitive teaching strategies by 5 items such as "I insist my student to think on their thinking with several thinking exercises" and self service strategies with three items such as "I enhance students' ability to reach the expected level of proficiency for a skill or process. The reliability and validity

observed for the current scale is given in Table-2. All the observed score for the all the dimension and the entire scales has reported with high range of alpha values and validated.

Table 2 - Summary on Reliability and Validity

Scale	**No of items**	**Cronbach's**	**KMO**	**Chi-**	**DF**	**Sig**
Student's Scale						
Entire Scale	27	.81	.86	3067.01	300	0.00
Teacher's Scale						
Entire Scale	22	.97	.87	3737.28	231	0.00
Knowledge Strategies	06	.92	.86	619.62	15	0.00
Cognitive dimension strategies	08	.93	.85	816.63	28	0.00
Meta-cognitive system	05	.91	.86	450.29	10	0.00
Self System Strategies	03	.85	.70	179	3	0.00

Sources; Primary data analysis

6. Results

6.1 Section 1

To obtain the results for the first objective the descriptive statistics had performed and the range of the skills which has considered is as 1.0- 2.0- low; 2.1-3.0-medium and 3.1-4.0 as high. The statistical results revealed that many of the students have perceived themselves in the medium level for the comparison, classification, analyzing perspectives, problem solving, experimental inquiry, invention, error analysis, constructing support, induction, investigation, information processing standards and effective communication where as abstracting and decision making have reported with low level of higher order thinking skills. Although none of the skills have reported high level of the skills.

Table 3: Students perceived level of higher order thinking skills

Higher Order Thinking Skills	Mean	Std. Deviation	Level
1. Comparison	2.75	.84	medium
2. Classification	2.76	.75	medium
3. Abstracting	1.69	.94	low
4. Analyzing Perspectives	2.61	.82	medium
5. Problem Solving	2.67	.75	medium
6. Experimental Inquiry	2.69	.77	medium
7. Invention	2.76	.79	medium
8. Error Analysis	2.53	.62	medium
9. Constructing Support	2.64	.60	medium
10. Induction	2.73	.60	medium
11. Decision Making	1.76	.66	low
12. Investigation	2.64	.59	medium
13. Information Processing Standard	2.71	.63	medium
14. Effective Communication	2.76	.50	medium

Source; Primary Data Analysis

The independent t-test has been taken to know the gender difference among the various skills of higher order thinking skills. The statistical inferences have revealed four skills; problem solving, error analysis, information processing standards and effective communications has shown difference among the gender. Though, all the ten skills have not shown difference between the two. The observed mean difference for both the gender has not reported major difference.

Table 4: Gender difference of higher order thinking skills:

	Male		**Female**		
	Mean	St. deviation	Mean	St Deviation	Sig
Comparison	2.80	.90	2.73	.81	.68
Classification	2.69	.90	2.79	.75	.35
Abstracting	1.80	.94	1.63	.93	.47
Analysing Perspectives	2.81	.72	2.69	.75	.80
Problem Solving	2.81	.72	2.60	.75	**.02**
Experimental Inquiry	2.81	.75	2.63	.77	.27
Invention	2.79	.78	2.74	.80	.49
Induction	2.73	.52	2.72	.60	.49
Error Analysis	2.52	.57	2.53	.65	**.04**
Constructing Support	2.61	.59	2.65	.61	.45
Decision Making	1.77	.63	1.75	.67	.64
Investigation	2.58	.59	2.67	.58	.73
Information processing standard	2.68	.58	2.72	.65	**.04**
Effective Communication	2.75	.45	2.76	.52	**.02**

Source; Primary Data Analysis

6.2 Section 2

The descriptive statistics revealed the fact that instructors are practicing more knowledge development and application strategies, where as other dimensions of the strategies such as cognitive development, meta-cognitive development and self-system development strategies are being practices equally as these three has not shown major mean difference.

