

## Factors Affecting a Thai Student's Higher Order Thinking Skills (HOTS)

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**Abstract:** In Thailand, higher-order thinking skills (HOTS) have become an essential element in early student education. However, the most recent assessment results from older student PISA results show a continuing downturn in Thai student problem-solving and analytical thinking skills abilities. Therefore, this study set out to investigate which factors play a role in increasing Thai student HOTS by use of a mixed research method to combine elements of both qualitative and quantitative research approaches. From the qualitative review of the literature and theory and a determination of which elements were established to contribute to student HOTS, the study made use of quantitative analysis from the input from 14 educational experts. After the identification of the ongoing problem with low Thai student PISA scores and the assessment's connection to HOTS, the authors set out to identify, synthesize, evaluate and analyze which factors played a role in Thai learner HOTS. From the qualitative analysis, eight elements were identified including *classroom atmosphere*, *achievement motivation*, *the internal locus of control (ILCO)*, *parenting*, *achievement*, *reasoning ability*, *attitude towards learning*, and finally, *scientific personality*. Of the eight elements, the *classroom's atmosphere* was judged to be the most important. This was followed closely by a student's *ILOC* and *parenting*. Furthermore, from the input of the 14 educational experts, four main categories were identified including *classroom atmosphere*, *achievement motivation*, *internal locus of control*, and *parenting*. From the analysis of these four categories and their related 16 elements, *democratic parenting* was judged to be most important for the development of a Thai student's higher-order thinking skills. This was closely followed by *rational parenting* and *loving and supportive parents*.

**Keywords:** Achievement motivation, classroom atmosphere, internal locus of control, parenting, Thailand

### 1. Introduction

Various scholars have discussed higher-order thinking skills (HOTS) as a cognitive attribute of humans that utilizes complex and profound thinking strategies through the interpretation of multiple core thinking skills at each step of the processing of knowledge and experiences to answer a particular question (Zohar & Schwartz, 2005). Therefore, student cognitive thinking requires basic experiences and knowledge, which is developed from learning (Shaffer, 1985). Consequently, every individual should be allowed to develop HOTS as these skills can lead to a higher level of intelligence (Heong et al., 2012). Therefore, the goals of today's education should be aimed at developing and enhancing students' HOTS, which allows them to apply their knowledge, understanding, and analysis of problems to decide on a solution or find a creative way to live happily in society. Mongkhondao (2015) also added that Thai educators have a responsibility to repeatedly teach students to think with reasoning, analysis, synthesis, evaluation, and/or creation.

Therefore, educational institutions play a crucial role in the development of the HOTS curriculum (Prayoonsri et al., 2015), which also have the responsibility to provide and manage HOTS student resources. Moreover, students should be trained to use the power of argument and thinking skills in education (Ritter et al., 2012). Also, learning is generally understood as the process of acquiring new knowledge. Furthermore, in cognitive psychology it has been established that there is a strong relationship between learning and thinking as thinking skills are central to higher-order cognitive learning (Ritter et al., 2012; Seel, 2012). Furthermore, Hyytinen et al. (2019) has added that today's universities are dedicated to improving student scientific thinking in part by improving their capacity to think critically.

Additionally, findings from numerous studies have confirmed that HOTS is essential for learners in the 21st Century and negatively affect learner outcome when HOTS is not taught (Pahdi et al., 2020; Saïdo et al. 2017). In Malaysia, Daud et al. (2019) added that *collaborative learning* also positively affected HOTS education for math students. Similarly, in Indonesia Kusaeri et al. (2019) and Pahdi et al. (2020) showed that students who lack

HOTS could not solve math problems with multiple answers or provide reasons. Likewise, Abdullah et al. (2015) in Malaysia once again noted the weakness of students in *correlating information* and *implementing strategies* used in solving math problems involving HOTS. The reasons are similar to the findings of Hadi et al. (2018) in Indonesia in which students were found to lack HOTS, *problem-solving skills*, and are were not able to *solve complex problems*. However, Darling-Hammond et al. (2020) has reported that educators can further support student learning by providing strategies and tools that reduce cognitive load and free the mind's attention for higher-order thinking and problem-solving. Additionally, the National Research Council (NRC) has also indicated that the kind of learning supporting HOTS is best developed through *inquiry* and *investigation*, *knowledge application* to new problems and situations, *production* of ideas and solutions, and *problem-solving collaboration* (Pellegrino & Hilton, 2012)

