
FIRST-YEAR UNDERGRADUATE STUDENTS' EXPERIENCE WITH CRITICAL THINKING SKILLS

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ABSTRACT

Developing critical thinking skills is essential in many higher education courses, and it is increasingly evident in syllabi and assessment criteria. Despite this, students frequently fail to comprehend and demonstrate it in their work. This study examines how students perceive the term 'critical thinking' and identifies relevant factors that influence this perception. It aims to examine first-year undergraduate students' critical thinking abilities and their repercussions. This study used a qualitative design and a purposive sampling strategy to select 300 first-year undergraduate students. Results reveal that students demonstrated low critical thinking skills and limited interpretation, analysis, and problem-solving skills. Additionally, both internal and external factors, such as relative inexperience with the problem description, misinterpretation of the problem and its solution strategy, a lack of creativity and experience, reading and comprehension problems, and a lack of interest in solving mathematical problems because of the length and complexity of the problems, have an impact on their current critical thinking abilities.

Keywords: Critical thinking skills, affecting factors, interpretation, analysis, problem-solving, undergraduate student, 21st-century skills

INTRODUCTION

21st-century skills and knowledge" refers to a broad range of information, abilities, and attitudes that are essential for success in the global workplace (Chen, 2023). Students at all levels must adapt to the demands of modern society as it continues to modernize and globalize (Li, 2024). As a result, it is critical to consider how they must develop and collect skills appropriate for the twenty-first century. Critical thinking, creative thinking, communicating, and cooperating are the four C's of 21st-century learning (Dignam, 2025). These abilities aid learning and are therefore essential for academic and professional success (Ahonen & Kinnunen, 2015; Chu, et al., 2021; Kivunja, 2015). These four C's are based on the Partnership for 21st Century Skills (P21), which was created in 2002 by leaders from business, education, and government to put these critical life skills at the forefront of all students' learning. Over the years, studies on how students acquire and develop 21st-century skills have been conducted across different countries worldwide (Sanabria et al., 2017; Jacobson-Lundeborg, 2016; Siddiq et al., 2017; Care et al., 2018). Accordingly, among the 21st-century skills students must develop, they must possess strong thinking skills that enable them to quickly absorb new knowledge and adapt to the demands of the 21st century. Critical thinking skills are the most important thinking talent in the twenty-first century (Alsaleh, 2020; Persky et al., 2019; Birgili, 2015).

Critical thinking skills are emphasized in the collegiate learning process as 21st-century skills. These skills are one set of life skills that must be developed during the educational process and can determine one's life success (Fuad et al., 2017). Solving issues and making judgments also means thinking clearly and identifying links among systems, concepts, and disciplines. Critical thinking necessitates clear, accurate, and precise expression; the relevance of

arguments or questions; logical thought; and sufficient depth and breadth to evaluate the complexity and perspectives of an issue (Huber & Kuncel, 2016). As per Karakoc (2016) and Reichenbach (2000), critical thinkers can evaluate the truth or worth of an idea or position before accepting it. Critical thinkers may ask excellent questions, present accurate and valuable information, make logical judgments based on trustworthy or unattainable (objective) sources, and reach consistent conclusions when solving a problem (Bustami et al., 2018; Cahyarini et al., 2016). Critical thinkers can ask essential questions about a situation, gather and analyze relevant information, draw sound conclusions and solutions, think honestly, and effectively convey their opinions (Paul & Elder, 2008). Interpretation, analysis, inference, assessment, explanation, and self-regulation are markers of critical thinking abilities in children (Facione, 2011).

Several experts have argued that physical focus, learning concentration, intellectual growth, and learning motivation impact critical thinking skills (Gul et al., 2014; Saeger, 2014; Fajari, 2020). According to Irwanto et al. (2018), students' prior knowledge influences their critical thinking abilities, as it can shape thinking based on initial premises. Furthermore, Saragih and Zuhri (2019) asserted that contacts, particularly interactions during teaching and learning, impact critical thinking processes. Critical thinking is also an important issue in today's educational environment. Students with strong critical thinking skills can plan and navigate their lives in a future marked by difficulties, competition, and unpredictability (Vieira & Tenreiro-Vieira, 2014; Darling-Hammond et al., 2020).

