THE DIVERSITY OF IMPLEMENTATIONS OF HIGHER ORDER THINKING IN THE FIELD OF EDUCATION

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Abstract: In today's world, research on Higher Order Thinking Skills (HOTS) is gaining momentum as it is deemed crucial for global competitiveness in the industrial sector. Implementing diverse techniques for HOTS is essential to cater to students at various levels of education, ranging from preschool to university. It is widely recognized that the survival and strength of HOTS as a core thinking culture is essential, and its diversity of implementation techniques is vital to ensure it can thrive in different situations. The differences in social environments and cognitive levels necessitate diversity in implementing HOTS. According to a report by OECD (2018), Malaysia ranks 47th among the 78 countries that have undergone PISA evaluations, indicating a need for improvement in educational standards. In light of this, discovering how teachers implement HOTS in teaching and learning is critical for preparing the younger generation for global competitiveness. This article not only aims to explore the diversity of HOTS implementation in teaching and learning but also to discuss its advantages and disadvantages to ensure its appropriate use. A thorough search for relevant articles was undertaken using the Systematic Reviews and Meta-Analyses (PRISMA) 2020 search, focusing on recent publications, including specific models or methodologies employed in bigger studies pertinent to the topic under discussion. This article emphasizes the importance of understanding the diversity of HOTS implementation techniques in achieving world-class education standards, synthesizing their strengths and weaknesses, and providing practical solutions to implement them effectively. By understanding these techniques, teachers can better prepare students with creative and critical thinking skills, ensuring HOTS grows as a culture of thinking among the younger generation.

Keywords: Diversity, Implementation, Higher Order Thinking

INTRODUCTION

Higher Order Thinking Skill (HOTS) are defined in many ways. Kings et al. (2013) stated that HOTS occur when students face unfamiliar problems or dilemmas which activate their higher ability to think and not only to remember, while Moore and Stanley (2010) defined HOTS as the last three aspects of Bloom's Taxonomy, namely analyzing, synthesizing and evaluating, which are the top three levels in Bloom's Taxonomy of Cognitive Domain. In whatever ways HOTS is defined, it still explains the rank of thinking in human cognitive skills. According to Foong (2000), the good achievement of HOTS in students will allow them to perform successfully in their studies. From these statements, it is crystal clear that producing a generation with HOTS is the fundamental educational process for the speedy development of the country.

The importance of HOTS in education cannot be overstated. According to the 2018 OECD report, Malaysia's performance in PISA and STEM was in the middle range, highlighting the need for HOTS. Recent research has shown a positive and strong correlation between HOTS and student GPA. De Mello et al. (2021) found that students who scored high in HOTS also tended to obtain high GPA scores. This correlation can be attributed to the exposure to analytical and logical thinking that HOTS demands. Appropriate intervention programs must be put in place to ensure that students can master HOTS. Pagrow (2005) also emphasized the importance of HOTS in preparing students for the challenges they will face in advanced academic life and their daily work and responsibilities as adults. With the right approach to HOTS, students can acquire the skills they need to succeed academically and professionally.

The education landscape has seen a recent surge in interest in HOTS among educators. Teachers must become proficient in the diverse range of HOTS skills and learn to apply them to different situations to achieve the desired

outcomes in student learning. Educators should impart HOTS teaching skills and attitudes continuously as part of their professional development, which is crucial to achieving the HOTS objectives in student learning, as highlighted by Rajendran (2001). To this end, the teaching framework, thinking taxonomy, and terminology must be interwoven to develop mastery of HOTS teaching skills. In addition, teachers must possess meta-cognitive strength to foster HOTS skill practice. Knowing how to apply HOTS techniques during teaching and learning is essential, as students' achievements in HOTS are directly influenced by the teaching techniques employed. The literature reveals that the deliberate teaching of HOTS in a conducive environment can promote its development among students. Therefore, educators must master the diversity of HOTS implementations and techniques to ensure the successful mastery and development of HOTS among students. As such, the knowledge and skills of HOTS teaching techniques must always be at educators' fingertips so they can deliver the HOTS implementation process effectively and achieve HOTS objectives among students.

