EFFECTIVE TEACHING OF HIGHER-ORDER THINKING (HOT) IN EDUCATION

Tan Shin Yen, Siti Hajar Halili
ajai912@gmail.com

Abstract: The teaching of Higher-order Thinking (HOT) has its own challenges and these challenges deserve due attention. In the 21st century, one critical aspect in discussing effective teaching and learning is examining the effectiveness of teachers in developing students' capability to think while ensuring content mastery at the same time. The aim to develop and enhance students' HOT has been a major educational goal. As a matter of fulfilling a national aspiration in education, the role of teachers in inculcating HOT is another important aspect of teaching HOT effectively.
Keywords: Higher-order thinking, Bloom's taxonomy, teachers, teaching, students

INTRODUCTION

Most teachers are familiar with Higher-order Thinking (HOT) due to Bloom's taxonomy (Figure 1). It was found that it is common understanding that to develop students' HOT teachers should promote student engagement with learning tasks which exceed the second level 'comprehension' in order to encourage *application*, *analysis*, *synthesis* and *evaluation* activities in processing information (Zohar, 1999). This resonates with the notion that HOT encompasses any thinking skills which require more than mere recall or memorization of information (Ivie, 1998; Underbakke, Borg & Peterson, 1993).
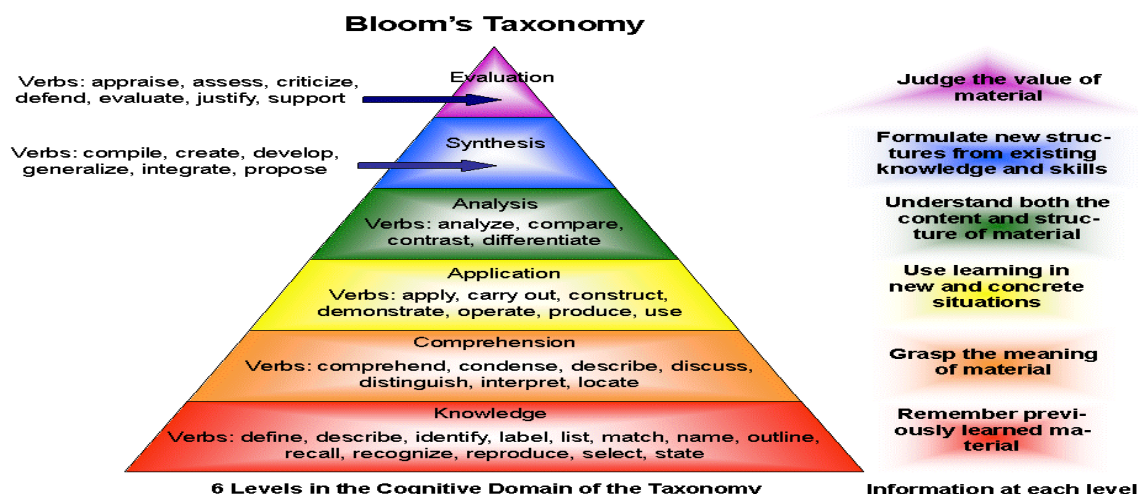

Figure 1. Bloom's Taxonomy.

The literature on HOT has been informative and broad. Yes, broad in the sense that HOT builds on and extends beyond Bloom's Taxonomy, resulting in discrete dimensions attributed to it: Critical thinking, creative thinking, problem solving, decision making and metacognition, just to name some prominent ones. Zohar's (2013) attempt to clarify the dimensions of HOT seems helpful for future reference of teachers and researchers alike. He summarizes the knowledge to teach thinking into "knowledge of elements of thinking" together with the four sub-categories, namely:

    (i)   Knowledge of individual thinking strategies

        – making comparisons, formulating justified arguments, drawing valid conclusions, etc.

    (ii) Knowledge of genre of thinking

        – argumentation, inquiry learning, problem solving, critical thinking, scientific thinking, creative thinking, etc.

    (iii) Knowledge of metacognition

        – thinking about own thinking

    (iv) Knowledge of additional issues

        – thinking dispositions (habits of mind), culture of thinking, etc.

                                       (p. 235)

To further help refine the understanding of HOT, Resnick in 1987 explained that although HOT is complex and may not be easily defined, its characteristics are actually quite easily observed in practice (as cited in Fisher, 1999). Table 1 shows Fisher's (1999, p. 54) adaptation of Resnick's (1987) characterization of HOT versus "routine teaching"; this may assist teachers in determining whether HOT is taking place in their classroom.