It can then be stressed that critical thinking plays a vital role among students in coping with the demands of the 21st-century environment, as mentioned in the literature cited above. However, despite the importance of the said skills and the different activities and initiatives implemented by schools and universities to enhance one's critical thinking, still, some research, like Manshaee et al. (2014) in Iran, Sarigoz (2012) in Turkey, and Massa (2014) in Italy, have proven survey results suggesting students' critical thinking abilities are also at a low level. In addition, some researchers argue that introducing innovations and programs to develop and enhance critical thinking in educational contexts often encounter resistance and challenges (Riggs & Hellyer-Riggs, 2014; Wolcott et al., 2002). More importantly, research on critical thinking among students was focused more on perceptions of students and teachers, and limited studies had been conducted looking into its acquisition and even factors contributing to its development (Goldsmith, 2013; Tindown et al., 2017; Wangenstein et al., 2011; Romeo, 2010; Carroll, 2007).

Given the identified literature gaps, conducting a qualitative study on the critical thinking skills of first-year college students and the factors that affect them is important. According to Davis (2015), critical thinking is essential in higher education because it teaches students to learn independently. Furthermore, many higher education institutions strive to prepare students to think critically, and employers of university graduates value these skills.

METHODOLOGY

To investigate undergraduate students' critical thinking abilities, this study used both qualitative and quantitative research methods. Three hundred first-year undergraduate students from the United Arab Emirates were considered for the study. 56% of the participants were male, while around 44% were female. Participants ranged in age from 17 to 22 years old. The majority (81%) of participants were between 17 and 19 years old, while only 9% were 20+ years old.

Research Instrument

The critical thinking skills exam consisted of eight open-ended questions designed to accommodate the broadest possible range of student responses while still assessing their critical thinking abilities. Multiple experts, including critical thinking skills specialists and learning instrument experts, have undergone and assessed the test instrument's content validity. The eight legitimate questions were selected and used in the current investigation. The questions distributed to university students concentrated on three main categories: analysis, interpretation, and problem-solving.

Data Analysis

The gathered data were analyzed using content analysis. Summarizing, selecting, emphasizing, grouping, and categorizing research findings based on the created theme or pattern completed the data reduction stage. Following that, the step of studying data presentation was completed, which was deemed critical because it would make it easier for researchers to interpret the gathered data, allowing them to draw more suitable conclusions or take future action. Finally, conclusions were drawn, which can be done again if necessary. In qualitative research, preliminary judgments are only transitory and may change as data or other field information are revised. The conclusion in question is a previously ambiguous item description that became obvious following the analysis.

Table 1 provides an overview of the research design, participants, instruments, and key analytical dimensions of the study.

Table 1. Summary of the Study on First-Year Undergraduate Students' Critical Thinking Skills

Aspect	Description
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Study Title	First-Year Undergraduate Students' Experience with Critical Thinking Skills
Research Purpose	To examine first-year undergraduate students' critical thinking skills and identify factors influencing their interpretation, analysis, and problem-solving abilities
Research Design	Mixed-methods approach with a dominant qualitative design
Participants	300 first-year undergraduate students from the United Arab Emirates
Gender Distribution	56% male, 44% female
Age Range	17–22 years (81% aged 17–19)
Sampling Technique	Purposive sampling
Research Instrument	Critical thinking skills test consisting of 8 open-ended questions
Critical Thinking Dimensions Assessed	Interpretation, Analysis, Problem-Solving
Data Analysis Technique	Content analysis (data reduction, data display, conclusion drawing)
Key Findings – Interpretation	Only 51% of students demonstrated correct interpretation; many showed difficulty comprehending problem statements
Key Findings – Analysis	64.4% answered the first analysis item correctly; 55.6% answered the second correctly; deceptive questions caused frequent errors
Key Findings – Problem-Solving	73% answered the first problem correctly; 55.6% answered the second correctly, indicating moderate but inconsistent problem-solving skills
Major Factors Affecting Critical Thinking	Limited prior knowledge, misinterpretation of problems, low reading comprehension, lack of creativity and experience, low mathematics self-efficacy, and task complexity
Role of AI and Contemporary Pedagogy	AI and blended learning can enhance critical thinking when used actively, but passive reliance may hinder deep cognitive engagement
Overall Conclusion	First-year undergraduates exhibit generally low critical thinking skills across all dimensions, influenced by cognitive, motivational, and instructional factors
Implications	Need for targeted instructional strategies, improved problem-based learning, and intentional integration of AI to promote higher-order thinking