The Thai Ministry of Education (MOE) has also announced a policy in the national education plan that serves as a goal to develop learners, which aims to develop every learner to have attributes and learning skills required for a 21st Century knowledge worker. Thus, the support and focus will be on the learning that helps students with critical thinking and problem-solving skills to develop HOTS (Office of the Education Council, 2017). Similarly, the supervision and management of the educational system in Thailand's capital Bangkok are under the responsibility of the *Bangkok Metropolitan Administration* (BMA). The stated roles of the BMA concerning education are to emphasize the importance of education management and to develop basic and high-quality education for children. Moreover, in the past focus was given to developing thinking skills in every aspect especially the development of high-quality HOTS that is recognized internationally.

However, when the resulting quality of education is considered, Bangkok students still have obvious problems with HOTS, according to the 2018 OECD report released in December 2019 on Thai students' competency assessment conducted by the *Program for International Student Assessment* (PISA) (Mala, 2019). According to various scholars, international assessment studies such as PISA is a good tool to determine student HOTS achievement levels (Apino & Retnawati 2017; Brookhart, 2010; Jaelani & Retnawati, 2016). Therefore, in Thailand from the 2018 PISA assessment round, it was found that the scores were lower than the average among OECD member countries in reading, math, and science, which has been reported to be caused by Thai students' lack of reading, thinking and problem-solving skills. In these 2018 results, Thailand ranked 53rd in science and 57th in math out of a total of 78 countries (54<sup>th</sup> for both in 2015) (Kenan Foundation Asia, 2019). The results are also consistent with the Thailand National Quality of Education Test (O-NET), in which the National Institute of Education Testing of Thailand reported that the results in mathematics, science, and English as a whole have not been satisfactory. About 50% failed to pass the average in every subject due to the lack of HOTS and inability to answer complex questions. As a result, numerous Thai scholars and educators have undertaken research to probe which factors contribute to the successful development of Thai student HOTS (Budsankom et al., 2015; Mongkhondao, 2015).

Likewise, as previously discussed with studies from other countries and regions, researchers are also trying to determine which factors affect HOTS. Thus far the authors have identified the following from their studies: 1) *classroom atmosphere* 2) *achievement motivation* 3) *internal locus of control* and 4) *parenting* (Lim & Smith, 2008; Marshall & Horton, 2011; O'Tuel & Bullard, 2001; Pascarella et al., 2013). It also suggested that to develop HOTS, they should be applied to suit the context of the area because learners in each context are different. In this regard, it is important to study the opinions and suggestions from educators and researchers in that area.

Therefore, the authors wish to examine and assess the factors identified from the qualitative analysis of the theory and literature that potentially have the greatest impact on Thai student HOTS studying under the educational authority of the *Bangkok Metropolitan Administration* (BMA). The research results can be used as guidelines for student development and educational planning as well as used to improve the strategies and quality of educational institutions to develop students' HOTS.

### 1.1. Research Objectives

(1) From the qualitative analysis the authors intend to select factors that are compatible with the theory and literature concerning a Thai student's HOTS.

(2) From the use of a purposive sampling technique a panel of education experts will be selected to evaluate and give input using a semi-structured interview process.

(3) From the use of the experts' input, content analysis will be undertaken.

## 2. Methodology

Creswell and Clark (2017) have suggested that a mixed research method entails a combination of qualitative and quantitative research elements. Thus, the authors divided the research into two primary phases consisting of phase 1's synthesis of HOTS literature and phase 2's expert input and analysis.

## 2.1. Phase 1

Phase 1 entails the synthesis of factors affecting HOTS of students studying under education authority from Thailand's BMA. This step is to research principles, theories, and academic journals from internationally recognized publishers using the research synthesis process (Pimdee, 2020).

## 2.2. Phase 2

In Phase 2 the authors conducted interviews with 14 educational experts who were authorities on Thai student HOTS. The education experts who participated included one individual who was a policy level administrator within Thailand's Office of Basic Education Commission (OBEC), one policy level administrator within the BMA's education department, two supervisors within the BMA's Primary Education Offices, four BMA area school administrators, four teachers within the BMA area's elementary level schools, and two scholars in the field of learning arrangement. A semi-structured interview script was designed using approaches and factors affecting HOTS from the research works previously discussed.

