PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGER EDUCATION AND SCIENTIFIC RESEARCH
AbdelhafidBoussouf University - Mila

Institute of Letters and Languages
Department of Foreign Languages
Section: English

The Influence of Artificial Intelligence on Students' Critical Thinking. A Case Study of Third Year Students of English at the University Center of Mila

A Dissertation Submitted in Partial Fulfillment for the Requirements of the Master Degree in
Didactics of Foreign Languages

Presented by:
1) DIF Aymen
2) BOUSIOUD Zakarya

Supervisor: Prof. BELLOUR Leila

Board of Examiners:
Chairman:
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Abbreviations

CT	Critical Thinking
ANI	Artificial Narrow Intelligence
ASI	Artificial Super Intelligence (ASI)
ML	Machine Learning
ANN	Artificial Neuron Networks
CNN	Convolutional Neural Networks
MSE	Mean Squared Error
RNN	Recurrent Neural Networks

List of figures

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Dedication

I dedicate this dissertation to my beloved parents whose steady belief in my potential has been guiding me throughout this journey. From the very beginning of my education to the final moments of completing this dissertation, your endless support and encouragement have been my foundation. Your sacrifices and wisdom have provided me with the strength to persevere, even in the face of the most difficult challenges. This achievement is as much yours as it is mine, for without your love and dedication, I would not have reached this milestone. To my dear friends, The moments of camaraderie, shared laughter, and your relentless faith in my abilities have been crucial in this journey. You have been my cheerleaders and my motivators, always ready to lift my spirits and push me towards my goals. Your friendship has been a source of immense joy and inspiration, making even the toughest days bearable and the successes even sweeter. This dissertation is dedicated to you all, with profound gratitude and love.

ZAKARYA

Dedication

To my parents,

I cannot sum my gratitude for you in mere few lines for it is truly immeasurable. This dissertation is a testament to your unwavering support and love. From my earliest days of schooling to this final academic milestone, you have been my constant pillars of strength. Your encouragement, sacrifices, and faith in my abilities have shaped me into the person I am today. I am eternally grateful for the countless hours you spent helping with the homework making sure I excelled, the countless hours spent on my well being, physical and mental health. And the countless hours spent providing for me. Your belief in me, even when I doubted myself, has been my greatest source of motivation. Thank you for your patience, understanding, and for always being there, no matter the distance or the time.

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Aymen DIF

Abstract

Artificial Intelligence has become deeply integrated into various aspects of our lives, with its influence reaching far and wide. While AI offers immense potential to enhance productivity, efficiency, and convenience, there are growing concerns regarding its impact on critical thinking skills, particularly among learners. This research delves into the effect of AI dependency on the critical thinking abilities of third-year EFL students. Through analyzing usage patterns and employing both quantitative and qualitative methodologies, the study assesses how reliance on AI tools shapes critical thinking. Drawing from existing literature, a comprehensive questionnaire was developed. The sample comprised 80 students and 5 teachers, whose data were analyzed to gauge the influence of AI on critical thinking. The findings reveal a nuanced picture, indicating that Artificial Intelligence can both positively and negatively affect critical thinking.

الملخص

لقد أصبح الذكاء الاصطناعي متكاملاً بشكل عميق في مختلف جوانب حياتنا، مع تأثيره الذي يمتد بشكل واسع .على الرغم من أن الذكاء الاصطناعي يقدم إمكانات هائلة لتعزيز الإنتاجية والكفاءة والراحة، إلا أن هناك مخاوف متزايدة بشأن تأثيره على مهارات التفكير النقدي، خصوصًا بين المتعلمين .تتناول هذه الدراسة تأثير الاعتماد على الذكاء الاصطناعي على مهارات التفكير النقدي لدى طلاب السنة الثالثة في تعلم اللغة الإنجليزية كلغة أجنبية .من خلال تحليل أنماط الاستخدام واستخدام المنهجيات الكمية والنوعية، تقيم الدراسة كيف يشكل الاعتماد على أدوات الذكاء الاصطناعي التفكير النقدي .تم تطوير استبيان شامل بالاستناد إلى الأدبيات الموجودة .تألفت العينة من 80طالبًا و 5معلمين، حيث تم تحليل بياناتهم لقياس تأثير الذكاء الاصطناعي على التفكير النقدي .تكشف النتائج عن صورة معقدة، تشير إلى أن الذكاء الاصطناعي يمكن أن يؤثر بشكل إيجابي وسلبي على التفكير النقدي.

Résumé

L'intelligence artificielle (IA) est devenue profondément intégrée dans divers aspects de nos vies, avec une influence vaste et étendue. Bien que l'IA offre un potentiel immense pour améliorer la productivité, l'efficacité et la commodité, des préoccupations croissantes émergent quant à son impact sur les compétences de pensée critique, en particulier chez les apprenants. Cette recherche examine l'effet de la dépendance à l'IA sur les capacités de pensée critique des étudiants de troisième année en anglais langue étrangère (EFL). En analysant les habitudes d'utilisation et en employant des méthodologies à la fois quantitatives et qualitatives, l'étude évalue comment la dépendance aux outils d'IA façonne la pensée critique. En s'appuyant sur la littérature existante, un questionnaire exhaustif a été développé. L'échantillon comprenait 80 étudiants et 5 enseignants, dont les données ont été analysées pour évaluer l'influence de l'IA sur la pensée critique. Les résultats révèlent un tableau nuancé, indiquant que l'IA peut affecter la pensée critique à la fois positivement et négativement.

General Introduction

1. Statement of the problem

Critical thinking is not modern as a concept, tracking its origins it can be linked to the works of philosophers like Socrates and Aristotle, who emphasized the importance of questioning, reasoning, and logical analysis. Over time, critical thinking gained prominence in various fields, including education. (Facione ,1990) Defined critical thinking as a self-directed process that uses the standards of good reasoning to analyse, evaluate, and reconstruct complex information. He emphasized the active role of the individual in analysing and interpreting information.

As artificial intelligence emerges the integration of the latter in education particularly in the field of EFL has witnessed significant advancements, which stimulates the investigation and research conducted about its impacts on education. According to Chen, L., Chen, P., & Lin, Z. (2020) Artificial Intelligence (AI) has improved student learning experiences, instructional quality, and administrative efficiency in education. The advantages of integrating AI in education typically exceed the disadvantages, notwithstanding certain worries, such as challenges with academic integrity tied to AI-facilitated cheating. By improving creativity and learning capacities and offering more accurate educational recommendations based on thorough data analytics, future AI systems are predicted to significantly transform education,

This study neglects the effect of AI on students academic performace and critical thinking and emphasizes the facilitations it provided in pedagogy . Moreover, Alam, A., Hasan, M., & Raza, M. M. (2022) suggested that the education system has already embraced AI and that AI's presence in education helps raise awareness about disruptive technologies and the importance of data management. It emphasizes the need for public awareness regarding privacy, data protection, and ethical issues related to AI technology. He claimed AI facilitates

personalized learning and supports various forms of education, including distance, open, online, and digital education, and promotes lifelong learning for individuals worldwide, enhancing educational access and quality beyond traditional limits. Although AI cannot replace human teachers, it significantly supports teaching and learning processes, thus this study neglected as well the impact AI could have on students critical thinking which shows that the impact of AI tools on students' critical thinking within the specific domain of English studies remains underexplored and uncharted territory.

Everyday we see new methods, material and technologies being integrated, and the integration of Artificial Intelligence (AI) technologies has emerged as a significant table turner, offering promising avenues for enhancing learning experiences and outcomes or significantly hindering the whole process . Within this context, critical thinking stands as a fundamental skill essential for students' academic success and professional future. As third-year English university students navigate complex texts, engage in analytical discussions, and formulate arguments, the role of critical thinking becomes particularly prominent. Therefore, it is imperative to find how the infusion of AI into the educationl journey influences the development and manifestation of critical thinking skills.

This research aims to explore the Impact of AI technologies and assisting tools infusion on third-year English university students' critical thinking.

2. Research Questions

How and to what extent does the integration of AI technologies influence the critical thinking skills of third-year English university students?

3. Research Aim

To explore the influence of Artificial Intelligence (AI) technologies on the critical thinking skills of third-year English university students.

4. Research Design

This study relies on two research tools, a questionnaire given to third year English students, and an interview conducted on English teachers.

Chapter One

Part One: Critical Thinking

Introduction

This chapter covers several facets of the concept of critical thinking in an effort to provide knowledge about the wide topic. An overview and list of definitions for critical thinking are provided first. Additionally, this chapter explains some of the key components of critical thinking, such as its significance in EFL and its most significant foundational concepts.

1.History And Background

The origins of critical thinking trace back 2,500 years to Socrates, who used probing questions to expose that people often couldn't justify their confident claims to knowledge. He revealed that authority figures might lack true insight and demonstrated the need for deep questioning to evaluate ideas before accepting them. (California Commission on Teacher Credentialing)

The essence of critical thinking is the Socrates way of questioning and not blindly following people with self claimed, undebatable knowledge. As Its origins are found in his method of probing questioning, he uncovered the fallacies inherent in confident claims to knowledge.

Socrates, the pioneering figure, laid the groundwork for critical inquiry by challenging established beliefs and emphasizing the importance of seeking evidence and logical consistency. His teachings, perpetuated by Plato and Aristotle, highlighted the necessity of systematic thinking and questioning the assumptions before giving the verdict.

In the Middle Ages, scholars like Thomas Aquinas further refined critical thinking, integrating it into theological discourse and advocating for the systematic examination of ideas. Aquinas's emphasized on rational inquiry in a time when church rule was

unquestionable. In those days, anyone who opposed was regarded as a heretic and was sentenced to hang. On the other hand in the Islamic world and culture, the teachings of Islam encouraged the act of analyzing and contemplating the Quranic verses labeling it as (التدبر).

> "Do they not ponder about the Qur'an? Had it been from any other than Allah, they would surely have found in it much inconsistency" (4:82)

The Quran emphasizes the importance of critical thinking, as demonstrated in dialogues such as that between Pharaoh and a Muslim man, where questioning beliefs was key. Similarly, Abraham urged his tribe to critically evaluate their worship practices, leading them to acknowledge their errors. These stories highlight the power of critical thinking over blind adherence to authority.

Fast forward to the renaissance which also witnessed a resurgence of critical inquiry across Europe, with thinkers like Francis Bacon advocating for empirical study and the systematic scrutiny of prevailing beliefs. Descartes and Moore furthered this tradition by championing clarity, precision, and foundational skepticism.

The Enlightenment period ushered in a fresh era of rationality, with influential thinkers such as Montesquieu and Voltaire championing intellectual discourse and questioning authority. This emphasis on reason and empirical evidence provided the foundation for modern scientific investigation and critical thought.

In the 19th and 20th centuries, critical thinking expanded into diverse disciplines, including sociology, psychology, and linguistics. Figures like Marx, Darwin, and Freud challenged conventional wisdom, fostering a deeper understanding of human society, biology, and psychology.

2. Definitions of Critical Thinking

Wittgenstein's insights indeed offer a valuable perspective on the nature of philosophical problems, particularly in the realm of language and concepts. His emphasis on the dynamic use of language and the contextual understanding of words echoes throughout many philosophical and linguistic discussions. Wittgenstein emphasized that language's true meaning emerges when it is actively employed, likening idle language to an engine idling (Wittgenstein, 1958, p. 51, sect 132).

The definitional issues that the critical thinking movement faces are clarified by this point of view. Concepts such as critical thinking are frequently separated from their practical application, giving rise to a variety of interpretations and misunderstandings, or what Wittgenstein called "puzzlement" (Wittgenstein, 1958). He promoted linguistic empiricism as a solution to this ambiguity, asking philosophers to pay attention to the ways in which words are employed instead of depending only on their apparent meanings. He gives an instruction that summarizes this strategy: "Don't think, but look."

The study described in the referenced article takes a practice-based, "emic" approach to comprehending critical thinking in education, drawing on Wittgenstein's theories. Rather than depending exclusively on existing literature, the research aims to reveal the true comprehension of critical thinking possessed by active academic practitioners. It seeks to investigate how educators apply the idea to their lesson plans. This strategy differs from traditional research techniques, which usually aim to comprehend an idea first and then investigate its practical application (Pike, 1967). Instead, the study seeks to gather insights from educational practice to develop a comprehensive understanding of critical thinking as a concept, and it yielded seven definitions.

2.1 Critical thinking as judgment

Critical thinking is the process of making informed judgments and discerning between valid and invalid arguments or sources across disciplines, where individuals evaluate the reliability, truthfulness, usefulness, and persuasiveness of information to form reasoned conclusions or interpretations

2.2 Critical thinking as a skeptical and provisional view of knowledge

Critical thinking is characterized by a skeptical attitude towards accepted ideas and an inclination to question and challenge assumptions, both from others and oneself. It involves the capacity to examine and evaluate concepts, theories, and beliefs critically, cutting through accepted norms and interrogating taken-for-granted assumptions. This involves not merely accepting information at face value but actively engaging in the process of questioning, challenging, and re-evaluating ideas to form well-founded judgments and conclusions.