Numerous research has been conducted on HOTS implementation in education. Malaysia is among the countries that contributed substantial research related to HOTS. According to Jun Liu et al. (2021), the statistical table of the top 10 countries or regions shows imbalances where research is mainly concentrated in the USA, Canada, and Asia, represented by Malaysia, Taiwan, Israel, Turkey and Indonesia. The discussion in this article will be mainly on the statistics of research conducted on HOTS without further inclusion on the diversity of its implementation. The diversity of technical aspects, such as the types of teaching techniques and their effectiveness towards students, have also not been included. This paper will discuss the diversity in HOTS implementations among the teachers during the teaching and learning sessions. This paper also discusses the advantages and disadvantages, strengths and weaknesses in the diversity of HOTS implementation techniques.

The approach used was to find articles regarding the various implementations of HOTS in education in the last 5 to 7 years. The review writing process on adopting HOTS in the last 5 to 7 years was conducted per PRISMA 2020. This paper will explore various HOTS teaching strategies for various groups, beginning with primary schools and progressing to higher education institutions such as universities and colleges. It can also indicate the acceptability of usage in various contexts and age ranges. The contribution is that the educators will have a diverse choice of HOTS teaching techniques according to their target group and suitability per the situation.

METHOD

The study's focus is on previous research on the implementation of HOTS in teaching and learning. Google search was the main engine used to search relevant journal articles. The term "Higher Order Thinking Skills" was used as the subject search to retrieve all articles about HOTS in the last seven years (2016 to 2022). Google Search was chosen as a tool for searching journal articles because it is more open and is not limited to any stereotypes of teaching techniques. According to Hammerstrøm et al. (2010), searching online databases is recommended because it facilitates the highly structured searching method. It is also equipped with an automated recording of search history and export results in bulk. This kind of ability is suited for systematic reviews. As we all know, systematic reviews need these kinds of functions, which can support transparency, accountability, and reproducibility of the search process. In other words, Google Search offers wider, open, unconditional, free and unlimited searches. In this way, the probability of finding a variety of journals is high. This is what is needed to explain the diversity of HOTS techniques. The research process was divided into three sections. The first identifies the teaching techniques that were used from 2016 until 2022. The second section is about identifying and isolating the techniques according to their usage based on the different ages and levels, such as primary schools to the university level. The last section compares and contrasts each technique's strengths, weaknesses, advantages, and disadvantages that make them unique and suitable to apply to different ages, situations, and needs. Previous research has been conducted about the evolutionary path, the development of practice from different theoretical perspectives, and what kind of research it included. Given this, the writing perspectives will identify the relevant current techniques that can drag users' interest in the right teaching techniques according to the needs and target groups.

Part 1

This paper writes about the diversity of HOTS teaching techniques. The present information and issues are based on the literature review of previous research. The technique used is the document analysis technique. The issues and findings reviewed by the scholars discussing HOTS techniques are tabulated. Teaching techniques that were

used from 2016 until 2022 are identified. It is important because the latest techniques will match the latest technology related to teaching and learning. Using the keywords “Higher Order Thinking” has resulted in many choices of articles on higher-order thinking. However, only those on higher-order thinking teaching techniques were chosen because they were related to the topic of this paper.

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) were used to review the appropriate articles. PRISMA was chosen because it is a valuable resource for researchers performing systematic reviews and meta-analyses. PRISMA offers a methodical approach to the review process. It also helps to ensure that all important information is included and makes reporting the discovery easier. According to Belle and Yixi Zhao (2022), PRISMA was chosen because it is used to conduct and produce systematic reviews. Snyder (2019) posited that a literature review that integrates multiple empirical findings and perspectives can address research questions with more power than any single study. This is also supported by Webster and Watson (2002), who suggested that a well-conducted and effective literature review as a research method can serve as a solid foundation for advancing knowledge and promoting the development of theories. The PRISMA criteria produce simpler and more transparent outcomes than existing recommendations. It is a popular approach for performing and reporting systematic reviews and meta-analyses. The World of Science (WOS) database was utilized to find the associated articles used in writing this paper. WOS was chosen as the search database since it is an authoritative database that contains all scientific citations. The Science Citation Index (SCI), an information retrieval tool, was initially commercially sold by the ISI in 1964 (Garfield, 1964), making it the earliest citation index for the sciences. The Web of Science (WOS) Core Collection database is a citation index for academic and scientific publications, and it includes journals, conferences, books, and data compilations.