## 2.3. Content Analysis

From the experts' input after Phase 2, five additional experts were tasked to verify and check the completeness of the items to be used for data collection. In this phase of the content analysis, these experts determined the presence of keywords, ideas, or general concepts within the text collected (Oryan & Gastil, 2013). This then allowed the authors to quantify and analyze the presence, meanings, and relationships of the key elements (Mayring, 2015).

## 3. Findings

Results from the factors affecting student HOTS were divided into two sections consisting of the Section 1 synthesis from the qualitative review of the literature and theory and the related HOTS elements and Section 2's interview results from 14 educational experts.

### 3.1. Section 1's Synthesis of the HOTS Components

Table 1 presents an overview of the results of the synthesis of factors affecting Thai student HOTS. From this analysis, eight primary elements were identified from the literature including *classroom atmosphere*, *achievement motivation*, *the internal locus of control (ILCO)*, *parenting*, *achievement*, *reasoning ability*, *attitude towards learning*, and finally, *scientific personality*. Of the eight elements, the *classroom's atmosphere* was mentioned most in the literature as important to the development of a student's HOTS. This was followed closely by a student's *ILOC* and *parenting*.

**Table 1.** Qualitative analysis results of elements affecting Thai student HOTS

HOTS elements	Lim and Smith (2008)	Fearon et al. (2013)	Richmond and Serna (1980)	Moneta and Siu (2002)	Lather et al. (2014)	Brown and Freeman (2000)	Fleith (2000)	Pascarella et al. (2013)	Budsankom et al. (2015)	Oryan and Gastil (2013)	Kader (2014, 2016)	Landine (1998)	Saeid and Eslaminejad (2016)	Dzinovic, et al. (2019)	Mongkhondao (2015)	Puttan (2006)	Artchula (2003)	Hermhag. (2012)	Promchit (2010)	Omar and Awang (2021)	Totals	
Classroom atmosphere						*	*	*	*		*				*	*	*	*				9
Achievement motivation			*	*	*				*		*	*	*	*			*					9
Internal locus of control (ILOC)			*	*	*				*		*	*	*	*		*	*	*				10



learning outcomes. Reid and Radhakrishnan (2003) also added that a classroom's atmosphere reflects students' opinions that are based on their experiences. Other authors have also noted the importance of humor in diffusing stressful classroom situations, which also helps develop good relationships between students and their teachers (McCabe et al., 2017). However, Moneta and Siu (2002) have reported that for Hong Kong students, the local university environments discourage intrinsic motivation and creativity. In summary, a classroom's atmosphere should entail cleanliness which is the foundation for a friendly relationship between students and their teachers. Moreover, teaching should not be overly serious or stressful, with students being allowed to fully show their potential, by the use of materials that are appropriate to teaching, learning and creativity (Omar & Awang, 2021).

#### 4.2. Achievement Motivation

Concerning the level of the aspects evaluated for a student's *achievement motivation*, being *ambitious* ( $f=11, n=8$ ) was judged to be the most significant in importance. This was followed by their sense of *self-responsibility* ( $f=10, n=7$ ), their *tolerance* levels ( $f=6, n=7$ ), and *long-term planning capability* ( $f=8, n=6$ ). The elements related to a student's *achievement motivation* in relation to their HOTS were determined to consist of four elements including how *ambitious* they were, their amount of *self-responsibility*, their *tolerance*, and their *long-term planning capability*. The factor of achievement motivates people to have behaviors that enable them to achieve the success that meets their standards of excellence (Adler, [1927] 1998; Alschuler, 1973; Dreikurs & Stolz, 1991; McClelland, 1961; Oryan & Gastil, 2013). AL-Baddareen et al. (2015) also contributed by reporting that student academic motivation is significantly affected by metacognition and mastery goals while self-efficacy had minimal effect on it. Therefore, students who have achievement motivation should concentrate and be self-responsible for their work to achieve work success at a high quality. Similarly, work planning and goals are also keys to success.