RESULTS AND DISCUSSION

Critical Thinking Skills of College Freshmen along with Interpretation

Only 51 percent of students answered the question correctly with an interpretation, and others simultaneously chose inconsistent solutions. Interpretation is an important aspect of critical thinking because it requires one to comprehend the information provided and communicate its meaning to others (Cottrell, 2017). The present study revealed that more than half of the student-respondents could identify the purpose of the cord contained in the critical thinking test. However, many first-year undergraduate students failed to manifest this competence in critical thinking. This means many respondents could not comprehend the information they received. According to Zivkovil (2016), individuals with low levels of critical thinking skills, specifically in interpretation, have difficulty reasoning and are less able to think independently and reflect on their way to a well-informed judgment. The findings are supported by previous research highlighting college students' low levels of critical thinking and interpretive skills (Sarwanto et al., 2021; Mutakinati et al., 2018; Fuad et al., 2017; Heijiltes et al., 2015). Furthermore, Sarwato et al. (2021) claimed that students failed to demonstrate this aspect of critical thinking for three major reasons: briefly mentioning the meaning without explanation, summarizing the question and treating it as an answer, and answering it unsystematically.

Figure 1. Students' Responses to the Interpretation Question. Distribution of student responses to the interpretation item, showing the proportion of correct, partially correct, and incorrect interpretations.



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that first-year students have low mathematics learning outcomes, as indicated by their academic performance. Based on previous studies, One factor of low mathematics learning outcomes in students is that many believe math is

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complicated to learn and that abstract mathematics is a terrifying specter, especially if the difficulty is linked to a lesson about the ability to solve problems in everyday life (Widana et al., 2018; Firdaus et al., 2015; Rodzalan & Saat, 2015). Students struggle with word problems and with translating them into mathematical models. As a result, students cannot solve the problem because they choose to draw inferences about the quantities in the story rather than understand the problem. Problem-solving, which typically involves a variety of concepts, requires students' thinking abilities. As a result, if assigned a different subject with previously difficult questions, address students' worries (Aizikovtsh-Udi & Cheng, 2015).

Critical Thinking Skills of College Freshmen along with Analysis

The analysis is another crucial part of critical thinking. Students were expected to recognize the intent and draw proper inferences in the link between assertions, questions, concepts, descriptions, or forms of statements meant to represent beliefs, judgments, experiences, reasons, facts, or opinions as a result of this dimension (Ristanto et al., 2020). Furthermore, according to Hidayah et al. (2017), analysis is a component of critical thinking, which is the ability to study something attentively, whether it be an issue, a set of data, or a text. Analytical skills enable people to analyze information, understand its meaning, and appropriately convey its implications to others. In this study, the analysis was measured using two analyses. In the first question, 64.4 % of the students answered correctly. In the second analysis question, 55.6 % of the students answered correctly. The findings suggest that students performed better along this dimension than in interpretation. However, the results still show that many student respondents failed on this dimension.

On the first question, which is, "If you have a bowl with six apples and you take four, how many do you have?" some of the answers of the respondents are as follows

The answer will be four apples that you took away with you.

However, two apples in the bowl are mine as well.

It need not be your bowl.