2.3 Critical thinking as a simple originality

Critical thinking encompasses not only a skeptical questioning of existing knowledge but also an active engagement in the creation and production of new ideas and interpretations. While skepticism is important, critical thinkers go beyond mere criticism to contribute positively to knowledge by constructing arguments, making original interpretations, and engaging in lateral thinking. This involves not only evaluating existing ideas but also actively participating in the process of building upon them or exploring alternative perspectives

2.4 Critical thinking as a careful and sensitive reading of text

Critical thinking involves a careful and sensitive reading of material, encompassing the ability to grasp the basic meaning of texts while also delving into their broader rhetorical purposes and underlying intentions. It requires readers to go beyond literal interpretations, understanding the context in which texts are produced, including the motives, intentions, and agendas of the authors. Critical reading involves contextualizing texts within broader

paradigms of writing and thinking, appreciating historical contexts and discourses. It also entails empathetic engagement with texts, seeking to understand rather than condemn, and ultimately, developing a nuanced and non-judgmental appreciation of the legacy of ideas within their historical context

2.5 Critical thinking as rationality

Critical thinking can be conceived as a form of rationality, emphasizing the importance of reason and logic in intellectual engagement. Philosophers particularly emphasize rationality as central to critical activities, emphasizing the importance of believing things based on explicit and specifiable reasons. While philosophers give weight to reason-based thinking, other disciplines also touch on this notion, albeit not always explicitly. For instance, in literary studies, there's a common concern about students arguing by assertion rather than providing a rational basis for their assessments. However, there's also a recognition of the limitations of solely relying on logic, as it can both enable and constrain one's thinking

2.6 Critical thinking as the adopting of an ethical and activist stance

Some informants view critical thinking not only as cognitive acts but also as incorporating ethical and activist dimensions. They emphasize the broader social mission of universities, advocating for critical action alongside cognition. Critical thinkers are seen as engaging with issues in a personal way, questioning established norms, and advocating for social change. This socially-engaged critique involves challenging the status quo and promoting values such as emancipation, liberation, and egalitarianism. It draws on critical traditions like the Frankfurt school, aiming to liberate individuals from oppression. However, not all share this perspective, with dissenting voices cautioning against pushing moral positions in academic work and advocating for a value-neutral approach to critique, free from subjective judgments and ideology.

2.7 Critical thinking as introspection

Some people define critical thinking as reflecting on one's own presumptions and mental processes in addition to assessing outside information. This self-reflexiveness entails realizing the subjectivity of interpretation and how judgments are formed. According to Kantian epistemology, critical thinking is dependent and shaped by the subjectivity of the thinker. Critical thinkers who are reflective recognize the ambiguity of knowledge and the complexity of their relationship to it. Individuals who are not reflexive enough may find it difficult to interact critically with the material.

Based on all the aforementioned definitions a broad one would be that critical thinking is a multifaceted cognitive process encompassing the evaluation of information, the introspective analysis of one's thought processes, and the application of rationality to engage with knowledge. It involves the systematic examination of ideas, evidence, and arguments to discern validity, reliability, and truthfulness. Critical thinkers demonstrate an awareness of the contingent nature of knowledge, recognizing the influence of personal perspectives and biases. They engage in self-reflection to understand how judgments are formed and maintain a commitment to reason and evidence in their analytical endeavors. Additionally, critical thinking extends beyond individual cognition to encompass an ethical and activist dimension, advocating for social change and challenging established norms. Overall, critical thinking involves a dynamic interplay between cognitive skills, meta cognition, and ethical awareness, fostering intellectual autonomy and informed decision-making.

3. Implications For Teaching

Many curriculums acknowledge the fact that critical thinking has become an essential skill in modern-day education as it has always been a necessary skill for students to master in order to succeed and become an important-contributing member of society. However, behind

this ideology, a question poses itself: can critical thinking actually be taught? And if yes, how?

This question has stirred up a big debate. There are those who believe that critical thinking is a very complex concept to be taught (Simpson and Courtney 2002; McPeck 1990) or as Atkinson (1997) reported that it can only be acquired unconsciously through social practice. However, most scholars agree that critical thinking skills can and should be taught. In fact, some even believe that developing CT is the primary aim of formal education, and A Wall Street Journal analysis of student critical thinking assessments found that students in many colleges make little progress in that dimension (Belkin, 2017)

Halpern (1998) argued as well that critical thinking can in fact be learned and proposed a 4-part empirically based model to guide teaching and learning for critical thinking: (a) a dispositional component to prepare learners for effortful cognitive work, (b) instruction in the skills of critical thinking, (c) training in the structural aspects of problems and arguments to promote the trans contextual transfer of critical-thinking skills, and (d) a metacognitive component that includes checking for accuracy and monitoring progress toward the goal (Halpern,1998, p 449)

Cultivating critical thinking skills in students requires a multifaceted approach. Inquisitive learning environments are fostered through the use of open-ended questions that challenge assumptions and encourage analysis (McTighe & Wiggins, 2005). Information literacy is a key component, where students dissect information by considering source, context, and potential bias (Kurland, 2018). Developing the ability to evaluate evidence is paramount, as students learn to assess the credibility and relevance of information they encounter (Paul & Elder, 2008). Finally, exposure to diverse perspectives broadens understanding and encourages students to consider arguments from various viewpoints (Bailin, S., 1992). By implementing these strategies, educators can empower students to become critical thinkers

who can effectively analyze information, construct sound arguments, and engage in meaningful discourse.

4. Assessing Critical Thinking

Assessing critical thinking skills can be multifaceted (Facione, 1990b). While traditional testing methods may gauge factual recall, true critical thinking evaluation requires examining deeper analytical processes. One approach involves presenting students with complex scenarios or arguments and observing their ability to dissect information, identify biases, and construct sound counter-arguments (Bailin & Steele, 1995). Effective assessment also considers a student's ability to ask insightful questions, recognize logical fallacies, and draw well-reasoned conclusions based on evidence (Watson & Glaser, 1980). By employing a multi-pronged approach that goes beyond memorization and taps into these analytical faculties, educators can gain a more comprehensive understanding of a student's critical thinking prowess.

5. Impact Of Technology

The integration of technology into education has transformed traditional pedagogical practices, offering novel opportunities for enhancing learning outcomes and fostering student engagement, it plays four roles in the aforementioned field: it is used to support instruction, as a tool to improve the learning process overall, as part of the curriculum, and as a means of delivering instruction. Education has changed from being passive and reactive to being interactive and aggressive as a result of technology.

This advent of technology has caused multifaceted impact on critical thinking, bearing both positive and negative implications. On one hand, technology serves as a vast repository of information, readily accessible through digital platforms. Resources such as online databases, scholarly articles, and educational apps empower individuals to explore diverse

perspectives, evaluate evidence, and engage in analytical thinking (Bailin et al., 1999). Interactive learning tools and collaborative platforms further facilitate active problem-solving and discourse, fostering the development of critical thinking skills (Paul & Elder, 2006). However, this accessibility to information also poses challenges, as individuals may struggle to discern credible sources from misinformation, potentially reinforcing confirmation bias and hindering intellectual growth (Willingham, 2007).

Furthermore, the extensive use of digital devices has reshaped cognitive processes, impacting attention spans and depth of analysis. The constant influx of notifications and stimuli fosters a culture of distraction, impeding sustained reflection and critical inquiry (Willingham, 2007). Additionally, the convenience of search engines and digital assistants may lead to a superficial approach to information retrieval, detracting from the depth of analysis and synthesis characteristic of robust critical thinking (Bailin et al., 1999). Thus, while technology presents opportunities for enhancing critical thinking, addressing these challenges is imperative to ensure its effective integration into educational practices and societal discourse.

6. Theories And Models

6.1.1 the Paul-Elder framework

Paul R. developed fundamental ideas in at least four key areas of research centered on the development of reasoning, all of which eventually served as a roof over the greatest ideas in the field of critical thinking. Paul outlined the components of reasoning once again and created a simple hypothesis explaining how these components work alone and in concert. His explanation of "the elements of reasoning" makes clear that the following aspects are present in every reasoning.

Point of View. Every thinker approaches a subject from a unique perspective shaped by experiences and beliefs. Recognizing different viewpoints fosters intellectual humility and a deeper understanding of the issue.

Questions. Thoughtful questioning is crucial for clarifying the purpose and uncovering underlying assumptions.

Data/Information/Evidence. Sound reasoning relies on a strong foundation of factual information and verifiable evidence. Analysing the quality and relevance of evidence is essential.

Concepts and Ideas. Concepts are mental constructs that categorize and maintain information organized. Examining the underlying concepts used in an argument helps identify potential biases or ambiguities.

Assumptions. All arguments are predicated on unstated premises. A more sophisticated understanding is made possible by recognizing and challenging these presumptions.

Inferences and Interpretations. We draw conclusions by interpreting data and evidence. Critically evaluating these inferences for accuracy and potential bias is crucial.

Implications and Consequences. A more responsible and moral approach to problem-solving is made possible by carefully weighing the possible results and repercussions of a given line of reasoning.

In addition to these ‘elements of reasoning’, Paul acknowledged that determining the caliber of reasoning, or these components, in a particular setting required the establishment of clear standards. These norms, or perfections of mind, are what Paul called universal "intellectual standards.", An assessment of the caliber of reasoning in each component of mind may be done using Intellectual Standards. These requirements include several areas, including logic, fairness, depth, relevance, accuracy, and clarity. For example, the fairness standard stresses listening to and taking into account different points of view, whereas the

clarity standard promotes the use of clear language to avoid ambiguity. Furthermore Paul emphasized the necessity of highlighting intellectual traits, in any reasonable conception of critical thinking, These traits refer to the attitudes and behaviors that support a critical thinking approach. Intellectual honesty (honesty in thought), intellectual humility (willingness to acknowledge one's own limitations in knowledge), intellectual courage (the capacity to question presumptions and provide well-reasoned arguments), intellectual empathy (the capacity to take into account opposing viewpoints), intellectual perseverance (the persistence to work through challenging issues), and intellectual autonomy are some examples of these.

The Paul-Elder framework develops a dynamic and integrated method of critical thinking by combining these three elements(elements of thought, intellectual standards, intellectual traits). It gives people the ability to:

Debunk Arguments. People may examine an argument's premises, logic, and supporting details by breaking it down into its constituent parts.

Evaluate Evidence. People can judge the caliber and applicability of the evidence put forward by applying the intellectual criteria.

Create Counterarguments. People are able to create well-reasoned counterarguments when they have a thorough understanding of opposing perspectives and possible logical fallacies.

Conduct Civil Conversations. People may have meaningful and fruitful conversations if they respect other points of view and practice intellectual humility.

The versatility of the Paul-Elder Framework makes it useful in a wide range of fields and contexts. It gives students the tools they need to assess news stories, understand academic publications, and make wise judgments in both their personal and professional life. The Paul-Elder Framework offers a sound and useful method for developing critical thinking. Through

comprehension of the components of thinking, application of intellectual standards, and development of the necessary intellectual traits, people may more confidently and clearly negotiate the complexity of information and arguments.

6.1.2 Criticism. Created by Richard Paul and Linda Elder, the Paul-Elder Framework is a prominent framework for developing critical thinking abilities. The framework, while praised for its practicality and comprehensiveness, is not without criticism. Several significant criticisms of the Paul-Elder Framework are examined below.

The framework's emphasis on dissecting arguments into distinct parts and a coherent structure is the subject of one critique. Critics contend that this method may result in a strict and formulaic application of critical thinking, ignoring the significance of creativity, intuition, and context in the process of reasoning (Facione, 2001). More subtlety and adaptability are frequently needed to solve real-world issues than just recognizing the "elements of thought."

The framework's limited consideration of the role of emotions in critical thinking is another critique. Our ability to acquire facts, evaluate data, and make decisions can all be strongly impacted by our emotions. The paradigm offers no help for handling emotionally charged situations and fails to sufficiently address the possible biases induced by emotions (de Sousa, 2011).

Because critical thinking has many facets, it is a difficult talent to evaluate. Although it offers intellectual standards, the Paul-Elder Framework lacks a precise and quantifiable method for evaluating critical thinking abilities. It may be more difficult to monitor development and assess the framework's efficacy in educational settings in the absence of a standardized evaluation method (Ennis, 1989).