The first part of all systematic investigations should emphasize framing research questions based on themes of interest. According to Khan et al. (2003), when presenting a research topic, it is advisable to move from a free-form query to a structured and explicit statement to meet reviewers’ expectations. The paper highlights the diverse techniques in assessing higher-order thinking in education. It provides an overview of relevant keywords such as "higher-order thinking assessment," "student assessment," "critical thinking assessment," and "problem-solving assessment." During this procedure, precise, measurable, achievable, relevant, and time-bound questions (SMART) should be posed. In developing a comprehensive search strategy, appropriate search terms and Boolean operators (such as AND, OR) should combine relevant keywords related to the research question. The search strategy should be designed to capture all relevant studies while minimizing the risk of missing any potentially eligible studies.

To ensure that relevant literature was included, the search phrases "higher order thinking assessments," "critical thinking assessment," and "problem-solving assessment" were extensively designed in this investigation. The specific search terms used for Higher Order Thinking include: "higher order thinking" OR "critical thinking" OR "problem-solving." For assessment include "assessment" OR "evaluation" OR "evaluate" OR "evaluating" OR "measure" OR "measuring" OR "measurement". There are two primary components: namely, a checklist of things and a flow diagram. The 37-item checklist contains the title, synopsis, method, results, discussion, and cost of future investigations. The flow diagram depicts the final meta-analysis based on the reporting guidelines.

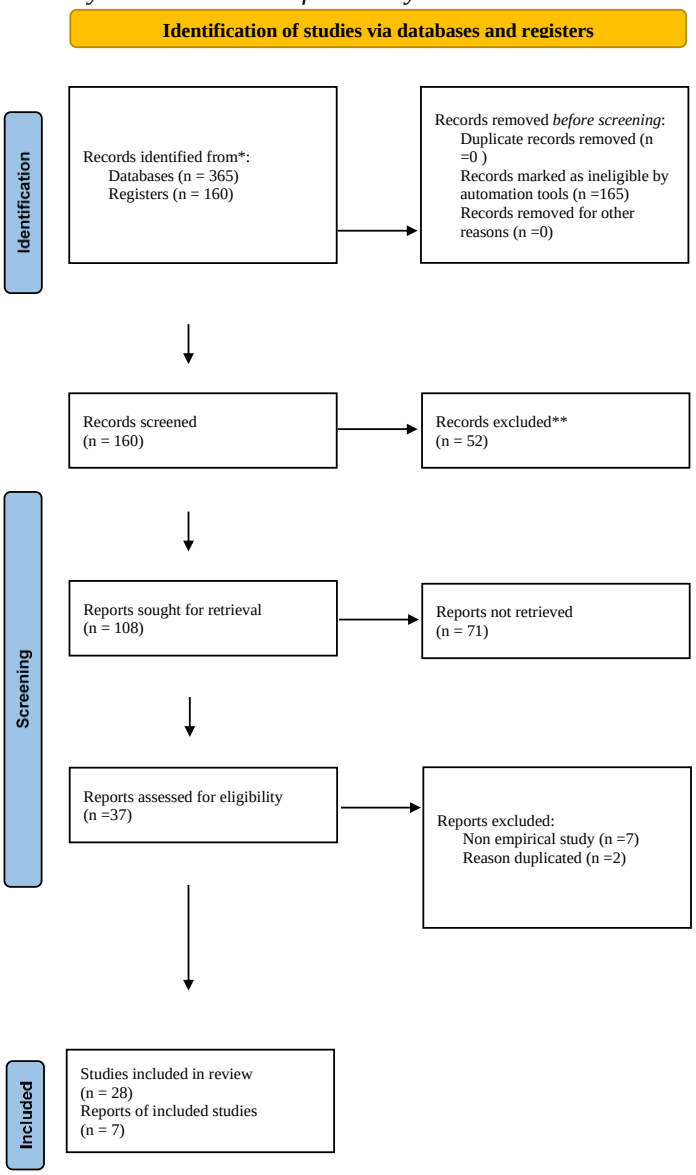
The screening procedure includes the review's inclusion and exclusion criteria. Different situations have different needs, and the criteria chosen should correspond to research issues. Only articles from 2016 to 2022 were selected. According to Santini et al. (2018), if the most current reference is more than 5 years old, it may indicate that a thorough literary examination has not been conducted. During the screening and selection of the study, the search results must be reviewed, and the titles and abstracts of the retrieved studies must be filtered based on pre-defined inclusion and exclusion criteria. This process involves evaluating the relevance of each study to the research question. Full-text articles of potentially relevant studies should be obtained for further evaluation. The eligibility screening stage of the review requires reading the full-text articles of selected studies to determine their suitability for inclusion in a systematic review or meta-analysis based on pre-specified inclusion and exclusion criteria. This approach involves evaluating the quality and relevance of each study to the research question. Around 160 relevant articles were retrieved from the WOS database, and only 28 articles that matched the inclusion criteria were finally examined.