However, you did not take a bowl with you.

hahahhah

Right love anny

Meanwhile, for the second question, "Where does the smoke go if an electric train moves north at 160km /h and a 16km / h wind blowswest?" most of them answered, "Smoke will go to the Southeast" side.

Figure 2. Students' Responses to the Analysis Questions. Examples and frequency of students' answers to the analysis-based questions, illustrating common reasoning patterns and typical errors.



Based on the respondents' answers, many understood the text's meaning and could analyze the reasons and causes of the phenomena posed in the questions. However, many students still failed to answer the two questions correctly. Based on respondents' answers to the question, it appears that one reason for their incorrect responses is the deceptive nature of the question. Accordingly, the findings support previous studies indicating that one factor contributing to the low level of critical thinking among college students is their inability to identify and understand deceptive questions (Eniis, 2015; Bowler & Champagne, 2016; Paul et al., 2019). However, deception questions are important

for enhancing critical thinking because they test students' ability to think critically, even when presented as a trick question. Without critical thinking skills, there is a risk of being deceived or of being led to conclusions unquestioningly (Bensley, 2023). To form opinions and reach conclusions, strong critical thinking skills are fundamental. A persuasive message attempts to convince others to agree or act in a particular direction, and the goal of the argument is to persuade them to accept a particular conclusion.

Meanwhile, according to some respondents, one factor in their ability to analyze the question posed is re-reading the material provided. Accordingly, researchers argue that this is an effective method and strategy for further developing one's critical thinking skills (Phillips et al., 2016; Fang, 2016; Mason et al., 2015; Van Silfhout et al., 2015). Reading something twice actually helps one recall more information, cannot forget what was learned the first time, take action on the knowledge in the reading, and have the information remain longer (Ali & Razall, 2019).

Critical Thinking Skills of College Freshmen, along with Problem Solving

The third dimension of critical thinking is problem-solving. As a result, critical thinking leads to issue-solving. It comprises identifying and studying the problem in order to choose the most effective method to address it (McCormick et al., 2015). It assumes that students can take responsibility for their learning and take personal action to solve problems, manage arguments, examine alternatives, and focus on thinking as an essential component of the curriculum. It allows students to apply their newly acquired knowledge to relevant, real-world tasks and helps them work at higher levels of thought. In the mathematics curriculum, problem-solving is a significant learning outcome that students must develop (NoprianniLubis et al., 2017; Ozrecheroglu & Caganaga, 2018; English & Gainsburg, 2015). Higher education mathematics instruction often directs students to understand mathematical formulas by applying them in a problem-solving activity. This is especially true when the data includes equations such as those for arithmetic sequences and series. In reality, to promote students' knowledge of the content and achieve significant learning, the capacity to recognize and construct formulae in Mathematics is essential (Sutarni et al., 2024). Creative thinking is one of the skills students need to experience more meaningful learning and develop their thinking skills in tackling everyday situations (Birgili, 2015).

In this study, two problem-solving questions were considered. In the first problem, 73% of the participants answered correctly. This could mean they thought about the problem and decided it must be something else, and they expressed it as if they were inquiring about things. However, they are actually asked about the names of things, breaking the technical practice that, when a word or phrase is used rather than the item it names, it must be contained in quotation marks. This means that before students can solve a problem, they must understand what they are requesting. This is frequently the first barrier in word problems that do not identify a specific mathematical operation.

Figure 3. Students' Responses to the Problem-Solving Questions. Summary of student solutions to the problem-solving items, indicating correct answer rates and common misconceptions.



Determining the solution is a simple task when one thoroughly comprehends the question. For some students, calculating amounts, sizes, and other measures is one of the most basic arithmetic skills. All of these abilities are required to execute exact and efficient numerical calculations. Simple math is well-known for directing the ability to perform simple calculations involving numbers, values, quantities, or other measures. To generalize an arithmetic series formula, creativity and flexibility are required.

Meanwhile, the second problem revealed that 55.6% of students answered correctly. The given question requires students to choose which mathematical operation (addition, subtraction, multiplication, or division) or combination of operations will be most effective in solving a word problem.