6.2.1 The Ennis model

In the 1950s, researchers began describing critical thinking's cognitive processes and exploring the concept of critical thinking. Among these scholars was the American

philosopher Robert Hugh Ennis, who made significant contributions to the study of critical thinking, particularly in the areas of characterizing and grading critical thinking abilities. "Reflective thinking that is focused on deciding what to believe or do" is how he described critical thinking (Ennis, 1987). He popularized the notion that critical thinking should affect a person's behavior and decision-making in addition to helping them acquire new abilities. According to Ennis (1987), a critical thinking curriculum and its evaluation can benefit from a set of comprehensive goals he devised for a set of critical thinking dispositions and critical skills. It was created by Richard Weil and Robert Ennis, provides a useful and approachable method for fostering critical thinking. In contrast to models that prioritize argument structure (Paul & Elder, 2008), the Ennis-Weil Model concentrates on building a repertoire of fundamental critical thinking abilities. These abilities are intended to be adaptable, useful in a variety of contexts, and enable people to develop into astute information consumers, skilled communicators, and autonomous thinkers (Ennis, 1991). Deconstructive critical thinking is promoted by frameworks such as the Paul-Elder Model (2008), which breaks down arguments into their constituent parts: claims, evidence, and reasoning. Although the ability to analyse arguments is useful, the Ennis-Weil Model recognizes that a more adaptable strategy is required. The Ennis-Weil Model, which emphasizes transferable abilities, prepares people to deal with the complexity of real-world scenarios where arguments may be implicit, evidence subtle, and contextually sensitive (Facione, 2009)

Some fundamental skills are identified by the Ennis-Weil Model and are categorized into three primary groups: thinking disposition skills, analytical skills, and assessment skills.

Analysis skills

Identifying the Issue. it means defining and finding the core problem at hand which is significant for every critical thinking process because it serves avoiding confusion and a results in focused analysis.

Argument Analysis. This ability entails breaking down an argument into its simplest form, focusing on the claim, justifications, and supporting details. Determining the argument's strength and validity involves critically analysing these components.

Concept Analysis. Implicit or unclear concepts are the foundation of many arguments. In order to guarantee a common understanding throughout the reasoning process, this talent promotes the identification and explanation of important concepts.

Evaluation skills

Evaluating Evidence. Critical thinkers determine the veracity and applicability of the data that is offered to back up a claim. Examining the evidence's reliability, source, and relationship to the assertion under consideration are all part of this process.

Recognizing Assumptions. Every argument has underlying presumptions that support it. Identifying these presumptions, assessing their plausibility, and considering how they could affect the outcome are all part of this competence.

Developing Conclusions. Critical thinkers assess if the conclusion is supported by the available data and logic, rather than just accepting conclusions as stated.

Thinking Disposition Skills

Considering Alternative Perspectives. This skill emphasizes the importance of acknowledging viewpoints different from one's own. In order to bolster their own arguments and spot any biases, critical thinkers take into account opposing viewpoints .

Systematic Thinking. Critical thinking is an organized process not random. This ability promotes a methodical approach that weighs all pertinent data and refrains from drawing hasty judgments.

Fairness and Open-Mindedness. Critical thinkers work to assess a point of view on its own merits, independent of personal prejudices or previous conceptions.

The Ennis Model's strength is that it emphasizes the development of skills. People may improve their ability to analyse data, formulate strong arguments, and spot possible logic errors by actively exercising these fundamental abilities. Because it enables teachers to include critical thinking tasks and exercises into their curricula across a range of subjects, this method is very beneficial in educational contexts.

6.2.2 Criticism

Although the Ennis-Weil Model emphasizes the development of specific critical thinking skills, it is critiqued for being unduly broad. Although the approach is commended for being practically applicable, its focus on transferrable abilities may obscure the importance of context and social impacts on reasoning (DeGraff, 2014).

It was criticized for neglecting the cultural and social dimensions of critical thinking, (DeGraff, 2014) suggests that critical thinking can not and doesn't occur in isolation. The model may make it more difficult for people to critically evaluate material in a variety of circumstances since it does not teach them how to recognize and deal with biases resulting from these factors.

Another critique of the approach is its little attention to emotions. Emotions have a significant influence on how we get information, evaluate it, and draw conclusions, claims (de Sousa, 2011). Since the Ennis-Weil Model provides no guidance on how to regulate emotions throughout the reasoning process, it is possible that it disregarded the impact of emotions on critical thinking.

Furthermore, the model's overemphasis on individual cognition may obscure the communal nature of critical thinking. Real-world issue solving usually necessitates

collaborating with individuals from various backgrounds and promoting group thinking (Bailin, 1992). It doesn't really target the skills needed for collaborative critical thinking.

6.3.1 The argumentation model

Many people believe that critical thinking and intellectual development are fundamentally based on the capacity to analyse information and arguments, The argumentation model offers an incredible and dynamic method to learning and enhancing this vital ability in EFL (English as a Foreign Language) situations. It can be found in the writings of academics like Stephen Toulmin and the van Eemeren brothers. While other models focus on deconstructing arguments and developing or enhancing reasoning skills in isolation, The Argumentation Model places a strong emphasis on argument formation and analysis as a cooperative process that helps EFL students develop their critical thinking skills.

this model suggests that critical thinking is a dialogic process. EFL students are not expected to understand complex reasoning on their own. Instead, the paradigm encourages dialogue and interaction with a variety of perspectives in a safe learning environment. By analyzing opposing viewpoints and developing rebuttals, students improve their critical thinking abilities in a group context and get a deeper understanding of the material.

The argumentation model offers some vital skills to cultivate in order to effectively navigate English arguments:

Argument Analysis. Students should learn to find the essential elements of an argument, such as the claim, supporting details, evidence, justification, and modality (degree of certainty) (Toulmin, 1958). By following this technique they will be able to assess an argument relevance and the quality of the provided supporting information.

Fallacy Recognition. The model assists students in identifying fallacies, which are cognitive flaws that cast doubt on the veracity of a certain argument. EFL learners should be aware of

fallacies such as ad hominem attacks and straw man arguments in order to critically assess English arguments and avoid them in their own writing (van Eemeren et al., 1996).

Counter argument Construction. Considering opposing ideas and creating strong counter arguments in English enormously helps students cultivate their own critical thinking skills. This technique develops an open-minded mindset by analyzing other points of view and enhancing their ability to have fruitful conversations (van Eemeren et al., 1996).

Focusing on analyzing arguments, creating counterarguments, and employing a dialogical approach aligns with modern EFL teaching strategies that encourage group work. In a social situation where language acquisition and critical thinking skills grow together, classroom activities that include students building arguments, defending their ideas, and politely participating in English-language debates can improve students' critical thinking skills. Additionally, because this method works with a wide range of academic disciplines, EFL students may apply it to study literature, science, history, and other subjects and use it to analyze arguments that they often encounter to improve their critical thinking skills in a classroom context.

6.3.2 Criticism

The Argumentation Model has a number of limitations. One area of potential concern is the overemphasis on formal argument structure. In real-world communication, formal arguments are less common, and focusing solely on structure may overlook their benefits (Bailin, 1992). This may be fixed by include exercises that look at arguments from everyday life or popular culture, ensuring that the model can be used in a variety of contexts.

Another criticism is on the emphasis on fallacies. While spotting fallacies is important, critical thinking also entails finding and building upon excellent arguments (Bailin, 1992). Integrating activities that assess well-constructed arguments and enable learners to expand on them can help to overcome this constraint.

Finally, the model does not clearly discuss the function of emotions in critical thinking. Emotions can shape how we present and evaluate arguments (de Sousa, 2011). The approach can incorporate discussions on how emotions effect arguments, as well as exercises involving examining arguments given in emotionally charged circumstances.

7. Conclusion

In conclusion, this part underscores the foundational importance of critical thinking, tracing its origins to the Socratic method and highlighting its evolution into a crucial skill for rigorous analysis, evaluation, and synthesis of information. Critical thinking is essential for navigating modern complexities, enabling informed decision-making, and fostering rational discourse. It involves challenging assumptions, recognizing biases, and considering diverse perspectives, which are integral to scientific inquiry, democratic processes, and ethical reasoning. Emphasizing the role of education, this part highlights the necessity of fostering critical thinking to prepare students as engaged and thoughtful citizens. In an era of information overload and misinformation, critical thinking equips individuals to discern truth, make well-reasoned decisions, and contribute meaningfully to society.

Part Two: Artificial Intelligence

1. Overview

1.1 History

Research in artificial intelligence has a rich and lengthy past. The foundation for artificial intelligence (AI) was built by early pioneers including Alan Turing (1950), who proposed the Turing test as a measure of computer intelligence, and John McCarthy et al. (1955), who first used the term "artificial intelligence" at the Dartmouth workshop. Over time, the objectives of AI research have changed. At first, the goal was to provide machines intelligence comparable to that of humans. But the focus of the discipline has turned to creating useful AI applications that can resolve issues in the real world.

1.2 Definition

In computer science, artificial intelligence (AI) is the study of building machines with independent thought, learning, and behavior. Artificial intelligence research has a long and rich history that dates back to the early days of computing. Nonetheless, the discipline has come a long way in the last few years because of the tremendous increases in processing power and the development of new algorithms.

Artificial intelligence refers as well to a machine's ability to exhibit human-like intelligent behaviours such as being able to acquire new knowledge and skills from the available data or experience which means a machine's ability to learn. Furthermore, a human-like act that can a machine perform is reasoning, new AI language models can use logic and deduction to solve complex problems and make decisions in addition to having the ability to understand, generate and produce human language. Artificial intelligence can also perceive, interpret and understand the surrounding environment through integrated sensors.

2. Types of Artificial Intelligence

2.1 Artificial Narrow Intelligence (ANI)

2.1.1 Definition. ANI, also known as Weak AI, represents the most widespread form of AI encountered today. It excels at performing specific, well-defined tasks with exceptional accuracy and speed. However, ANI lacks general intelligence and the ability to adapt to significantly different situations.These AI systems excel within predefined parameters but lack the general cognitive abilities of human intelligence (Russell & Norvig, 2022).

2.1.2 Applications. ANI underpins numerous technologies seamlessly integrated into our daily lives. Examples include recommendation Systems, recommending products, music, or movies on e-commerce platforms or streaming services. Spam filtering Identifying and filtering unwanted emails in email clients. Image recognition facial recognition software used for security purposes or photo tagging on social media platforms. Game playing AI programs capable of defeating human champions in complex games like chess or Go. Limited automation in self-driving cars within controlled environments or specific stretches of highway (due to limitations in handling unforeseen situations).

2.2 Artificial General Intelligence (AGI)

2.2.1 Definition. AGI, also known as Strong AI, is a hypothetical type of AI possessing human-level or even surpassing human intelligence. AGI would exhibit capabilities like learning, reasoning, problem-solving, and adapting to novel situations across diverse domains. However, achieving General or Strong AI remains a significant challenge and is currently more of a long-term aspiration rather than a reality (Kurzweil, 2020)..

2.2.2 Applications. The potential applications of AGI are vast and life changing impacting various fields including scientific discovery where AGI could accelerate scientific research by analyzing vast data-sets, formulating hypotheses, and designing experiments. In medicine AGI-powered systems could revolutionize medical diagnosis, treatment planning,

and drug discovery. In education, personalized learning experiences tailored to individual student needs and learning styles could be facilitated by AGI. It could help build advanced robots capable of complex tasks and interacting with the environment in a human-like manner. With all those possibilities It is crucial to note that AGI is not currently a reality.

2.2.3 Ethics And Challenges. As Artificial Intelligence (AI) technologies advance rapidly, they bring with them a host of challenges and ethical concerns that demand careful consideration. These challenges span technical, societal, and ethical domains, and their resolution is crucial for realizing the potential benefits of AI while mitigating potential risks.

2.2.3.1 Control and Autonomy. Strong AI, by its nature, would possess capabilities far beyond those of humans, including the ability to modify and improve its own systems. This raises concerns about maintaining control over such autonomous entities. Ensuring that strong AI systems align with human values and goals while preventing them from acting against human interests presents a significant challenge (Bostrom, 2014).

2.2.3.2 Unintended Consequences. The complexity and unpredictability of strong AI systems could lead to unintended consequences. Even with the best intentions and programming, these systems may produce results or behaviors that are unforeseen and potentially harmful. Safeguarding against such outcomes requires thorough testing, validation, and ongoing monitoring (Omohundro, 2008).

2.2.3.3 Bias and Fairness. AI systems, including strong AI, are susceptible to biases inherent in their training data or programming. Without careful attention, these biases can perpetuate or even cause societal inequalities. In the context of strong AI, the amplification of biases could have far-reaching implications, influencing critical decision-making processes in areas such as healthcare, finance, and criminal justice (Barocas & Selbst, 2016).

2.2.3.4 Security and Privacy. Strong AI systems may pose significant risks to cyber-security and personal privacy. Their advanced capabilities could be exploited by malicious

actors to carry out sophisticated cyber-attacks, manipulate information, or breach sensitive data. Ensuring robust security measures and protecting individuals' privacy rights are essential considerations in the development and deployment of strong AI (Brundage et al., 2020).