Table 1.
The Inclusion and Exclusion Criteria of This Study

Criteria	Inclusion	Exclusion
1. Publishing schedule	2016-2022.	Before 2016
2. Type of document	Review and article (with empirical data)	Books, book series, book chapters, conference proceedings, and so on
3. Source type	Journal	Non-journal
4. Language	English	Non-English
5. The nature of the research	Concentrating on the students	Not concentrating on the students

The PRISMA flowchart is a type of flowchart used to report systematic reviews and meta-analyses. It transparently describes evidence-backed details so that users can easily and fully understand. The flowchart is stated below.

Figure 1.
The Study Selection Process for This Systematic Review



Adapted and adopted from: Page et al. (2020)

Only seven different techniques were chosen. The chosen technique, such as the characteristics and learners' needs is important. Factors like age, cognitive abilities, prior knowledge, and learning styles play a significant role in selecting an appropriate technique. Flexibility and adaptability should be enough to accommodate different classroom settings, subject areas, and learning contexts. Teachers often encounter diverse learners and may need to adapt their teaching approach accordingly. A versatile technique allows for the customization, modification, and integration of various instructional strategies to cater to different needs and situations. The availability of resources was the next considered factor. Consideration should be given to the resources, materials, and technology required for implementing a teaching technique. Some techniques may require specific tools, equipment, or software, which may not be feasible in certain educational settings. Choosing a technique that aligns with available resources ensures practicality and smooth implementation. Ultimately, the choice of a teaching technique is driven by a combination of important factors, including specific learning objectives, learner characteristics, engagement, evidence of effectiveness, and resource availability. It is crucial to select a technique that can maximize learning outcomes and create an inclusive and engaging learning environment.

Part 2

The second part identifies and separates approaches used depending on age and stage, such as from elementary school to university level. Some of the teaching strategies were chosen based on the given criteria to ensure that they cover various teaching techniques from basic schools to university and college levels. Varied HOTS teaching strategies are crucial to demonstrate the diversity of HOTS teaching techniques, the numerous options for teaching HOTS, and the fact that there are always unique ways to offer HOTS that are limitless and accessible in various ways.

Part 3

The last part compares and contrasts each technique's strengths, weaknesses, advantages, and disadvantages. Document analysis was done for each of them. Data were collected through the selected techniques already being studied by the researchers. This can reveal the advantages and disadvantages of each technique. The narratives were generated from the S.W.A.T analysis itself.

