# HIGHER-ORDER THINKING SKILLS (HOTS) IN THE 21ST CENTURY: CHALLENGES AND OPPORTUNITIES FOR HIGHER EDUCATION

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ABSTRACT

The act of thinking is a fundamental characteristic of human beings. However, the quality and level of thinking can vary greatly. Some forms of thinking fall into the realm of high-order thinking, while others are considered lower-order. Higher-order thinking skills encompass critical and creative thinking, problem solving, analytical thinking, reflective thinking and creative thinking skill. In the face of challenges such as uncertainty, globalized economies and societies, intense global competition, and a rapidly evolving world, the importance of higher-order thinking skills (HOTS) becomes increasingly evident, particularly in the context of higher education. Current article aims to explore the significance of HOTS, challenges and opportunities for Higher Education. Qualitative design, with the main source of literature, was operated in the study. In line with this, literature review method, covering researching, reading, analyzing, evaluating, and summarizing scholarly literature related to the topic, was executed. The findings of the study unequivocally demonstrate the vital importance of HOTS for Higher Education. Nevertheless, it is appeared that higher education institutions face both obstacles that hinder the development of HOTS and opportunities that support their cultivation.

KEYWORDS: Thinking, Thinking Skills, Higher - Order Thinking (HOT), Higher Education

Thinking has been defined in various ways throughout history, encompassing epistemic, ontological, and axiological aspects. Aristotle, for instance, characterizes thinking as "making connections between ideas, distinct from imagination (phantasia)," and underscores its human aspect through reasoning (logismos) (Mccready-Flora, 2014). Similarly, Plato (Wolf, 2013) outlines thinking as "the mental process of representing an object in a way that accurately reflects its true nature, without any distortion or inaccuracy," emphasizing the cognitive and objective characteristics of thinking. Dewey (1910) clarifies thinking as a mental process that includes observation, the presentation of potential solutions, reasoning, and experimentation to reach conclusions, highlighting the relationship between what is attempted and what results from the attempt. On the other hand, Gough (1991) summarizes thinking more epistemologically as "mental processes involved in perception, memory, judgment, and reasoning, encompassing the ability to analyze, evaluate, and synthesize information to make decisions and solve problems." These definitions collectively suggest that the act of thinking is a

unique and individual process, requiring cognitive properties such as reasoning, constructing, and deducing.

It is prominent in the literature that cognitive thinking can be categorized into two domains: higher-order thinking (HOT) and lower-order thinking (LOT). In order to distinguish between lower and higher-order thinking, it is essential to consider the Taxonomy of Educational Objectives (ToEO) proposed by Benjamin Bloom. The ToEO comprises six main levels: remember, understand, apply, analyze, evaluate, and create. LOT encompasses the remember, understand, and apply categories, while HOT involves the analyze, evaluate, and create categories (Sulastri, Rintayati, & Sarwono, 2019). As is evident from this distinction, HOT represents a form of thinking that extends beyond mere recall, memorization, and observation. HOT encompasses skills related to problem-solving, critical thinking, decision-making, and creativity. It demands the ability to leverage prior knowledge to make inferences, solve problems, and analyze, synthesize, and evaluate information (Marie-France, Daniel Sheryle-Bergman, & Drewe, 1998; Miri, David, & Uri, 2007; Richland, & Simms, 2018).

***Skills of HOT and Characteristics***

While critical and creative thinking are perhaps the most well-known higher-order thinking skills (Conklin, 2011), the literature also covers other thinking skills, such as analytical thinking, problem-solving, reflective thinking, and creative thinking, which promote higher-order thinking (Ennis, 1981; Yeung, 2012). Each of these thinking skills contributes to higher-order thinking at various levels. To better understand these concepts, it is essential to explore the definitions and characteristics of each skill. For example, “creative thinking is the way of thinking that leads to the generation of valuable and original ideas” (OECD, 2023a, p. 1). Creativity is characterized by attributes such as discovery and problem-solving (King, Goodson, & Rohani, 1998). Since creative thinking is instrumental in generating original solutions, suggestions, and products, it occupies the highest position in Bloom's Taxonomy of Educational Objectives, falling under the 'create' category. Creative thinking significantly contributes to an individual's academic achievement and socio-emotional development (OECD, 2023a).