2.2.3.5 Economic Disruption. The widespread adoption of strong AI has the potential to disrupt labor markets and economies on a global scale. Automation driven by AI technologies could lead to job displacement across various industries, aggrevating socioeconomic inequalities and requiring proactive measures to mitigate the impacts on workers and communities (Frey & Osborne, 2017).

2.2.3.6 Existential Risks. Some experts warn of existential risks associated with the development of strong AI, including scenarios where AI systems surpass human intelligence and become uncontrollable or act against human interests. While speculative, the potential consequences of such scenarios underscore the need for careful consideration of safety mechanisms and governance frameworks (Bostrom, 2014).

Navigating these challenges will require a collaborative effort from interested parties from various sectors, including academia, industry, government, and civil society to harness the transformative potential of AI while minimizing its risks and maximising its benefits to humanity by addressing technical, ethical, safety, societal, and legal concerns.

2.3 Artificial Super Intelligence (ASI)

2.3.1 Definition. ASI is a hypothetical type of AI surpassing human intelligence in all aspects, including cognitive abilities, creativity, and social skills. ASI development is purely speculative, and the potential aftermaths are significant and even existential according to some experts.

2.3.2 Applications. Due to its hypothetical nature, specific applications of ASI are difficult to define. However, it is conceivable that ASI could manage complex global

challenges, usher in a new era of technological advancement, or pose an existential threat if not developed and controlled responsibly.

2.4 Reactive AI

Reactive AI operates solely on pre-programmed rules and lacks memory or the ability to learn from previous experiences. These systems excel at specific tasks but lack adaptability and cannot improve with time and experience. Deep Blue, IBM's chess-playing computer, defeated world chess champion Garry Kasparov in 1997 by analyzing board positions and selecting optimal moves (Nilsson, 1998).

2.5 Limited Memory AI

Limited Memory AI uses memory to improve decision-making and performance. Unlike reactive systems, which operate in the present moment, limited memory AI can use previous experiences to inform current actions. This type of AI is commonly used in applications such as self-driving cars, where historical data on traffic patterns and road conditions helps to make real-time navigation decisions (Thrun et al., 2006).

2.6 Theory of Mind AI

Theory of Mind AI represents a new frontier in AI research, aiming to give machines the ability to understand and interpret human emotions, beliefs, intentions, and desires. This advanced form of AI would allow machines to empathize with human users, anticipate their needs, and interact in more natural and meaningful ways. While progress in this area is still largely theoretical, it has the potential to improve human-machine collaboration and communication (Premack and Woodruff, 1978).

2.7 summary

In essence, Artificial Intelligence (AI) refers to a variety of technologies, each with its own set of features and applications. Narrow AI, also known as weak AI, focuses on specific tasks

and dominates everyday applications such as voice assistants and recommendation systems. General AI, or Strong AI, represents the theoretical goal of creating human-like intelligence, whereas Superintelligent AI outperforms human intelligence. Reactive AI follows predefined rules, whereas Limited Memory AI makes decisions based on past experiences. Theory of Mind AI aims to give machines a human-like understanding of emotions and intentions. These types shape the AI landscape, from specialized applications to theoretical concepts.the development and deployment of artificial intelligence (AI) raises an array of technical, societal, and legal concerns. The technical challenges include ensuring the scalability, seamless integration, and reliability of AI systems. Ethical considerations include fairness, accountability, transparency, and bias reduction in order to maintain societal values and human rights. Safety and security are critical, necessitating resilience against accidents and malicious exploitation, as well as safeguards against cyber-security threats and unauthorized data access. Societal impacts, such as job displacement and increased inequalities, must be carefully considered, while legal and regulatory frameworks lag behind the rapid pace of AI development, necessitating collaboration to establish clear guidelines and standards. Addressing these challenges requires collaboration across disciplines and proactive measures from those concerned to harness its transformative power while limiting risks.

3. Machine Learning

3.1. Overview of machine learning

Machine learning (ML) is a branch of artificial intelligence (AI) that allows computers to learn from data without explicit programming (Mitchell, 1997). This learning process allows them to recognize patterns, predict outcomes, and improve their performance on specific tasks over time. ML algorithms take in large datasets, analyze them for underlying structures and relationships, and then use this knowledge to produce desired results, such as classifications, forecasts, or recommendations.

The roots of machine learning can be traced back to early attempts at automating reasoning and decision-making processes. In the 1940s, pioneering figures like Alan Turing laid the groundwork for AI with his seminal paper "Computing Machinery and Intelligence" (Turing, 1950), which introduced the Turing test, a benchmark for a machine's ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human.Machine learning truly flourished in the latter half of the twentieth century, thanks to the integration of several key factors. The creation of powerful computer hardware capable of handling large datasets was critical. Furthermore, advances in statistical modeling and algorithms like linear regression laid the groundwork for developing effective learning models (Samuel, 1959).

Machine learning is now an omnipresent technology that drives innovation across multiple domains. From facial recognition software and spam filtering to medical diagnosis and stock market prediction, machine learning algorithms are transforming how we interact with technology and navigate the world.

3.2 Types of machine learning Models

ML encompasses various learning paradigms, including supervised learning, unsupervised learning, and reinforcement learning. Supervised learning involves training models on labeled data, where each data point has a corresponding desired output (e.g., classifying emails as spam or not spam). Unsupervised learning, on the other hand, deals with unlabeled data, where the model seeks to uncover hidden patterns and structures within the data itself (e.g., grouping customers into different segments based on their purchase history). Reinforcement learning involves an iterative process where an agent interacts with an environment, receives rewards or penalties for its actions, and learns to optimize its behavior over time (Sutton & Barto, 2018).

3.3 Algorithms

ML algorithms act as learning engines, processing data and extracting knowledge. These algorithms range from simple linear regression models to sophisticated deep neural networks. The model used is determined by the task at hand and the nature of the data.

3.4. Training And Evaluation

The training phase is central to machine learning, in which the model is exposed to a large dataset and learns to map inputs to desired outputs. After training, the model's performance is tested on a separate dataset to determine its potential for generalization and effectiveness in real-world scenarios.

To summarize, machine learning has emerged as an effective tool for extracting knowledge from data and making data-driven decisions.

4. Deep learning

Deep learning is a branch of machine learning that takes its cues from the composition and functionality of the human brain. When dealing with complex data, like text, audio, and images, these algorithms excel. Artificial neural networks with numerous layers that are capable of extracting higher-level properties from raw input make up deep learning models. Envision being able to identify a face on a higher layer of a picture in addition to borders on the first layer. Deep learning can tackle increasingly complicated problems as processing power grows. Deep learning made performing complex tasks like realistic image production, automatic speech and picture recognition, and even language translation possible.

4.1 Artificial neuron networks

Deep learning is based mainly on artificial neuron networks (ANNs), which is a computational model that simulates the functions and structure of the biological human brain. ANNs consists of interconnected layers of artificial neurons that process information through

a series of weighted connections. Each layer performs a specific transformation on the input data, extracting increasingly complex features as it progresses through the network.

4.2 Deep learning models training

A deep learning model is trained using a large dataset labeled with the desired outputs. The model learns from this data in an iterative manner, mapping the input to the output through a sequence of mathematical transformations. The following is a breakdown of the main training steps:

Data Preparation: Reliable, accurately labeled data is necessary for training to be successful. This usually involves data cleansing, pre-processing (normalization, scaling), and augmentation (creating variants of current data) to improve model robustness.

Model Architecture Selection: The neural network architecture is chosen based on the specific task and the characteristics of the data. Convolutional neural networks (CNNs) are frequently used for picture identification, while recurrent neural networks (RNNs) are typically employed for sequence data, such as text.

Loss Function: This function determines how much the output that the model anticipated differs from the label that actually appears. Mean squared error (MSE) is a popular choice for regression problems, whereas cross-entropy is a popular choice for classification tasks. The goal of the optimization process is to minimize the loss function in order to increase model accuracy.

Optimization Algorithm: These algorithms adjust the weights and biases among the network's neurons based on the loss function. Gradient descent and its repeatedly fine-tuned variants (e.g., Adam, RMSprop) are commonly utilized choices.

4.3 Deep learning applications

Revolutionizing Computer Vision. Nowadays, computer vision advances are mostly led by deep learning. Due to its superior performance in image recognition tasks, Convolutional Neural Networks (CNNs) are used in applications such as: facial recognition, object detection and tracking and medical image analysis.

Transforming Natural Language Processing (NLP). Deep learning has greatly improved human ability to communicate naturally with machines. Because Recurrent Neural Networks (RNNs) are so good at processing sequential input, such as text, they have made significant advances in*:* machine translation, chatbots and virtual assistants and text summarisation and sentiment analysis.

Advancing Scientific Research: Through the analysis of large, complex, and multidimensional data sets, deep learning is expediting scientific discoveries. Deep learning models have applications in domains such as materials research, drug discovery, and genomics specifically such as: analysing DNA sequences, predicting material properties and simulating complex systems.

5. Future Directions of AI

5.1 Advancements in AI research

Machine learning will grow in power as we develop more sophisticated algorithms and collect larger amounts of data. This could result in AI that learns and adapts to new situations much faster than existing models.While it remains a distant possibility, some experts believe technological advancements will bring us closer to AGI - machines with human-like intelligence capable of comprehending and learning any intellectual task.

5.2 Emerging technologies

The merging of quantum computing and neuromorphic computing ushers in a new era in artificial intelligence (AI). Quantum computing, with its ability to use quantum bits (qubits) and principles such as superposition and entanglement, provides unprecedented

computational power, with the potential to revolutionize AI by addressing complex problems that are currently beyond the reach of classical computers. From drug discovery to materials science, quantum computing promises to speed up tasks like optimization and machine learning. Meanwhile, neuromorphic computing, which is inspired by the brain's structure and function, provides AI with efficiency and adaptability. Neuromorphic chips excel at pattern recognition and sensory processing because they mimic the brain's parallel processing and low power consumption, making them useful in fields such as robotics and healthcare. Together, these technologies are set to reshape AI, ushering a future in which intelligent systems address society's most pressing issues with unprecedented speed and efficiency.

5.3 Potential societal impacts and ethical considerations

The rise of AI technologies, such as quantum and neuromorphic computing, has profound societal implications and ethical concerns. On the one hand, these advancements show promise for addressing complex issues such as healthcare, climate change, and transportation. AI-powered innovations can boost productivity, streamline processes, and improve decision-making across a variety of industries. However, there are concerns about job displacement, exacerbation of existing inequalities, and the potential misuse of AI for surveillance and control. Furthermore, the ethical implications of artificial intelligence, such as privacy, bias, and accountability, must be carefully considered. To mitigate risks and maximize societal benefits, AI systems must be designed with fairness, transparency, and a focus on humans. Furthermore, encouraging interdisciplinary dialogue and engaging diverse stakeholders is critical for developing policies and regulations that promote responsible deployment and management of AI. Finally, understanding the societal implications and ethical complexity of AI necessitates a comprehensive approach that balances innovation with ethical values and societal well-being.

6. AI In Education

The landscape of English as a Second Language (ESL) education is changing dramatically as a result of the rise of Artificial Intelligence (AI). AI provides a wide range of technologies and applications that have the potential to transform the way ESL is taught and learnt.

6.1 Personalized Learning Experiences

AI analyzes student data to create personalized learning experiences, benefiting ESL students by targeting specific needs and providing real-time feedback for improved learning outcomes. Imagine a student in Tokyo struggling with gerunds. Duolingo, a popular AI-powered language learning platform, uses an adaptive learning algorithm. By analyzing the student's performance on exercises and quizzes, Duolingo identifies the gerund issue and tailors subsequent lessons with targeted practice activities. This personalized approach ensures the student focuses on mastering gerunds before moving on to new concepts.

6.2 Enhanced Engagement and Motivation

AI transforms ESL learning with interactive tutors, gamified elements, and diverse accents via text-to-speech, making it engaging and effective, particularly for younger or less motivated students.Traditional grammar drills can feel monotonous. ELSA Speak, an AI-powered speech evaluation tool, uses gamification to make learning pronunciation fun. Students can participate in interactive challenges where they earn points for accurate pronunciation. ELSA analyzes speech patterns and provides real-time feedback, helping students identify and correct errors in a more engaging way.

6.3 Improved Feedback Mechanisms

AI provides immediate and comprehensive feedback on language learning, including pronunciation, grammar, and writing mechanics. Speech evaluation tools focus on pronunciation errors, whereas AI writing assistants offer suggestions for sentence structure, vocabulary, and plagiarism detection. This real-time feedback loop enables students to

identify and correct errors more quickly, thereby improving their English proficiency. A student in Brazil writes an essay for class. Grammarly for Education, an AI writing assistant, analyzes the essay and makes suggestions for grammar, vocabulary, and sentence clarity. It identifies potential plagiarism and suggests alternative phrasings, allowing students to improve the overall flow and quality of their writing. This immediate feedback allows the student to become a more confident and polished writer.