Table 1. Higher-order Thinking (HOT) versus Routine Teaching

HOT	Routine Teaching
Not routine/not fully known in advance	Routine/outcome planned in advance
Complex	Clear purpose and goal
Yields multiple solutions/viewpoints	Yields converging outcomes
Involves uncertainty	Seeks certainty
Involves process of making meaning	Involves process of doing
Is effortful, requires mental work	Is judged by outcome rather than effort

THE TEACHING OF HIGHER-ORDER THINKING (HOT)

Over the decades, the aim of developing and enhancing students' HOT has been a major educational goal (Fisher, 1999; Marzano, 1993; Supon, n.d.; Zohar & Schwarter, 2005). As Resnick in 2010 said, "scaling up the 'thinking curriculum' in a way that will foster proficiency for all students is currently a major educational challenge" (as cited in Zohar, 2013, p. 234); and a primary glance at teachers' perspective tells us that most teachers agree that it is crucial to teach students HOT, primarily to guide their idea generation (Yee et al., 2012). This commitment toward HOT is relevant to global economic growth, the development of information and communications technology (ICT), a knowledge-based economy and a fast-paced world. In reality, HOT is an extremely needed skill for every individual in any educational setting. Also, Fisher (1999) believes that the development of students' HOT is complementary with the inculcation of lifelong learning among them. In other words, we need "thinking" students who can incessantly respond to real-world demands (Vijayaratnam, 2012).

Obviously, we know what is important and what we expect of our education system, of our teachers and of our students; but how well are they responding to the challenge of teaching and/or learning HOT? For one, "in most classrooms higher order thinking receives little or no attention" (Ivie, 1998, p. 35). Ivie (1998) continues to substantiate using previous findings that even when HOT does occur in the classroom, teachers rarely make effort to sustain students' flow of higher-level thoughts, perhaps due to teachers' incompetency or disinterest in pursuing learning outcomes other than learning content-specific goals. Sadly, a classroom scenario of such dismalness is believed to be epidemic across nations. On the other hand, despite unfavorable reports, considerable development has occurred in improving the teaching and/or learning of HOT; it is just that in terms of realizing the educational ideal of having 'thinking' students in a 'thinking' classroom within the 'thinking' curriculum where active cognition is a routine, we still need to work real hard (Zohar, 2013). Attention is needed at the planning and implementation levels because recurring inconsistencies in curriculum development and enforcement will continue to keep the effective teaching of HOT in the classroom as pure rhetoric (Ivie, 1998).

Within Malaysia, the steady increasing influence of thinking skills in our education system is eminent. To enhance effective teaching of HOT, the Ministry of Education (MOE) implemented a stretch of structural reforms through the Integrated Curriculum for Secondary Schools (KBSM) which introduced critical thinking skills, in 1988, the Vision 2020 in 1991, the Critical and Creative Thinking Skills (KBKK) in 1996, and the concept of "smart school" in 1997, with the aim of producing human capital with high thinking ability. Then in 2012, the Malaysian MOE released the Preliminary Report of the Malaysia Education Blueprint 2013-2025 that so evidently emphasized HOT in three core aspects of education: The written curriculum, the taught curriculum, and the examined curriculum (assessment).

With such prominence given to HOT through our national agenda for the past three decades, it is necessary if not compulsory for teachers to hone effectiveness in teaching thinking especially with regard to HOT. One may wonder, with the existing strong emphasis on HOT in our curricula through various educational policies, is there even an issue of ineffectiveness in teaching HOT in schools specifically in Malaysia? "Yes, of course", says the literature review.

For a quick check, how have we been performing in accordance with our national curricular effort? A study in the Preliminary Report of the Malaysia Education Blueprint 2013-2025 has shown that most lessons in schools did not sufficiently engage students in constructive thinking where teachers relied on lecture format and most importantly, the learning focus was still directed at recalling facts or achieving surface-level content understanding rather than cultivating HOT (Malaysia MOE, 2012). In short, just like the conditions portrayed earlier by Ivie (1998) and Zohar (2013), in Malaysia too, lower-order thinking, instead of HOT, still dominates teaching methods and learning outcomes.

CAN HOT ACTUALLY BE TAUGHT?