Table 2.
Information Related to The Diversity Implementations of The HOTS Issues Discussed in This Paper

References	Research title	Issue related/Finding
1. Azizah et al. (2018)	2. Scaffolding as an effort for thinking process optimization on heredity.	1. The thinking process can be developed by interaction between students and their environment, such as scaffolding. Given scaffolding is based on each student's necessity. 2. The levels of scaffolding are explaining, reviewing, and restructuring. It also includes developing conceptual thinking. 3. Technique: Scaffolding 4. Finding; The result of this research showed that the students' thinking process developed is higher after scaffolding. Therefore, this technique helps students answer questions properly.
2. Gwo et al. (2019)	1. The era of flipped learning: promoting active learning and higher-order thinking with innovative flipped learning strategies and supporting systems	1. Flipped learning has attracted a lot of attention from researchers and school teachers where students are guided to engage in learning activities. Students apply

		knowledge with the help of teachers or peers. HOTS abilities can be improved through the practice and application of knowledge obtained from mobile and wireless communication technology as a learning tool that is increasingly popular and widely accepted. 2. According to Lin & Hwang,2018; Sam & Bergmann, 2013, flipped learning is about the student learning via videos or multimedia learning materials that are prepared by the teacher before their class. 3. Technique: Flipped learning. 4. Findings: Many studies have reported the effectiveness of flipped learning, and hence researchers have started to investigate whether adopting innovative strategies or technologies can make flipped learning more effective.
3. Nuraffefa Hamdan et al. (2019)	1. An Effectiveness of High Order Thinking Skills (HOTS) Self-instructional Manual for Students' Assignment Achievement	1. This module was created to overcome the problem of weakness in implementing HOTS which is one of the reasons why a student is not creative at solving all the problems that arise. 2. This study is about evaluating the effectiveness of HOTS's Self-Instructional Manual (SIM) in teaching and learning for assignment achievement among polytechnic students. 3. Technique: High Order Thinking Skills (HOTS) Self-instructional Manual 4. Findings: The findings in this study showed that most of the students in the Target Group (TG) and Control Group (CG) achieved good results in the individual pre-assignment. The results also show that there is a significant difference in the mean scores of individual post assignments between TG and CG.
4. Merta Dhewa Kusuma et al. (2017)	1. The Development of Higher Order Thinking Skill (Hots)	1. The lack of achievement of HOTS in TIMMS and PISA and

	Instrument Assessment in Physics Study	the lack or absence of assessment instruments designed to train HOTS has led to the need to develop HOTS assessment instruments. An evaluation instrument was designed which is a model adapted from the Borg & Gall model. 2. The objectives were to determine the indicators and the effectiveness of the HOTS assessment instrument as an assessment for learning for a high school student. 3. Technique: Instrument Assessment in Physics Study 4. Findings: The assessment instrument was developed based on cognitive dimensions in HOTS indicators, including the ability to analyze (C4), evaluate (C5), and create (C6) in static fluid material as well as knowledge dimensions in the form of factual knowledge, conceptual procedure, and metacognitive
5. Baskoro Adi Prayitno et al. (2018)	1. Enhancing students' higher-order thinking skills in science through INSTAD strategy	1. The effectiveness of the INSTAD strategy in comparison to other teaching strategies was examined. 2. The comparison included inquiry, student team's achievement division (STAD), and lecture method. 3. This is in order to reduce the gap of higher-order thinking skills between Upper Academic (UA) and Lower Academic (LA) groups of students. 4. Technique: INSTAD strategy 5. Findings: INSTAD has become the most optimal learning strategy to improve students' high-level thinking skills when compared to Inquiry, STAD, and lectures.
6. He Sun et al. (2022)	1. Exploring the structure of students' scientific higher-order thinking in science education.	1. Research on the nature of scientific higher-order Thinking (S-HOT) and defining its unique characteristics needs to continue because HOT plays an important role in the science learning process.