6.4 Heutagogy

AI tools' asynchronous nature allows students to learn at any time and from any location. ESL students with hectic schedules or limited access to traditional classroom settings can greatly benefit from AI-powered platforms. These tools encourage self-directed learning, giving students control over their pace and progress. LingQ is a language learning platform that combines reading materials, spaced repetition systems, and AI-powered pronunciation assistance which alows students to learn independently. LingQ tailors content difficulty to each student's performance, encouraging self-directed learning at any time and from any location.

6.5 Challenges

There are several key challenges in integrating AI tools into ESL education. One major concern is the potential over-reliance on AI, which could diminish the role of human teachers and overlook the crucial aspects of social interaction and cultural understanding that they provide. Additionally, the issue of bias in AI systems poses a significant challenge, as these tools can perpetuate stereotypes or overlook diverse linguistic backgrounds if not properly developed with inclusive data-sets. Moreover, the digital divide exacerbates inequalities in education, as not all students have equal access to the technology required for AI-powered learning.

7. Conclusion

In conclusion, this part explores the transformative potential of artificial intelligence (AI), a field rooted in computational theories and machine learning that has revolutionized various industries. AI technologies like natural language processing, neural networks, and deep learning enable machines to perform tasks requiring human intelligence, including visual perception, speech recognition, decision-making, and language translation. AI has become integral to healthcare, finance, transportation, and more, driving innovation and efficiency.

In education, AI offers unprecedented opportunities to enhance learning experiences. It enables personalized learning by adapting to individual student needs, increasing engagement and effectiveness. AI-powered tools provide real-time feedback, identify student struggles, and suggest tailored resources.

However, the integration of AI in education also raises ethical considerations, including concerns about data privacy, algorithmic bias, and ensuring equitable access to technology.

Chapter Two: Data Analysis and Interpretation

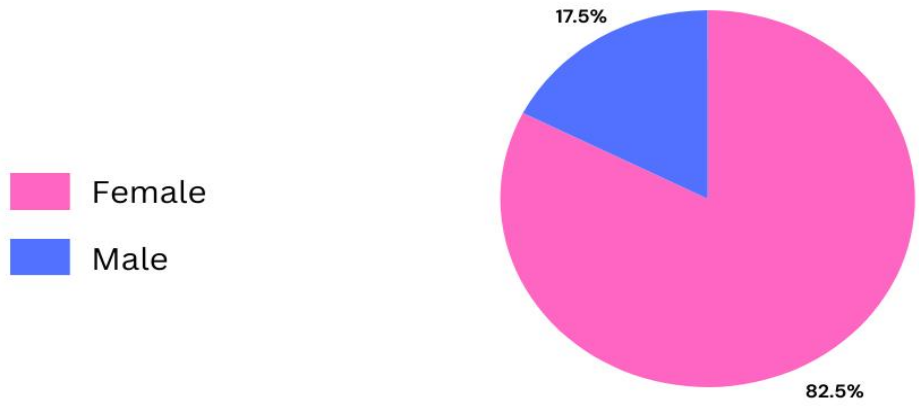
1. Analysis and Interpretation of the Questionnaire

Section One: Demographic

Question 01

Figure 01

The participant's gender



As this pie chart shows, 66 of the participants are females which represents 82.5% of the sample. 14 participants are males representing an anemic 17.5%. This shows that the staggering majority of the participants in this study are females.

Question 02

Figure 02

The participant's age

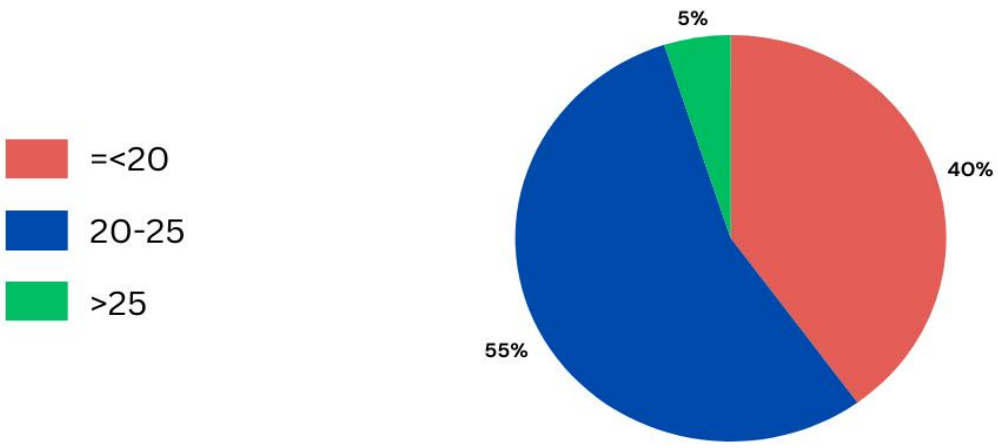


Figure 02 shows the participants whose age is 20 or less are 32 students representing 40 percent of the studied sample, the age of 44 of the respondents, who represent 55% of the sample ranges between 20 and 25 which depicts 55% of the sample. Students older than 25 are a rare commodity with only 5% constituting only 4 students.

Question 03

Figure 03

The participants years of experience with the English language

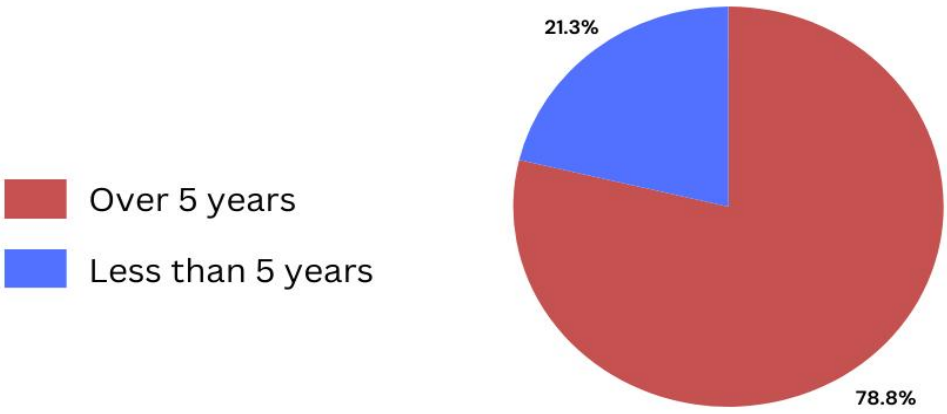


Figure 03 portrays the students' experience with English where we can discern the crushing majority of 78.8% having more than 5 years of experience with the most prominent answers being 10 to 12 years. It also shows the "novice" participants so to speak having less than 5 years of experience with most having 3.

Question 04

Figure 04

The participants years of experience with the AI and AI tools

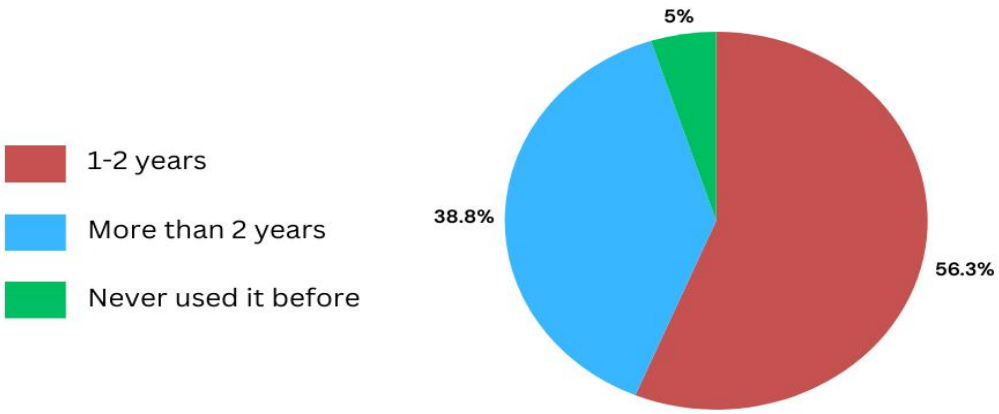


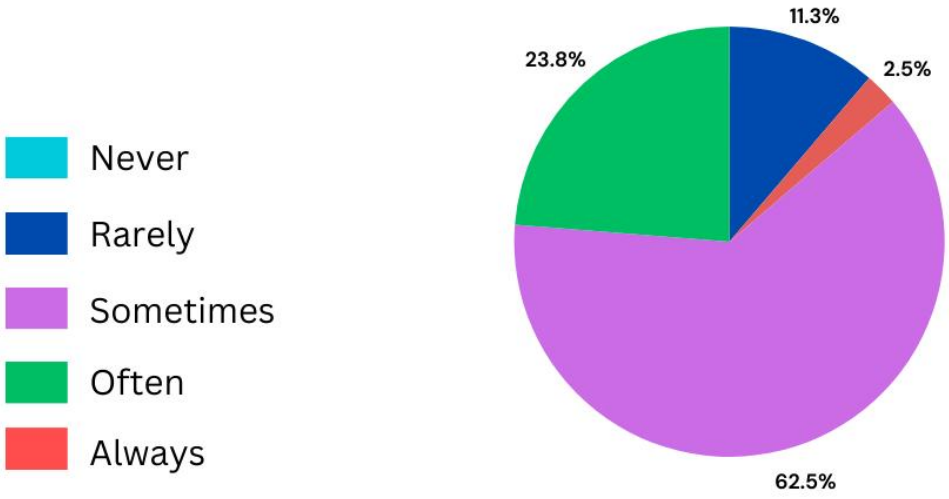
Figure 04 demonstrates the students' experience with using AI assisting tools , with 56.3% have been using it for 1 to 2 years being 45 students, this was the most common answer. It also shows 31 participants (38.8%) having more than 2 years of experience . Those who have never used AI assisting tools before are 4 students representing only 5% of the sample.

1.2. Section Two: Critical Thinking

Question 01: When faced with challenges and puzzles, how often do you find yourself deeply analyzing the situation?

Figure 05

The frequency in which the respondents usually analyze challenges and puzzles

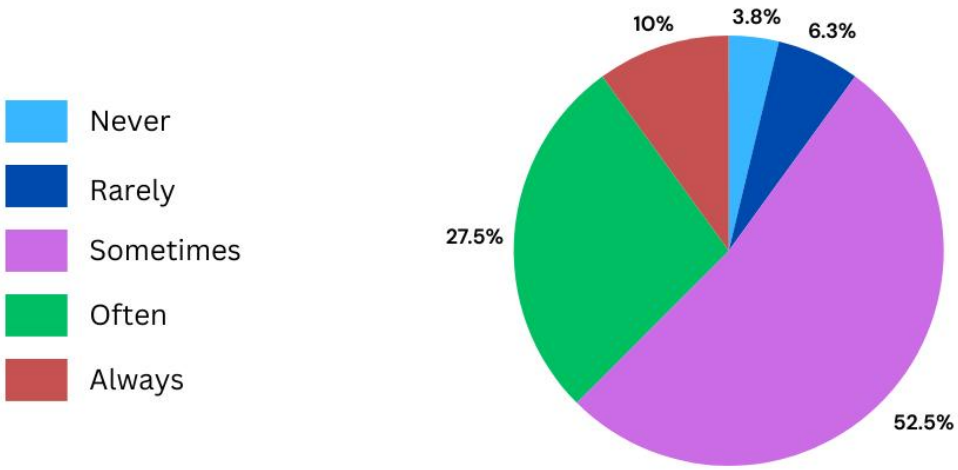


This question was asked to gauge one of the main pillars of critical thinking which is the ability to analyze. Figure 05 demonstrates how frequently the students who responded to the questionnaire usually use and apply their critical thinking skills in a real life scenario, the results show that the majority representing 50 participants ie: 62.5% of the whole sample answered with sometimes, 23.8% have chosen often, while 11.3% stated that they rarely analyse puzzles and challenges, and the smallest percentage being 2.5% of the participants declared that they always do analyse challenges and puzzles. This shows us that the majority of 90% consider themselves as possessors of a core critical thinking skill which is analysis.

Question 02: When you encounter new ideas and information whether online or from people, how often do you question their accuracy and reliability?