#### 4.3. Internal Locus of Control (ILOC)

Concerning the level of the aspects evaluated for a student's ILOC, it was determined that *effort to succeed* was most important ( $f=10, n=9$ ), followed closely by *enthusiasm* ( $f=9, n=7$ ). However, the *pursuit of knowledge* was somewhat less important ( $f=8, n=6$ ), followed even more by *rational thinking* ( $f=6, n=6$ ). These results are consistent with Lather et al. (2014) whose results also showed that highly creative students score significantly higher on ILOC. These results are also consistent with Richmond et al. (1980), many earlier US studies concerning college student ILOC was positively related to creativity, which the authors also suggest is true for Mexican students. Moreover, other studies have suggested that entrepreneurs also tend to have a strong ILOC because they always try to 'tough it out' and meet their goals (Bandura, 1997). This is consistent with Holden et al. (2019) who suggested that students with an ILOC will want to try hard in their efforts to become successful. Thus, the authors identified four elements related to a student's ILOC. These included their *efforts to succeed*, their *enthusiasm*, their *pursuit of knowledge*, and finally, their ability at *rational thinking*. In summary, student ILOC characteristics exhibit a love for learning, a thirst for knowledge of other places, an eagerness to learn about the environment and how they can contribute to its future benefit, and an attempt to succeed at everything they do, however difficult.

#### 4.4. Parenting

The experts and the reviewed literature are in very strong agreement concerning the importance of the factors related to *parenting*. Concerning the use of a *democratic* style in parenting, this was judged to be extremely important ( $f=15, n=14$ ). This was closely followed by the use of a parental *rational* style ( $f=13, n=13$ ) and *loving and supportiveness* ( $f=13, n=13$ ). These results are consistent with Fearon et al. (2013), that also linked creativity to critical thinking when parents allowed it to happen. Darling-Hammond et al. (2020) have also indicated the school and home connections are a critical aspect in providing aligned child support. Moreover, according to Osher et al (2018) in addition to student-teacher relationships, other child-adult relationships which are supportive, warm, and caring create better school performance and social competence, and the willingness to take on challenges. Furthermore, according to Hammond (2016), culturally responsive and sensitive adult relationships can support student welfare and development and welfare. Furthermore, the authors identified three main elements associated with parentings in student HOTS. These were *democratic* (or *Adlerian parenting*) (Lundin, 2015), *rational*, and finally, *supportive and loving* (Baumrind, 1966). However, Fearon et al. (2013)

showed that Jamaican parents' authoritarian style of parenting was a hindrance to student creativity and thus, critical thinking. In summary, in the pursuit of student HOTS, children must receive warmth fully, while allowing them to decide and do what they love themselves. Parenting also involves permitting children to actively participate in learning activities, showing good work ethics, and how to take on self-responsibility. Moreover, good parenting involves mutual agreement and understanding and not being told what is right or wrong. Finally, good parenting should be open-minded, a willingness to listen to others, and having a positive attitude.

## 5. Conclusion

After the identification of the ongoing problem with low Thai student PISA scores and the assessment's connection to high order thinking skills, the authors set out to identify, synthesize, evaluate and analyze which factors played a role in Thai learner HOTS. From this process, the factors affecting student HOTS were divided into two sections consisting of the Section 1 synthesis from the qualitative review of the literature and theory and the related HOTS elements and Section 2's quantitative interview results from the 14 educational experts. After the identification of the ongoing problem with low Thai student PISA scores and the assessment's connection to HOTS, the authors set out to identify, synthesize, evaluate and analyze which factors played a role in Thai learner HOTS. From the qualitative analysis, eight elements were identified including *classroom atmosphere*, *achievement motivation*, *the internal locus of control (ILCO)*, *parenting*, *achievement*, *reasoning ability*, *attitude towards learning*, and finally, *scientific personality*. Of the eight elements, the *classroom's atmosphere* was judged to be the most important. This was followed closely by a student's *ILOC* and *parenting*. Furthermore, from the input of the 14 educational experts, four main categories were identified including *classroom atmosphere*, *achievement motivation*, *internal locus of control*, and *parenting*. From the analysis of these four categories and their related 16 elements, *democratic parenting* was judged to be most important for the development of a Thai student's HOTS. This was closely followed by *rational parenting* and *loving and supportive parents*.

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