		2. As a result of this problem, a study was conducted to present a new model of S-HOT that synthesizes five competencies. 3. This study has developed a new questionnaire to measure students' S-HOT. 4. Technique: S-HOT Questionnaire. 5. Findings: i) The results of the study showed that the average score of creative thinking for male students is significantly higher than for female students. ii) There is also a correlation between the five competencies studied, such as metacognition has a significant path to scientific reasoning, science self-efficacy has a significant path to critical and creative thinking, and scientific reasoning directly affects science self-efficacy.
7. Swaran Singh et al. (2018)	1. A Review of Research on the Use of Higher Order Thinking Skills to Teach Writing	1. This study examines the HOTS skills taught in the field of writing in the Malaysian context. The issues touched upon are related to ESL teachers who are only trained to ask questions related to HOTS but most of them have very little knowledge of implementing HOTS pedagogy. 2. Previous studies have also reported that teachers are not prepared for HOTS in their own classrooms. 3. Starting from this problem, the need to investigate issues related to HOTS during the teaching of writing requires immediate attention. 4. Technique: Schema Theory. Findings: 1. English language outside of the classroom requires tactics like higher order thinking abilities to improve thinking abilities in daily life. Young ESL learners would benefit greatly from using writing as a way to exercise higher order thinking abilities.

	2. The greatest way to educate pupils with higher order thinking abilities is to explain the connection between questions and responses to them. Students will be able to master the numerous types of thinking abilities presented in this module by using it, enabling them to employ a variety of thinking skills.

RESULTS AND ANALYSIS

Findings are based on the diversity of implementation of HOTS in primary schools, secondary schools, and higher education, such as in colleges and universities.

Table 3.
Primary Schools

Technique	Strength	Weakness	Remarks
1. Scaffolding technique	1. The scaffolding technique shows that the students develop a thinking process by helping them towards the potential zone based on each student's necessity. 2. Describe students' thinking processes using the scaffolding method so that students can learn effectively. 3. The teacher can do this activity spontaneously if he/she has good skills in the Scaffolding technique.	1. Students only can develop higher thinking skills when getting scaffolding from teachers who are experts in using this technique. 2. There are no modules provided. Teachers need to be proficient and have good pedagogy skills. 3. Teachers must be able to identify the weak points of each student during the scaffolding. This included the misconception and the structure of their thinking. The scaffolding is according to their needs. 4. Takes quite a long time to implement.	1. Only two levels of scaffolding technique. 2. Different scaffolding in for each of the students according to their needs.

Table 4.
Secondary Schools

Technique	Strength	Weakness	Remarks
1. Instrument Assessment in Physics Study	1. Understanding the way students approach learning. 2. Ability to the analysis of factual, conceptual, procedural, and metacognitive knowledge 3. Assessment for learning is effective to train student's HOTS. 4. Instrument/questions provided	1. It takes a long time to do the assessment and the teacher must be experienced and skilled in this way. 2. Suitable for a high school student. 3. The assessment instrument was developed based on HOTS only excluding the LOTS	1. The Assessment in Physics Study was adapted to the Borg and Gall type, which includes 10 development steps, but in this research, only 7 steps were used.

2. S-HOT Questionnaire	1. Teachers can observe students' HOTS levels and enhance them based on the S-HOT model to improve their teaching and develop students' thinking skills. 2. There is correlation between the five competencies: metacognition had a significant path to scientific reasoning, science self-efficacy had a significant path to critical and creative thinking, and scientific reasoning directly affected science self-efficacy.	1. Only focusing on a few features based on the theoretical framework of the study. 2. Teachers need to be proficient and have good pedagogy skills to achieve S-HOT skills. 3. Teachers need to understand the structure of S-HOT in order to be efficient in the use of the S-HOT model during the lesson.	1. A new development related to the structure of S-HOT which is a study that has been abandoned by researchers for a long time.