Figure 06

Students' frequent questioning of the accuracy and reliability of new information and ideas

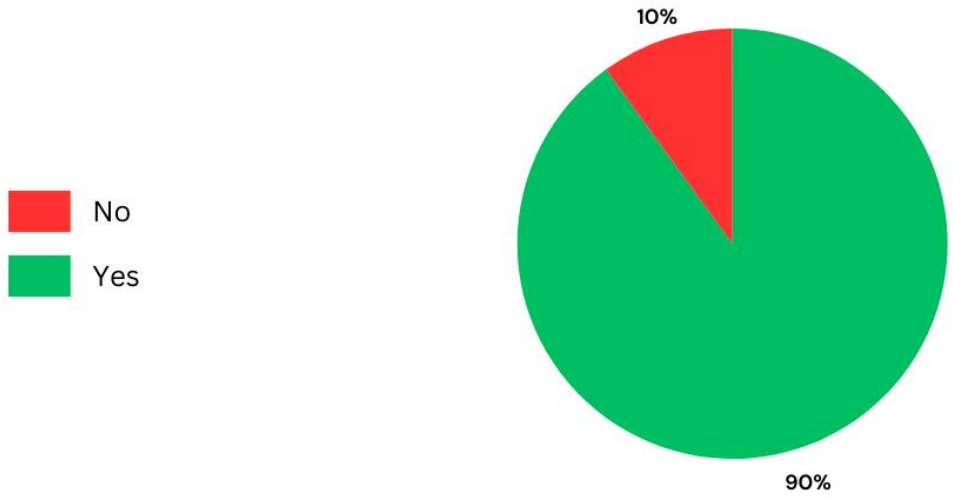


The question was asked to see the reasoning aspect of critical thinking in students. Figure 06 shows a percentage of 52.5% representing the majority of the participants who sometimes question the accuracy and reliability of new information. 27.5% of students often do so, while 10% stated that they always check the accuracy and reliability. 6.3% opted for rarely and 3.8% chose never. This demonstrates that the majority of students comprising 90% believe they have another skill which is reasoning.

Question 03: When you read or listen to others, do you find yourself able to evaluate and make judgments?

Figure 07

Students' frequency of evaluation and making judgments when listening or reading

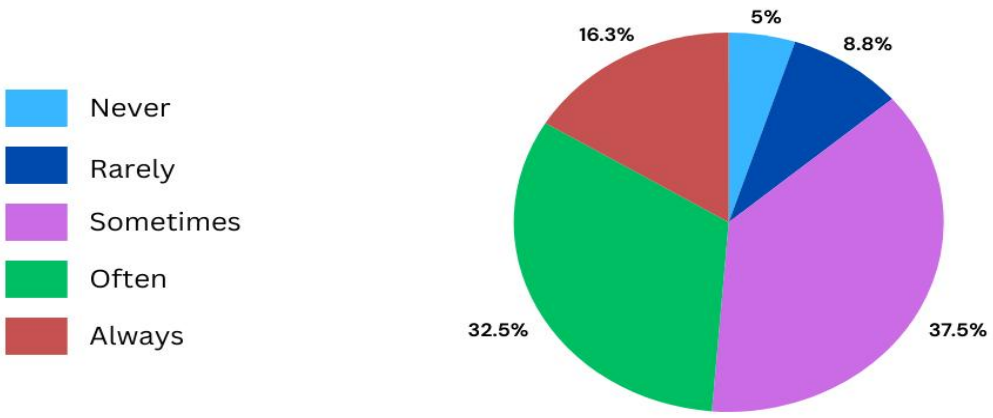


The question was asked to see if the students had the evaluation and judgment production skills. Figure 07 shows that the vast majority of students, 90%, evaluate and make judgments when listening or reading. The remaining 10% respondants do not. Results are consistent with the previous findings showing that the students have the ability to evaluate and judge.

Question 04: When facing a problem, how often do you brainstorm to generate possible solutions?

Figure 08

Students' frequency of trying to create novel solutions when facing a problem



The question was asked to inquire about students' creativity and their problem solving skill. The pie chart above indicates students ability to contemplate and come up with possible solutions for problems they may encounter, where we find that a considerable portion of 37.5% of them say that sometimes they try to solve the faced problems. Coming second with almost the same percentile of 32.5% denoting the occurrence of the aforementioned process as being often. 16.3% is the percentage of those who claimed that they always try to come up with solutions. Then we have those who rarely try to do the same process with a minor percentage of 8.8%. Lastly with a shy percentage of 5% representing only 4 students state that they never try to think and manifest solutions. Here we say a minuscule discrepancy in results when we compare to the previous ones where we see 15% instead of 10% not having this critical thinking core skill but, overall, it can be disregarded and it is safe to say that results are consistent.

Question 05: When making errors and mistakes, how often do you reflect back on them and try to pinpoint what was wrong and improve on it ?

Figure 09

Students' engagement in the process of introspection to pinpoint their mistakes and improve on them

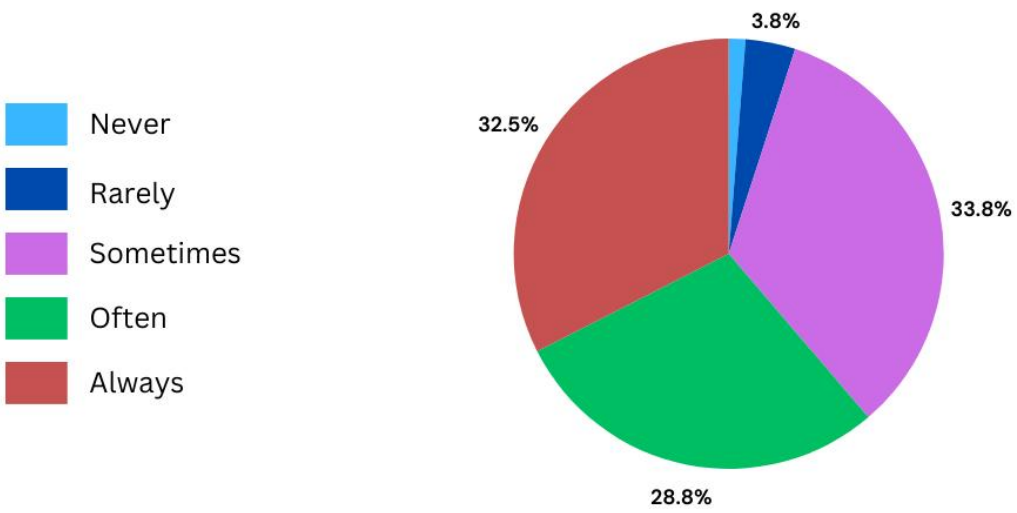
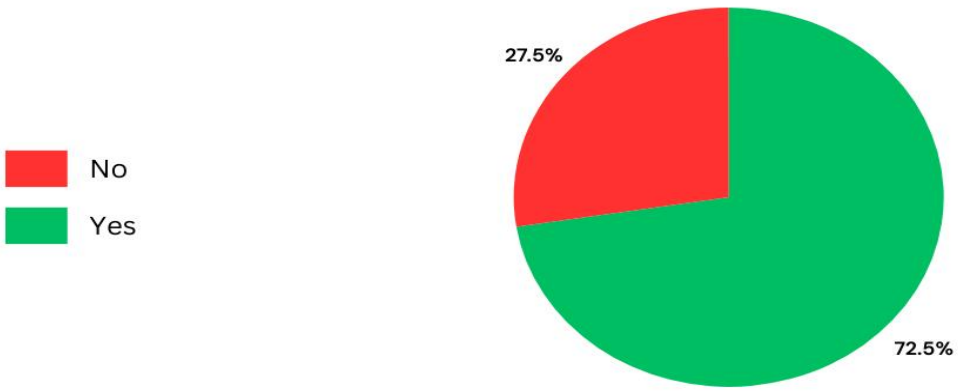


Figure 09 illustrates how often do students engage in the process of introspection to discern their mistakes and improve on them which is the purpose of the question. when we see almost identical readings between sometimes, often, and always with a percentile of 33.8%, 28,8%, and 32.5% respectively. Coming as meagre percentages of 3.8% and 1.2% (one person) saying rarely and never respectively. Again with the small discrepancy of 5% instead of 10% not having the introspection skill, we see that the majority engage in introspection and observation of their own mistakes, which is a core critical thinking skill.

Question 06: While in class, do you find yourself sharing your views regarding different subjects?

Figure 10

Students' willingness to share their views on different matters



This question was asked to measure the extent if existed of one of their critical thinking abilities which is having opinions and taking a stance. This chart shows that 72.5% of participants share their views on different matters in class, the remainder of 27.5% don't. Those who did not share their views further elaborated with the most noticeable answers being as follows:

-Not all the topics because not all are interesting, and I sometimes don't have ideas to express.

-I don't like getting involved because of my classmates low level.

-Because there are some subjects that don't interest me besides of being afraid of making mistakes, and I find it as a big obstacle

-No, because I don't like to share my views due to shyness and anxiety

-Because I am afraid that my answers might be wrong and the teachers will provide me with deconstructive feedback.

-I am too shy.

-I do share my opinion when I feel that the subject needs my view, for me it is all about the subject.

-Always I keep my views for myself for the fear of being corrected and judged by my classmates.

-I find peace in hearing other points of views rather than sharing my own.

-I don't have enough vocabulary to speak.

-I don't have enough information about the subject and I don't like drawing attention.

-Sometimes when the discussion gets too long i get bored and when the teacher asks English disappears from my head.

The respondents who claimed that they don't have the willingness to share views and opinions on different matters explained that this is mainly because of shyness, fear of being judged, some prefer to listen to others rather than expressing themselves, lack of communication skills and having different interests. Thus, these factors could be what prevents students from sharing their views and discussing others' views. The remainder claimed they do have the aforementioned skill.

This section, as it was evinced aimed at finding about students' critical thinking, We asked questions to seeif its skills are evident in them, Based on the results we see that the crushing majority of 85-90 % are critical thinkers to different extents, meaning some or more than others. This should be taken with a large grain of salt.

1.3. Section Three: Artificial Intelligence

Question 01: Are you aware of artificial intelligence (AI) tools designed to assist in learning ?

Figure 11

Students' awareness of AI tools designed to assist in learning

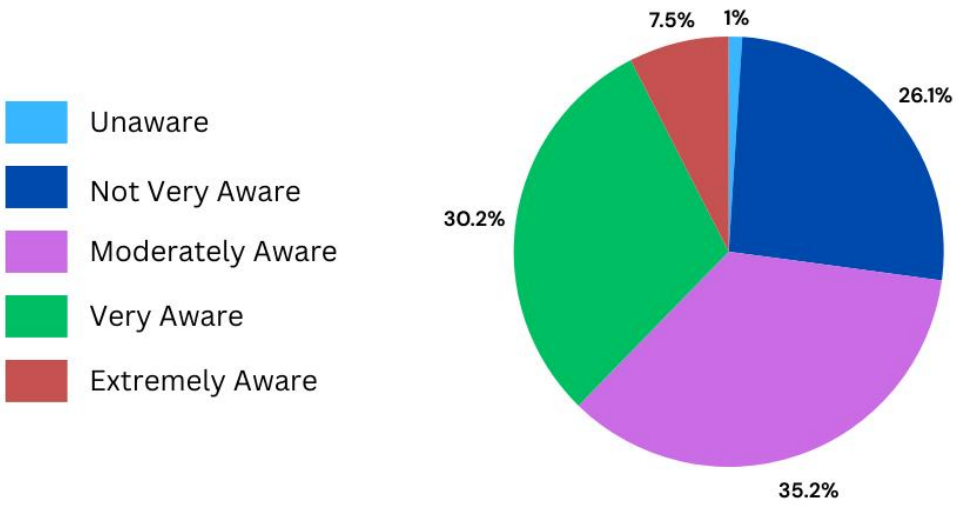
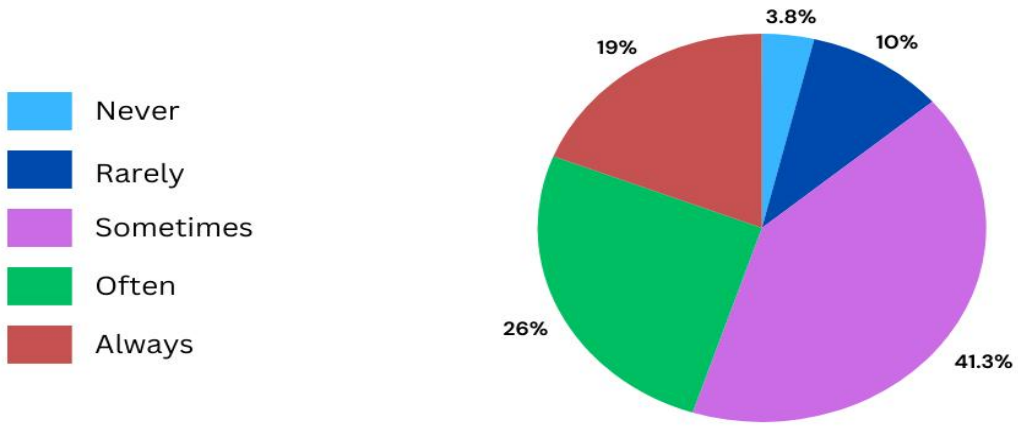


Figure 11 depicts students' awareness of AI tools used to aid the learning process, with a significant portion of 35.2% (28 students) being moderately aware of such tools. Second, those who are very aware account for 30.2% (24 students). Students who were extremely aware were the minority, accounting for only 6 of the total 80 student. Only one student avows that he/she is completely unaware. This shows that everyone except one person knew about AI tools.