Table 5: Descriptive on Teaching Strategies for Higher Order Thinking Skills

S.No	Dimensions of Teaching Strategies	Mean	Std Deviation
1.	Knowledge Development and Application Strategy	4.01	1.06
2.	Cognitive Development Strategy	3.65	1.10
3.	Meta-cognitive System Development Strategies	3.67	1.09
4.	Self-System Development Strategies	3.69	1.03

Source; Primary Data Analysis

The table 6 depicts the statistical investigation on the relationship between Designation, Experience of Teachers, Educational Qualification Training and Workshop Exposure, Research Experience and HOTS teaching strategies. The empirical investigations revealed that higher order thinking skills teaching is significantly correlated with designation (r= 1.79, p<0.01), Teaching Experience (r=.06, p<0.01) and educational qualifications (r=.13, p.01). It has also been found that Research experience (r=-1.05, p>0.01) and Training and workshop exposure (r=-0.05, p>.01) are not correlated with the higher order thinking skills' teaching strategies.

Table 6: Correlations between Designation, Experience of Teachers, Educational Qualification Training and Workshop Exposure, Research Experience and HOTS Teaching strategies.

	Designation	Teaching Experience	Educational Qualification	Training and Workshop Exposure	Research Experience	HOTS Teaching Strategies
Designation	1					
Teaching Experience	.130	1				
Educational Qualification	.072	.150	1			
Training and Workshop Exposure	.112	.387**	.314**	1		
Research Experience	.122	.208*	.348**	.630**	1	
HOTS Teaching Strategies	.179**	.064**	.131**	-.105	-.050	1

*. Correlation is significant at the 0.05 level (2-tailed).,**. Correlation is significant at the 0.01 level (2-tailed).
Source; Primary Data Analysis

7. Discussion and Conclusion

The study has attempted to examine the perceived level of higher order thinking skills among the graduates who are passing students of their final stage of the degree and status quotient of teaching strategies. This has also examined its relationship with teacher's professional components. The fourteen skills which have been investigated among the students were; Comparisons, Classification, Abstracting, Analyzing Perspectives, Problem Solving, Experimental Inquiry, Invention and Error Analysis, Constructing Support, Induction, Decision Making, Investigation, Information Processing Standards and Effective Communication. Out of fourteen Decisions Making and Abstracting has shown low perceptual level. Although, only four skills Problem Solving, Error Analysis, Information Processing Standards, Effective Communication have shown gender difference. To analyze the overall gender difference for the higher order thinking skills boys have been rated with slightly high with girls. The current findings finds partially similar to the study by Heong el al, 2011. While investigating on the teachers' instructional strategies the study has measured 4 levels of instructional strategies based on Marzano's New Taxonomy. It has been observed that teachers' are practising more knowledge and application based strategies. Though, the other instructional strategies domains; such as cognitive development domain and self system domain has reported with equal application with minor difference in observed mean. While investigating the relationship between teachers' professional components such as educational qualification, designation, teaching and research experience, training and workshop exposure with teaching strategies of higher order thinking skills it has been found that 'designation', 'teaching experience' and 'educational qualification' significantly contributes to the teaching strategies of higher order thinking skills where as 'research experience' and 'training and workshop exposure' is not significantly correlated with the higher order thinking skills. This reflects the understanding that as the experience and career hierarchy grows the teaching intention of the higher order thinking skills also grows. However the a good researcher may not be a good teacher or mere attending and learning from the training and workshop may not contribute to practice of higher order thinking skills in the classroom and contribute to the teachers potential of practicing teaching strategies of higher order thinking skills in class rooms.

8. Managerial Implications and Suggestive measures

The current study signifies the status quotient of student perceived level and teachers' instructional strategies of higher order thinking skills in higher educational institutions in Thailand. This also contributes to the literature with investigating the relationship between teacher's professional components and their potential to practice higher order thinking skills. The study recommends the more application of meta-cognitive and self system teaching strategies so that along with gaining knowledge and application ability student may show meta-cognitive strength and self system awareness. The study also recommends the more experienced and qualified teachers' appointments with effective focus to career development measures.

9. Limitation and Future scope of the study

The current study has taken the quantitative approach of the conceptual investigation which lacks to investigate the in-depth difficulties and real time experiences of teachers while executing teaching strategies of higher order thinking skills, hence this may taken the longitudinal study , triangulation or qualitative approach to study. The study also reflects the limitation with the respondents' biasness and cost consideration.

The current study has taken the professional components to investigate the conceptual relationship though, institutional environment, students' personality characteristics and parent's involvement, teachers' personal characteristics such as intrinsic and extrinsic motivations, personality characteristics, job commitment may also be taken as further scope of the study in the inculcation of higher order thinking skills in coming generation. The cross cultural and multinationals differences may also be taken as dimensions for the future scope of the research.

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