The lack of encouraging performance in the teaching of HOT makes one wonder if HOT can actually be taught. Could it be that we have not succeeded simply because teaching HOT is undoable? The articles reviewed suggest two opposing views as follows:

(i)   Teachers treat thinking skills as not teachable, that they are an intrinsic ability like "common sense" which is naturally molded by one's social and cultural values (Atkinson, 1997). It is common that many are still reserved about the idea of teaching thinking as the notion of "thinking-as-a-skill" (Hart, 1993, as cited in Fisher, 1999, p. 53) remains under scrutiny. Piaget would most probably insist that children's development of thinking is a biological process and needs no explicit instruction (Hannum, n.d.).

(ii)   Puchta (2012) who quotes Robert Fisher, stresses, "… thinking is not a natural function…needs to be developed". Indeed, thinking skills need practice (Marzano, 1993) and could be developed, but not automatically (Rajendran, 2000); this shows that thinking skills are indeed teachable. Despite the belief that to an extent the ability to think is something we are born with and hence the limited intelligence capacity of each individual, we do not and could not exactly know the limit of that thinking capacity; that is why thinking can and should be developed so that each student can achieve their highest thinking potential (Fisher, 1999). Fisher (1999) further illustrates that "children who come to believe that with effort you can always do better at thinking and learning will tend to do better at school than those who think their intelligence is fixed" (p. 53).

Two main ways to teach HOT have been proposed by researchers (Rajendran, 2001, 2002; Zohar, 2013; Zohar & Schwartzer, 2005): (1) Infusion approach (Fisher, 1999) and (2) Separate-subject approach. The former refers to teaching of HOT in a content-specific setting; teachers integrate HOT explicitly with the teaching of specific content. The latter regards HOT as general strategies used across subject domains (not content-specific; teachers teach HOT as a set of skills or strategies to be acquired).

WHY IS THE TEACHING OF HOT PRESENTLY INEFFECTIVE (THE CHALLENGES)?

From the articles reviewed, we personally agree that HOT can indeed be taught and there are existing paradigms (infusion and separate-subject) to guide the proper approach to teach HOT effectively. Then again, why the ineffectiveness in teaching HOT till now? For deeper investigation, some of the most significant findings discovered by various studies are summarized in Table 2.

Table 2. The Challenges in Teaching HOT

No.	Challenges	Descriptions
i.	Time	The cultivation of HOT is an internal process which develops over time. It is a time-consuming effort where students need to reflect, to articulate, to justify, to interact with, to discuss, to question, etc., all in one time frame. Hence, due to the tight schedule for each subject, teachers may have difficulties planning HOT-filled lessons to be completed in 1 or 2 class periods (Limbach & Waugh, n.d.; Sparapani, 1998).
ii.	Student factor	Attitude/Motivation ▪ Some students (even the good ones) have the mentality of taking the easy way out; they do not see the necessity to go through the hassle if there are easier ways to complete their tasks in/out of the classroom (Sparapani, 1998). In other words, they do not like and have no motivation to think. For them, it will be easier and faster to be given a direct answer instead of being asked to think out of the box and to provide rationales afterwards.
iii.	Teacher factor	a) Competence ▪ Teachers themselves are confused over the definitions of thinking skills (Beyer, 1984) and they sometimes find it difficult to differentiate levels in thinking (Marzano, 1993; Rajendran, 2000). This lack of knowledge of HOT may eventually lead to teachers' inability to assess students' HOT. ▪ Teachers are not always sure of how to teach HOT (Rajendran, 2001; Sparapani, 1998). Yildirim (1994) discovered that the majority of teachers had only adequate skills to promote HOT (Supon, n.d.). Also, it was found that "in-service and pre-service teachers' initial knowledge of thinking