Question 02: How often do you use AI-powered educational tools or platforms?

Figure 12

Frequency of students use of AI-powered tools or platforms

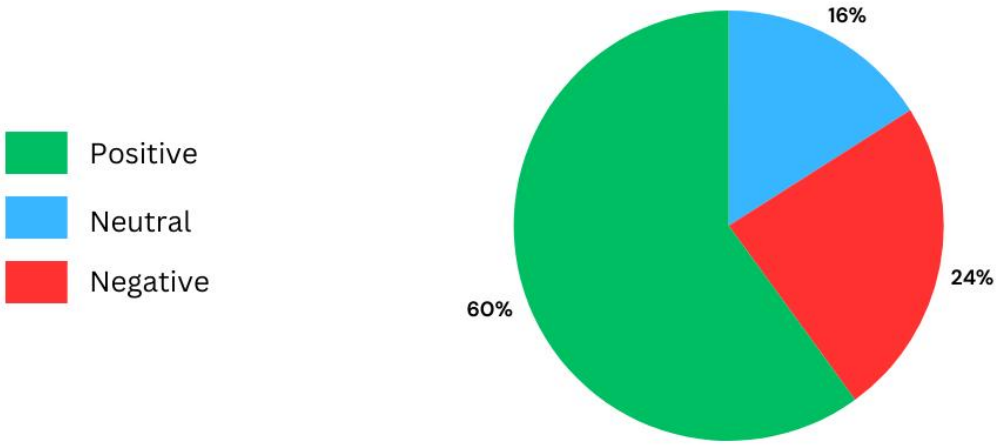


This question was asked to inform about students use frequency of AI-powered tools or platforms, Starting with the largest group, 42.3% of participants reported that they only sometimes use AI tools and platforms. 26% of students use them often making 26% of the totality, Only 10% rarely use them, and very few students (3.8%) never use them. Participants who always do use the aforementioned tools come in at a decent 19% (15 students). Reading this tells us that only a minuscule portion of 4 students never use AI tools; the rest of students do with different frequencies.

Question 03: Do AI tools influence your learning and academic performance positively or negatively? Please, explain.

Figure 13

The influence of AI tools on students' learning and academic performance



This pie chart show that 60% of the students said it effects them positively while one fourth of them said it had negative effects on their learning and academic performance. 16% of the participants were neutral about it and saw that it has no effect on them. Their most noticeable answers were as follows:

Positively

- AI tools affect me positively because I always gain new vocabulary and know my mistakes in grammar

- AI tools affect me positively because it helped me correct my pronunciation and grammar mistakes

- AI tools affect me positively because it corrects my essays

- Because it gives me the right answers in few seconds makes me do hard work in few minutes.

- It helps me improve my language through different ways and sources

- AI tools influence my learning positively because because it is more amusing and with more available information

- When you have many lessons in the exams it summarizes it and makes it easier to understand

- It provides personalized materials and helps me understand complex concepts and offer instant feedback on assignments ans quizzes

Negatively

- AI tools affect me negatively because now I face problems expressing my own point of view also I rely on the answers AI gives me

- AI tools affect me negatively because it gives me answers early so I don't make efforts or do research

- Because I almost totally rely on Chat GPT in doing my academic assignments

- Because it makes my ability and creativity decreased and make me lazy

- We start to rely on it completely and limit our creativity

- It prevents me from searching and improving my skills

- AI tools influence my learning and academic performance in a positive way because it facilitates research for me and help me gain time and get information easily

Neutral

- They don't influence at all due to the lack of use

- I never use AI tools actually.

- It depends on the use

Question 04: Given the choice would you choose AI tools and language models (spelling checkers, essay generators and correctors, chat bots, rephrasing tools, chat gpt, Google Gemini, Microsoft copilot, Quillbot…etc) over traditional study methods?

Figure 14

Students choice of AI tools and language models over traditional learning

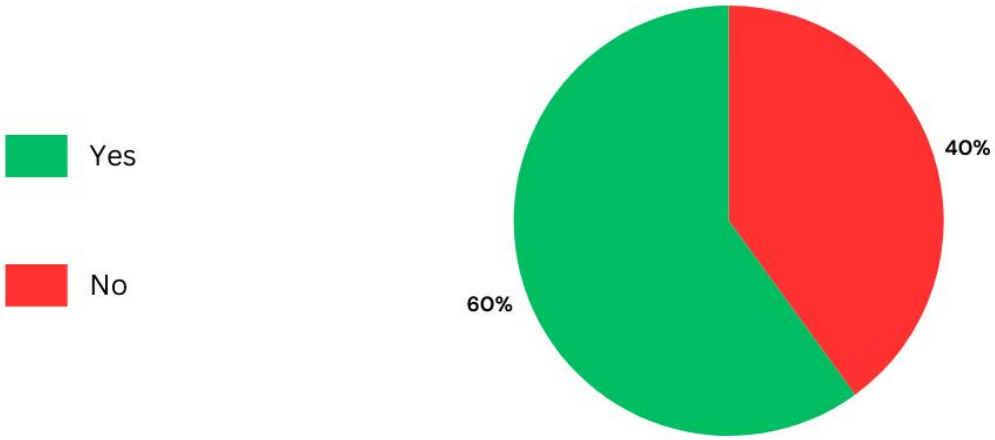


Figure 14 demonstrates the percentile of students who prefer AI assisted learning over the traditional learning. The majority of students (60%) prefer AI assisted learning over traditional learning, the remaining students who represent 40% chose the traditional methods, these are their most reoccurring answers :

Traditional learning

-Because traditional study methods make you more active in learning and they develop my critical thinking more than AI does

-I prefer traditional study methods and see them more effective than AI tools because you will understand and remember information very well

-I want to work hard to find answers to my questions, in this method our information goes to long term memory

-I think in learning you need someone to guide you in real life it is better than depending on AI, after all students are learners, they make mistakes, some require traditional methods to fix it

AI assisted learning

-It saves time and effort by getting the needed information easily

-It is much more helpful

-Because it is easier and provides specific answers

-It simplifies the process of studying and preparing lessons and homework

In parallel with the previous results on the effect we see that the same participants who stated that it affects them positively chose AI assisted learning over the traditional methods and vice versa.

1.4. Section Four: The Effect of Artificial Intelligence on Critical Thinking

Question 01: How often do you rely on AI tools to solve problems that require critical thinking?

Figure 15

Students' reliance on AI tools to solve problems requiring critical thinking

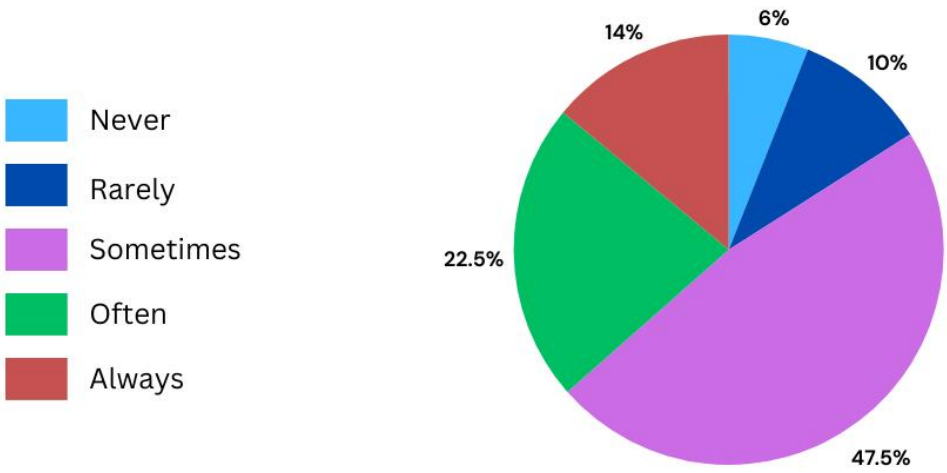
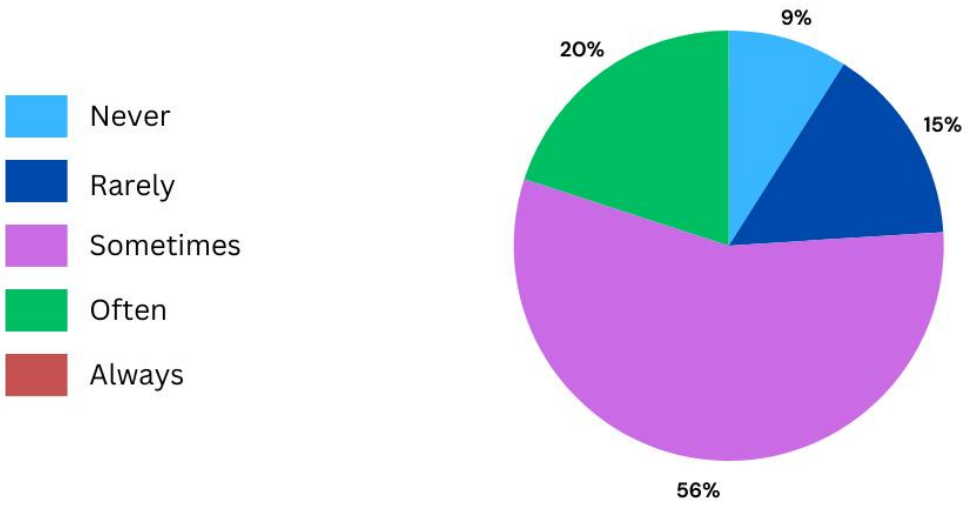


Figure 15 shows students' reliance on AI tools to solve problems requiring critical thinking. We find that the overwhelming majority of students (57.5%) sometimes rely on AI tools to solve problems that require critical thinking. The remainder percentage is distributed amongst often, always never and rarley with 22.5%, 14%, 10% and 6% respectively.

Question 02: When AI tools suggest alternative approaches or solutions, how often do you incorporate them into your critical thinking process?

Figure 16

Students incorporation of alternative solutions suggested by AI tools



The pie chart above illustrates how students incorporate alternative solutions suggested by AI tools. The largest group, comprising 56% of the participants, reported using AI suggestions sometimes. Following this, 20% of students often incorporate these solutions. Meanwhile, 15% of students rarely use AI suggestions, and 9% never do.

Question 03: Do you think the use of AI affects your creativity in problem-solving negatively ?

Figure 17

Students thoughts on AI effecting their creativity and problem solving negatively

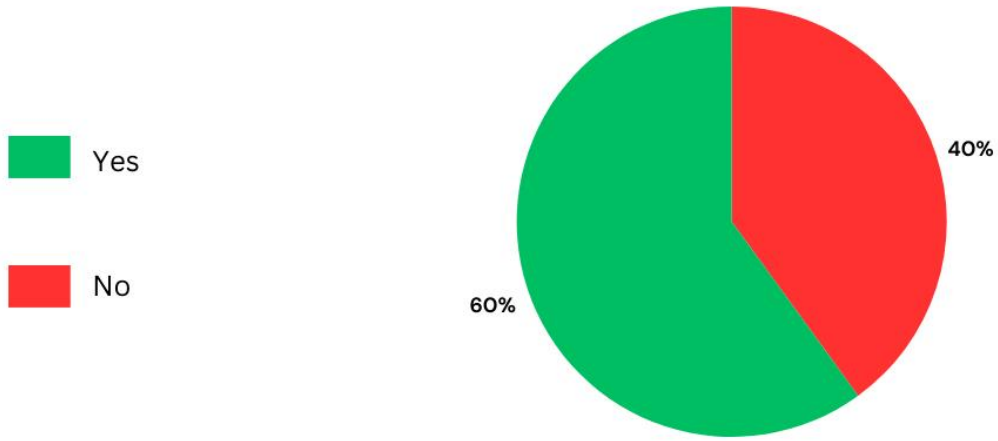


Figure 17 shows students thoughts on AI effecting their creativity and problem solving negatively were we find 60% saying yes and 40% saying no. Here we see that students ability to solve problems and create solutions which is a core component of critical thinking has been effected 40 % of students avowed that it effected them positively, While most of them (60%) said it affected them negatively. This can be a result of the blind following of the recommendations as we see in Figure 18.

Question 04: Do you find yourself blindly following AI recommendations?