On the other hand, critical thinking serves as a crucial foundation for the development of creative thinking. In critical thinking, the ability to analyze objectively is just as important as personal qualities, both cognitive and affective. “Critical thinking is the art of analyzing and evaluating thinking with a view to improving it” (Paul & Elder, 1992, p. 4). “Critical thinking is an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one’s experiences, knowledge of the methods of logical inquiry and reasoning, and some skill in applying those methods” (Glasser, 1941, p. 5). In line with the essence of critical thinking, critical thinkers should possess certain characteristics, including an open-minded personality, the ability to pose clear questions, the capacity to acquire and clarify relevant information, and the skill to construct well-

reasoned conclusions and solutions (Paul & Elder, 1992). These qualities demonstrate that critical thinking also possesses an affective dimension. Higher-order thinking skills (HOTS) also include reflective thinking, which can be described as "a state of perplexity, hesitation, doubt; and an act of search or investigation directed toward bringing to light further facts which serve to corroborate or to nullify the suggested belief" (Dewey, 1910, p. 9). Additionally, analytical thinking is another cognitive process falling within the analytical category of Bloom's Taxonomy. It involves breaking down, analyzing, and understanding a given situation (Amer, 2005).

***Why HOTS matters?***

"Higher-Order Thinking Skills (HOTS), encompassing enduring, transferable, life, and soft skills, play a crucial role in generating solutions to problems in the face of uncertainty and adapting to global competition. As stated by Rotherham and Willingham (2010, p.17.) "Critical thinking and problem solving, for example, have been components of human progress throughout history, from the development of early tools, to agricultural advancements, to the invention of vaccines, to land and sea exploration". Undoubtedly, HOTS constitute one of the most essential components of 21st-century education. International reports underscore the significance of HOTS in various ways. In a report by the World Economic Forum (WEF), it was emphasized that analytical and creative thinking are among the skills in high demand in the workplace, ranking among the top ten skills (Di Battista, Grayling, & Hasselaar, 2023). Furthermore, in a recent OECD report, the importance of HOTS, creativity, and critical thinking for the economy, society, and higher education was stressed, stating, "creativity and critical thinking are key skills for the complex and globalized economies and societies of the 21st century. There is a growing consensus that higher education systems and institutions should cultivate these skills with their students" (OECD, 2023b, p.1).

Creativity and critical thinking are integral components of learning and innovation skills. The demand for critical thinking is closely linked to the core literacies of today, namely ICT (Information, Communications, and Technology) Media and Information Literacy (Partnership for 21st Century Skills, 2006). The significance of creative thinking and critical skills is also highlighted concerning individual and social life, the well-being of humanity, and the quality of democratic structures (Vincent-Lancrin et al., 2019). Today, artificial intelligence poses a threat to many professions. However, it is evident that AI cannot replace professions requiring human characteristics such as judgment and decision-making. This underscores the growing importance of HOTS skills, especially creativity (Shine, 2023). AI-generated content and its inherent ambiguity further emphasize the importance of critical thinking and judgment (Cao and Dede, 2023).

***Teaching of HOTS in Higher Education***

In today's rapidly evolving and uncertain world, prioritizing the promotion of Higher-Order Thinking Skills (HOTS) in higher education becomes a primary transformational goal. As Gyenes

(2015, p. 17) notes, "The fostering of critical thinking is seen as a key component of secondary and higher education, as many countries face the challenges posed by globalization in the 21st century". Despite the clear emphasis on the importance of HOTS in numerous studies, concerns are growing louder among employers and economic organizations. "employers and economic organizations express with increasingly louder voices that they are no longer confident that graduates have acquired the skills for the 21st – century workplace, in particular, generic skills such as problem solving, communication, creativity and critical thinking" (Van Damme and Zahner, 2022, p. 15). It is evident that teaching HOTS remains a significant challenge. However, the solution requires a multifaceted and multidimensional approach. Seizing the momentum of change is closely linked to moving away from traditional teaching practices that primarily focus on lower-order thinking skills.

Current global challenges highlight the need for a greater emphasis on flexible, lifelong learning, the vitality of generating authentic knowledge, managing large-scale knowledge and data sets, and addressing complex challenges (Drake & Reid, 2018; Stehle & Peters-Burton, 2019). Higher-Order Thinking Skills (HOTS) demand unique characteristics, including logical, creative, evaluative, nonalgorithmic, and self-regulatory skills (Daniel & Bergman-Drewe, 1998). These characteristics necessitate engaging in cognitive activities that involve analysis, evaluation, and the creation of knowledge, as outlined in Bloom's Taxonomy (Zohar and Dori, 2003). Meeting these demands requires a departure from routine teaching practices and the adoption of teaching methods that foster Higher-Order Thinking (HOT). Yen and Halili (2015, p. 42) distinguish between Higher-Order Thinking (HOT) and Routine Teaching as follows:

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 |

As evident in the table, Higher-Order Thinking (HOT) requires embracing ambiguity and non-routine teaching methods that encourage subjectivity and the exploration of various perspectives. Additionally, Newman (1990, p. 44) characterizes Higher-Order Thinking Skills (HOTS) as "challenges the student to interpret, analyze or manipulate information". In line with this perspective, Mardell, Ryan, Krechevsky, Baker, Schulz, and Liu-Constant (2023) underline that teachers are required to