Selecting mathematical operations is an important aspect of the overall process of converting English words into mathematical statements (Zhang et al., 2021). Success is determined by the capacity to grasp the literal meaning of the phrase as well as quantitatively articulate that meaning. Even if they have the essential mathematical abilities,

students who do not comprehend the sentence's literal meaning will be unable to represent it mathematically. Even if students know the sentence's precise meaning, they will be unable to solve the problem unless they can also represent this meaning mathematically. In other words, appropriate solutions to word problems require both reading and mathematical ability (Jupri & Drijvers, 2016; Daroczy et al., 2015). Selecting an operation, in particular, entails recognizing linguistic signs that imply mathematical meanings.

The Role of Contemporary Educational Approaches and AI in Shaping Critical Thinking

Beyond the traditional reasons behind the development of critical thinking skills, new methods of teaching especially the blending of digital media with artificial intelligence (AI) are opening the doors for these skills to be cultivated while at the same time, posing difficulties. In contemporary teaching styles that include blended learning, flipping of classrooms, and inquiry-based learning, students become the focal point of the whole learning process and are involved in problem-solving related to the real world (Agbi, 2022). This can eventually lead to more thoroughness in the development of analytical and interpretive skills but only if the process of teaching is carefully carried out. On the other hand, the increase in the usage of AI-based tools like automatic tutors, content creators, and data miners might unintentionally lead to a situation where students, who are relying on these resources passively, lose the practice of engagement through independent listening and thinking (Grassini, 2023). AI, on the one hand, can tailor education according to the student's pace and expose them to complicated issues, but on the other hand, it can lead to surface-level understanding if the teacher does not specifically incorporate activities that develop evaluation, synthesis, and ethical reasoning skills which go beyond the production of AI outputs. Therefore, the question of how to utilize the new technologies to the utmost while at the same time promoting critical thinking is bound to be solved in a somewhat less liberating and more cognitively demanding way, for students not to be lasciviously passive, yet still be discerning thinkers in an ever-automated world.

Factors Affecting the Mathematical Problem-Solving of the Respondents

Looking further into students' responses, it can be determined that first-year undergraduate students had weak critical thinking abilities across the three dimensions due to many variables such as the following: (1) Students were unfamiliar with the problem description; (2) Students did not understand the problem and its resolution strategy; (3) It requires identifying and studying the problem in order to choose the most effective method to address it (McCormick et al., 2015); (4) Students struggle with reading and comprehension, unable to identify significant information in an issue and organize it appropriately. As a result, they cannot translate the words into mathematical symbols, and (5) Due to the length and difficulty of the tasks, students are disinterested in tackling them. Looking at all the variables, it is possible to conclude that multiple factors, including mathematics self-efficacy, ideas and perceptions about problem-solving, and the nature and difficulty of the mathematical problem, contribute to students' low problem-solving. Considering the said factors may enhance one's critical thinking skills. Problem-solving is considered the core of mathematics learning since it focuses not just on topic learning but also on the development of thinking skills (Hogheim, 2017). Because the processes of solving mathematical problems are similar to those of general problem solving, students can apply their knowledge and problem-solving skills in everyday life.

CONCLUSION AND IMPLICATIONS FOR FURTHER RESEARCH

According to the study, college students' critical thinking abilities remained relatively poor across three dimensions: interpretation, analysis, and problem-solving. Internal and external factors, such as mathematics self-efficacy, attitudes and behaviors toward problem-solving, and the nature and complexity of the mathematical problem, mainly drive the low level of critical thinking among freshman undergraduate students.

In light of the preceding results, it is suggested that future studies should focus on critical thinking abilities and the factors that influence them in a larger, more in-depth, and more specific manner. Furthermore, college professors should discover practical ways to teach the critical thinking skills their students need by understanding the factors that shape primary school students' critical thinking. In addition, educational institutions should focus more on techniques and strategies to strengthen students' critical thinking skills. The findings may be used to design successful ways to improve teaching and strengthen critical thinking skills at the college level.

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