Table 5.
Colleges/Universities

Technique	Strength	Weakness	Remarks
1. INSTAD strategy	1. It can be practiced at all levels, such as primary schools, secondary schools, colleges, or universities. 2. Reduce the gap between Low Academic (LA) students and Upper Academic (UA) students. 3. Better than an inquiry or method of lecturing alone.	1. Use more than one technique. 2. Teachers must be trained and proficient in more than one technique. to master INSTAD strategies. Otherwise, it cannot be implemented effectively. 3. This will be time-consuming if the teacher needs to be proficient in two combined teaching methods. 4.. Module for INSTAD strategy not provided.	1. INSTAD strategy is a hybrid technique. Combining Inquiry-based learning and Student team's achievement division; STAD (INSTAD). 2. Empower UA students by minimizing the gap in higher-order thinking skills between UA and LA students
2. Flipped learning	1. Modern technique. Using mobile devices, learners can access instructional materials without being limited by time or location 2. Notes taken and information collected in the pre-class stage of flipped learning can be accessed and shared in the class 3. Using multimedia as a medium in teaching and learning. 3. Advantages: Many resources, easy, high availability, handy to use. 4. Avoid boring learning because it is based on multimedia, video, narrative, and active learning.	1. Widely used in only five countries, namely the USA, China, Taiwan, Australia, and South Korea. It has not been widely used in other countries, including Malaysia. It needs to be learned first because it is quite foreign to our teaching techniques. 2 Among the problems encountered in carrying out flip learning activities is that students may fail to understand the learning content while watching videos at home. 3. The teacher's problem is the difficulty of knowing the learning status before class for each student. This makes	1. Flipped learning can be adapted to a wide range of areas, including social science, computer science, medicine, engineering, mathematics, and others. 2. Demonstrated the most up-to-date flipped learning, great potential in learning methodologies, and sophisticated teaching and learning resources.

		it difficult for teachers to carry out effective classroom activities. Teachers need to be aware of the student's learning status and be prepared for activities that change according to learning needs. 4. The concern about flipped learning is that more effective strategies or innovation need to be used to make it work better. 5. Module/ instrument of Flipped learning not provided.	
3. High Order Thinking Skills (HOTS) Self-instructional Manual	1. Availability of self-instructional manual. 2. Handy to use by teachers and students. The self-instructional manual is easy to manage and has clear instructions (clear learning experience). 3. It might boost student confidence and inspire them to do homework on their own. 4. It allows students to experiment with different learning approaches and to use HOTS throughout the learning cycle. According to Nurafefa Hamdan et al (2019), the autonomous learning handbook allows students to acquire different techniques of learning. Students may learn how to employ HOTS in a complete learning cycle by mastering eight HOTS in learning.	1. For the use of higher institutions of education only.	1. It is a user-friendly self-instruction guidebook that may be utilized by lecturers, teachers, or students. 2. Various learning approaches.
4. Schema Theory	1. Teachers might begin the class introduction based on a student's prior knowledge. The Schema Theory learning is based on a collection of knowledge that is frequently connected with a concept and includes background information related to the learning issue. Mental development is the focus of Schema Theory. 2. This benefits the teacher	1. The questioning approach is used in this learning style to promote HOTS in the students' minds. Teachers must be skilled in more than one strategy in order to master the Schema Theory and prevent stereotype learning styles, which can lead to a dull scenario in the classroom.	1. Although there are numerous studies on HOTS, only a few are in the language field, which is the field of writing. This is one of the study articles on the subject since HOTS issues in writing are common among students nowadays. 2. Cognitive Theory is related to the theoretical framework based on Schema Theory.

	because students complete the cycle of learning by beginning the class with prior knowledge and finishing it with new information.

All the techniques discussed above have strengths and weaknesses. Those techniques are supposed to collaborate and integrate to complete the learning cycle. Teachers must master various techniques to achieve the best results when teaching HOTS. There are various technical instructions for students during the lessons. Techniques discussed above include inquiry-based learning and high-level questioning in pedagogy and assessment that could promote HOTS among students. Those ways can help in improving student-centered and independent learning and can directly improve student achievement. According to Vygotsky (1962; 1934), the learning process can only benefit students if they are directly involved in the thinking process.