"engage learners in open-ended investigations and encourage risk-taking as fundamental to the learning process (p.74)" to promote creative thinking. Furthermore, it is essential to employ teaching strategies and design learning environments that foster Higher-Order Thinking Skills. Gamification is one such strategy that nurtures creative and critical thinking (Gupta, 2023). Similarly, approaches that place the student at the center of the learning experience, promote reflection, employ Socratic questioning, embrace inquiry-driven learning, utilize project-based and experiential methods, and encourage collaboration are effective in fostering HOTS in students (Bauld, 2023; Ross, 2023; Smith, 2023). Moreover, teaching methods and activities such as writing assignments, debates, drama, real-world activities, and case studies contribute significantly to the cultivation of Higher-Order Thinking Skills in higher education (Bezanilla, Fernández-Nogueira, Poblete, & Galindo-Domínguez, 2019).

***HOTS in Higher Education: Challenges and Opportunities***

Principal thinking skills such as analytical thinking, problem-solving, critical thinking, creative thinking, and reflective thinking promote HOT (Ennis, 1981; Yeung, 2012). However, achieving HOT in students at the higher education level presents several challenges. These challenges can be attributed to factors such as time constraints, student motivation, teacher competencies and perceptions, standardized high-stakes assessments, learning environment design, and resource limitations (Ömür & Bavli, 2020; Yen & Halili, 2015). In light of challenges related to the curriculum, it's important to note that "schools and school systems are under mounting pressure to modernize their curricula so that students can develop a broader set of knowledge, skills, values and attitudes to help them cope with new realities and new demands" (OECD, 2019, p.52).

In accordance with the characteristics of critical thinking, it is imperative for educators to redesign syllabi and curricula (Özmen, 2008). A prerequisite for a curriculum is the inclusion of both convergent and divergent oriented activities (Gupta & Mishra, 2021). In line with modern educational philosophies that emphasize learner autonomy, individual differences, and the learning process, assessment activities, both in and out of school, should also be reevaluated. In this context, assessment needs to be process-based, specifically formative, involving selection, generation, and explanation (King, Goodson, & Rohani, 1998). In addition to fostering learner autonomy, attention should be given to the affective aspects of learners, such as attitude, motivation, active learning, and confidence, to promote Higher-Order Thinking Skills (HOTS) in students (Bezanilla, Galindo-Domínguez, & Poblete, 2021; Or-Bach, 2013). Moreover, the growing use of generative artificial intelligence (AI) also underscores the importance of critical thinking and places pressure on it. UNESCO (2023) explicitly states that Generative AI may restrict "opportunities for real-life interactions, plural opinions, plural expression, and critical thinking" (p. 32) and that the "homogenization of knowledge limits pluralistic and creative thinking" (p. 37). Furthermore, the design and features of the learning environment also play a role in promoting HOTS. Large classrooms, teacher-centered and content-centered teaching that

neglect learner autonomy, individual differences, teacher-learner, and learner-learner interaction do not prioritize the development of HOTS (Jamaluddin, Kadir, Abdullah, & Alias, 2019).

Recent studies underline the importance of reducing the number of students per teacher, considering the individual difference during the instructions in higher education (Akçiğit & Özcan-Tok, 2020; Kurtoğlu Erden, Uslupehlivan, & Kurt, 2021; Küçükcan & Gür, 2009). Furthermore, in relation to the characteristics of the learning environment, there is a growing emphasis on the need for self-study and small group study (Valtonen et al., 2021). Teacher competencies and perceptions represent significant challenges in teaching Higher-Order Thinking Skills (HOTS). Teachers are required to enhance their skills through professional development and training to effectively teach students critical thinking (Bezanilla, Galindo-Domínguez, & Poblete, 2021).

However, it's important to acknowledge that there are both challenges and opportunities. It is essential to implement individualized open-access learning opportunities to enhance teacher competence and improve the quality of classroom teaching practices. Increasing teacher awareness and competence in using teaching methods such as discovery learning, customized instruction, cooperative learning, active learning, problem-based learning, authentic problem-solving, student-centered learning, and question-based learning (Asok, Abirami, Angeline, & Lavanya, 2016; Limbach & Waugh, 2010; Riadi, 2016; Tajudin & Chinnappan, 2016) within the learning environment can effectively promote HOTS. The importance of adopting various alternative teaching approaches to foster HOTS was also highlighted by the OECD (2018). Furthermore, the design of the learning environment, which encourages peer interaction and learner motivation, can be a predictor of Higher-Order Thinking Skills. Implementing technology-enabled learning environments, such as smart classrooms and digital learning tools that cater to personalized learning, collaboration, engagement, and problem-solving, plays a critical role in this regard (Lu, Yang, Shi, & Wang, 2021; Pitt & Chugh, 2023).

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