		strategies was often not sound enough for purposes of instruction" (Zohar, 2013, p. 235). To conclude, teachers lack the appropriate pedagogical knowledge to teach HOT (Fisher, 1999; Zohar, 1999; Zohar & Schwartzer, 2005). ▪ As teachers are confused themselves, they sometimes thought that they are teaching HOT when in reality they could be just inducing lower-order thinking among their students (Rajendran, 2002; Sparapani, 1998). On the contrary, some teachers may be unaware that they have been unconsciously integrating HOT in their instruction all this while (Zohar, 1999). ▪ Teachers see it easier to "prepare simplistic lessons that let the textbook do the teaching" (Sparapani, 1998, p. 274); the integration of HOT into the curriculum is being compromised (Zohar & Schwartzer, 2005). ▪ Some teachers rely solely on Bloom's taxonomy without realizing that the taxonomy is not prescribed specifically for the teaching of HOT (Ivie, 1998). b) Perception ▪ Teachers have expressed that Mathematics and Science teachers are most probably better oriented to teach HOT (Hashim, 2003). ▪ Teachers are still clinging on to the thought that HOT is only meant for high-performing students (Hashim, 2003; Lundquist & Hill, 2009; Zohar et al., 2001; Zohar & Dori, 2003; Zohar & Schwartzer, 2005). To them, weak students have very little thinking capacity, and their thinking ability is mostly hindered by their low language proficiency (Lundquist & Hill, 2009). ▪ Language teachers generally have more confidence in teaching language arts than teaching HOT (Rajendran, 2001).
iv.	**Assessment**	a) Standardized tests (teach-to-test syndrome) ▪ Teachers are bound with the issues of accountability in providing quantifiable achievement scores; as a result they have to stick to "normal" classroom practices to fulfil examination requirements (Sparapani, 1998). ▪ "Standardized tests (national and international) inhibit and contradict the development of HOT" (Zohar, 2013, p. 239). Any changes made to the curriculum (e.g., Integration of HOT) but not to the assessment practices will result in naught. ▪ Assessments should be geared toward appreciating and meriting HOT ability instead of recognizing only content mastery. It has become a norm that content goals are prioritized over thinking goals (Zohar, 2013). ▪ To this effect, in Malaysia especially, the dominance of standardized examinations in the education system is clearly exhibited (Ali, 2003; Che Musa, Koo, & Azman, 2012; Michael, 2012). b) Teachers' use of alternative assessments to evaluate HOT is usually hindered by the rigid guidelines provided by the authorities. The inflexibility of mainstream assessments has been and will always be a constraint to teaching HOT effectively.
v.	**Learning environment**	a) An example is the traditional way of desk arrangement has been maintained up to this day, especially in Malaysian classrooms. Students usually sit in pairs in rows facing the teacher and the whiteboard at the front. Such seating is neat and formal-like for the teaching and learning process, however it bars HOT. If classrooms are to be platforms for lively exchanges of intellect, teachers have to provide a stimulating atmosphere which encourages deep thinking (Sparapani, 1998).

		b) The culture of learning has greatly been inherited from drill-and-practice and rote learning (Sparapani, 1998). Teachers need to provide scaffolding for transition from this type of passive learning to active learning (HOT).
		c) It has been claimed that critical thinking is a form of western culture and that Asian students are unable to think critically because such practice is alien especially in Asian educational contexts and culture (Abdul Rashid & Awang Hashim, 2008).
vi.	**Resources**	a) Support in resources to ensure an engaging learning process among the teacher and the students is lacking. Practising HOT with students in class is intense and could always throw the teacher's pre-planned lesson out the window (still a well-thought out lesson plan is indispensable), thus having a variety of resources (e.g., computers, reference books, newspapers, etc.) is a must to cater to the on-going intellectual interaction in the classroom (Sparapani, 1998).
		b) Resources to develop teachers' professional knowledge of HOT and pedagogical knowledge to teach HOT effectively need vast improvement (Zohar, 2013).

CONCLUSION

Once again, all articles reviewed point to the importance of teaching HOT effectively as a matter of fulfilling a national aspiration in education. And this noble responsibility descends upon the shoulders of none other than our fellow teachers. Teachers have to realize that the effectiveness of teaching HOT will materialize only when the traditional view of transmitting information becomes secondary to a more constructivist view which affords students active learning that harnesses meaning-making in the learning process.

To wrap up, effective teaching gives rise to effective learning and students' learning can come in all forms, one of them being learning to think at the higher levels. This naturally makes effective teaching of HOT imperative in ensuring students' effective learning as a whole. The emphasis attributed to students' development of HOT is titanic, so much so that Dewey posits (1916), "all which the school can or need do for pupils, so far as their minds are concerned is to develop their ability to think" (as cited in Fisher, 1999, p. 59).

Bearing such ambition in mind, the challenges are immense. Many have been trapped in the "why-try-because-nothing-positive-will-happen-anyway" (p. 275) dark hole and some may go to the extent of belittling other teachers' budding efforts in trying out new approaches to teach HOT (Sparapani, 1998). As this review essay has deliberated, with the challenges identified and understood, with well-planned strategization and self-development, and with unwavering belief and perseverance toward the marked targets, we will sooner or later hit the bull's eye.

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