Various teaching techniques have been discussed that can be used to implement HOTS in lessons. The techniques practiced in higher institutions should be expanded for lower-level education institutions such as primary schools and early education. To do so, practical modules must be easier for the early stages of learning (early education and primary school). Simplification of the modules should be prepared according to the diverse techniques for wider use at primary school and early education levels. This type of research can be explored to build new learning styles suitable for different cognitive levels. This research gap can be explored to improve the quality and enrich the implementation of the diversity of HOTS. The study also needs to be done more widely, not just about HOTS teaching techniques, but the hotspot regions that conduct the study need to be expanded. Liu et al. (2021) informed of a regional imbalance in the HOTS collaborative network, which is mainly concentrated in the USA and Canada, followed by Asia such as Malaysia, Taiwan, Israel, Turkey, and Indonesia. With the involvement of many countries, various forms of HOTS research can be explored, and the diversity of HOTS will increase. Although many studies and techniques have been revealed, there is still room for improvement as each technique and study on HOTS has its strengths and weaknesses. Various HOTS methods and concepts in learning manual methods can be created and multiplied for widespread use. This opens up opportunities for students to experience HOTS and learn more independently.

The combination of the teacher's knowledge of the correct pedagogical techniques, the teacher's teaching strategy, the media to cultivate HOTS, and the student's factors support each other to achieve the goals of HOTS. Competent teachers produce effective learning. Although diverse HOTS implementation exists, this goal cannot be achieved well because teachers' pedagogical skills and knowledge of HOTS still need to be strengthened. Improvement of HOTS skills and knowledge of pedagogy for teachers needs to be improved. Preparing short-term courses provided by the department and sharing knowledge with fellow teachers are highly encouraged. In this way, the knowledge of HOTS pedagogy can be enriched and become a culture among educators. This opportunity is still available because the field of education is dynamic and is always open to positive changes.

CONCLUSION

This paper presents a comprehensive review of the current literature on higher-order thinking skills techniques in education, focusing on student assessment strategies for higher-order thinking and problem-solving from 2016 to 2022. The review synthesizes research findings on various thinking skills techniques in education that can enhance critical thinking and problem-solving skills among students. Based on the Malaysian Education Development Plan 2013-2025, teachers should be aware of the importance of HOTS among the younger generation. Studies on HOTS are increasing all over time. The importance of HOTS being embedded in students' minds and making it a culture of thinking cannot be denied in a fast and global competition. Using this kind of analysis will give a clear picture for educators to decide on the techniques to conduct lessons. Most interestingly, not all techniques are suitable for each target group because of the different kinds of situations and ages. All the techniques are unique in their styles of delivering the HOTS skills to the target group of students. The techniques could be changed or combined depending on the educators' understanding of the techniques and their skills to design their lessons.

The right technique helps enhance HOTS delivery to the students. Shukla and Dungsungnoe (2016) stated that the various strategies facilitated different levels of learning. Different learning gives different outcomes and different

students' behavior. There are different cognitive ability levels of students, and that is where students may develop cognition from one level to another. With the different kinds of students with different cognitive conditions, specific instruction to develop thinking skills is crucial. The teacher's skills in determining the right techniques are crucial to drive HOTS skills in their students. This paper also discusses these assessment strategies' challenges and limitations and identifies research and practice's future directions in this area. The findings of this review contribute to the existing literature on student assessment and provide valuable insights for educators, policymakers, and researchers interested in promoting higher-order thinking skills in education

In summary, this research helps researchers discover the diversity of ways teachers implement HOTS in teaching and learning. Various implementation of HOTS is the starting point for educators to encourage the development of HOTS practices. The researchers also can understand the different ways of looking at different unique operational HOTS teaching styles. This study can encourage other researchers to continue distinguishing other HOTS implementation techniques because not all techniques can be included and discussed in this paper. Educators also can adopt the teaching techniques discussed above in the classroom. The early exposure to the techniques' strengths and weaknesses and how they differ according to the needs of different groups of students will enable educators to choose the appropriate ones. Other studies can be conducted or continued to improve the weaknesses of the existing techniques discussed above. This is seen as a necessity because each technique is dynamic and can be improved according to the creativity and suitability of each individual. This article also only touches on the variety of implementations of HOTS, namely HOTS learning techniques and HOTS learning instruments. Other studies that can be continued related to the diversity of HOTS, such as the HOTS curriculum and HOTS related to the student's own needs. This is to complete the study related to HOTS and expand the diversity of implementation of HOTS in education.

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