Figure 18

Students thoughts on blindly following AI recommendations

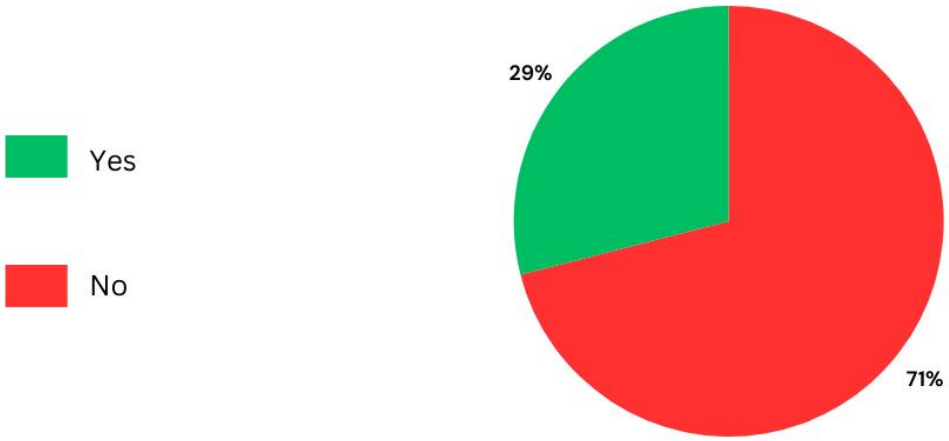


Figure 18 illustrates students thoughts on blindly following AI recommendations. We can see that the majority of students (71%) opted for no and the remainder of them (29%) opted for yes. The most prevailing explanation of those who opted for "yes" can be summed up as follows:

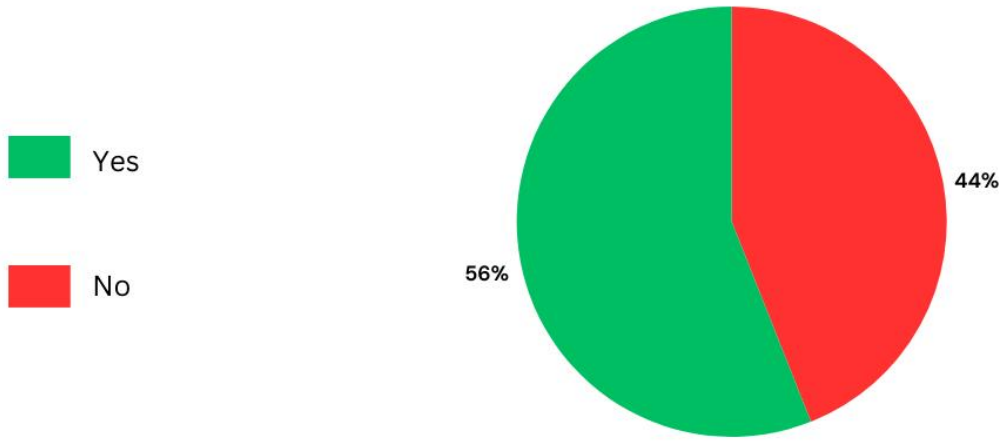
- Because I just want to find the answer.
- Because they give me specific information that I trust.
- Sometimes do to moments of hard circumstances
- I trust what it suggests.

The incorporation of the answers provided by AI blindly means that it has affected their ability to make judgments and to question the reliability of the given information.

Question 05: Have you noticed any changes in your analytical skills as a result of using AI tools for critical thinking tasks?

Figure 19

The effect of using AI tools on students analytical skills



The pie chart above shows the affect of using AI tools on students analytical skills where we see 56% of the participants answering with yes and 44% of them answering with no. The most notable elaborations were as follows:

Those who opted for "No" said

- I didn't see any changes.
- It didn't give me enough information.
- I use my own ideas.
- I'm not using it excessively so I cannot know or tell.

- The ideas provided is so advanced we can't simply take it as it is.

Those who opted for "Yes" said

- I am becoming more reliant on them which makes my critical thinking decreases and I find my self becoming passive in thinking and problem solving.
- It limits thinking, basically the AI does all the work.
- It helps a lot it gives mew information and I noticed a change in my skills.
- It changed my way of writing after using it I started delving into ideas and criticize deeply.
- It enhances my ability to think critically since it provides me with numerous experiences and different solutions for different problems.
- For example it provides us with the basis of how to analyse things, and for me at least examples that AI provides give me standards of analyzing things.
- My brain starts to depend only on AI and losing the ability to analyse as a result of looking for the easy way.

The portion of participants who denoted that they did not notice any changes in their analytical skills elaborated that they didn't use it enough to begin with, it couldn't have effected them due to the lack of use, these are the students who replied with rarely or never to the question related to the frequency by which they used the AI tools. On the other hand we have the portion which stated that it has actually noticed changes, either positive or negative. This answer correlates well with the other answers of the questions in this section, we discern that the use of AI tools effects them both positively and negatively. To know when either of the effects take place we have to look at the conducted interview.

2. Teachers' Interview

Description of the interview

The interview was conducted in person with five teachers from the Department of Foreign Languages at Mila University Center. The teachers had at least 7 years of experience teaching English at the university level. The interview included four main questions and some follow-up questions, all of which focused on their opinions and experiences with critical thinking instruction, students' AI use, attitudes, academic performance, and use of critical thinking skills. Significantly, the interview is aimed at gathering their opinions on the effects of AI and AI tools on critical thinking.

Analysis and interpretation of the interview

Based on your academic background and your own interpretation, what do you define critical thinking as?

When asked, all teachers gave more or less the same answers and definitions. It is the ability to analyze information objectively, evaluate its validity and relevance, and make reasoned judgments or decisions based on evidence and logical reasoning. It involves being open-minded, asking probing questions, and considering multiple perspectives before forming conclusions.

Teacher 1 stated: "my definition of critical thinking is the ability to... and the readiness, maybe, not to accept everything you receive, and not to easily believe everything that you see and hear. A critical thinker is not a gullible person, in my view. So, the simplest way of putting it, a critical thinker is not a gullible person."

- How long have you been teaching at the university?

All teachers had more than 7 years of experience so their observations and experience would provide valuable insights.

During those years of experience, have you encountered students that, by definition, are true critical thinkers?

When asked this question all teachers expressed their complete dissatisfaction with the students' level of critical thinking skills, with one teacher dismissing the existence of the skills of critical thinking. All of the interviewed teachers avowed that the overwhelming majority of students are not critical thinkers and gave a rough estimate of only 20% having what it takes to be labeled as a critical thinker.

Teacher 2 stated: "Maybe they are critical thinkers, and they can have this ability, but generally our students are lazy. Our minority, I'm saying 20-80″

Are you aware of the integration of artificial intelligence? And by that I mean the language models assisting students, especially in the past two years or so.

All teachers replied with yes, they are aware of the use with teacher 3 sharing an anecdote on a student who consulted her about the use of an AI tutor. Teacher 2 said she noticed that in the past years bachelor degree students became more and more reliant on them in order to meet deadlines and procure their diplomas without any postponement.

Would you say that these tools affect their critical thinking negatively or positively, taking into consideration the people who already have critical thinking? Does that impact them in a negative way? Do they stop critically analyzing situations?

Paraphrasing teacher 4, the online tools for critical thinking are a double-edged sword. They offer vast information for analysis, but can also hinder independent thinking. Strong

critical thinkers leverage them to enhance analysis, but weaker thinkers might become reliant and stop questioning. Educators should promote a balance between using these tools and fostering independent critical thinking.

This teacher recognizes the dual nature of AI and AI tools in influencing critical thinking. She acknowledges the potential benefits of access to information but also highlights the risk of over-reliance. Her observation that students with existing critical thinking skills tend to use technology to enhance rather than replace their analysis suggests that strong critical thinking can act as a safeguard against the negative impacts of AI. However, they caution that some students may indeed become less inclined to critically analyze situations if they can easily find answers online.

Paraphrasing what Teacher 5 said, these tools can have an impact on critical thinking in both positive and negative ways. On the one hand, they give students instant access to a wealth of information, which can foster critical thinking by exposing them to new perspectives and challenging their assumptions. However, there is a risk that students will become passive recipients of information rather than active critical thinkers. I've noticed that some students, particularly those who already have critical thinking abilities, strategically use these tools to enhance their understanding and analysis of complex issues. However, there are some students who rely too heavily on these tools and do not engage in deep critical thinking. They may be more likely to accept information at face value, without questioning its validity or considering

This teacher shares similar views on the dual impact of AI on critical thinking. They emphasize the potential for AI to both improve and degrade critical thinking skills, depending on how students use these tools. The observation that some students use technology

strategically to deepen their analysis is consistent with the notion that strong critical thinking can mitigate the negative effects of technology.

All the interviewed teachers agree on the same thing, if a student is already a critical thinker then their use of AI and AI tools will further ameliorate it, However if the student does not have the skill to begin with, It will only make it worse, “It is like walking with a broken leg, It will only make your injury worse” to quote what one of the teachers said.

Conclusion

This chapter aimed at investigating the impact of AI and AI tools on the critical thinking skills of third-year students studying English as a foreign language in the university center of Mila. Depending on the student’s answers, and the answers provided by the teachers, we have concluded that the use of AI by the students yields both positive and negative results. It is positive in the case where students already possess the necessary skills of critical thinking, by exposure to AI they can further ameliorate it by being faced with novel situations where they get to widen their prospective and practice their analytical skills. It is negative in the case of students who do not possess the aforementioned skills where the exposure would only make them more dependant and less of critical thinkers as it greatly damages their ability to evaluate and analyze information presented to them.

General conclusion

In today's world, critical thinking is increasingly recognized as essential for success in various domains. It's a skill crucial for navigating academia, the professional sphere, and everyday challenges. The development of critical thinking skills is important for a society's prosperity. As AI becomes more prevalent, it will be used across all age groups and sectors.

Naturally, concerns arise about its potential impact on critical thinking skills, given the amount of time individuals, including students, spend engaging with it.

To explore the influence of AI on critical thinking, we conducted a study examining the current state of critical thinking among students at UCM and their AI usage habits. Employing both questionnaires and face-to-face interviews with UCM educators, we sought to determine whether AI's affects are predominantly positive or negative.

Our analysis reveals that AI's impact on critical thinking skills is nuanced. While there are concerns about its potential to hinder critical thinking, there are also notable benefits.

Contrary to initial expectations, AI has shown to enhance certain aspects of critical thinking among students. Through AI-powered platforms, students gain access to diverse perspectives and information, stimulating their analytical abilities and fostering deeper comprehension of complex subjects.

However, it's crucial to acknowledge the potential drawbacks. Excessive reliance on AI can indeed impede critical thinking by promoting passive consumption of information and discouraging independent thought.

Appendix

Students' questionnaire

Dear students,
As AI (Artificial intelligence) continues to advance, it raises questions about its influence on our ability to analyze, evaluate, and assimilate information effectively which is also known as critical thinking.This questionnaire aims at examining the influence of artificial intelligence on students' critical thinking. Your help by answering these questions honestly and accurately would provide us second year master students at the department of foreign languages at Mila University Center with valuable insights. Please note that your answers will be anonymous and no personal data will be collected.
Thank you tons for your collaboration.

Section One: Demographic

1. Age …….
2. Gender: ……
3. Years of experience with the English language: …….
4. Years of experience with AI tools: …….

Section Two: Critical Thinking

1. When faced with challenges and puzzles, how often do you find yourself deeply analyzing the situation?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

2. When you encounter new ideas and information whether online or from people, how often do you question their accuracy and reliability?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

3. When you read or listen to others, do you find yourself able to evaluate and make judgments?

a) Yes ☐
b) No ☐

4. When facing a problem, how often do you brainstorm to generate possible solutions?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

5. When making errors and mistakes, how often do you reflect back on them and try to pinpoint what was wrong and improve on it ?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

6. While in class, do you find yourself sharing your views regarding different subjects?

a) Yes ☐
b) No ☐

If no, please, justify :

……..

…….

…….

Section Three: Artificial Intelligence

1. Are you aware of artificial intelligence (AI) tools designed to assist in learning ?

a) Unaware ☐
b) Not very aware ☐
c) Moderately Aware ☐
d) Very aware ☐
e) Extremely aware ☐

2. How often do you use AI-powered educational tools or platforms?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

3. Do AI tools influence your learning and academic performance positively or negatively? Please, explain.

…..……

……

……..

4. Given the choice would you choose AI tools and language models (spelling checkers, essay generators and correctors, chat bots, rephrasing tools, chat gpt, Google Gemini, Microsoft copilot, Quillbot…etc) over traditional study methods?

Yes ☐
No ☐

Please justify.

…..……
……
…….

Section Four: The Effect of Artificial Intelligence on Critical Thinking

1. How often do you rely on AI tools to solve problems that require critical thinking?

a) Always ☐
b) Often ☐
c) Sometimes ☐
d) Rarely ☐
e) Never ☐

2. When AI tools suggest alternative approaches or solutions, how often do you incorporate them into your critical thinking process?

a) Never ☐
b) Rarely ☐
c) Sometimes ☐
d) Often ☐
e) Always ☐

3. Do you think the use of AI affects your creativity in problem-solving negatively ?

a) Yes ☐
b) No ☐

4. Do you find yourself blindly following AI recommendations?

a) Yes ☐
b) No ☐

If yes, please, explain:
…..……
……
…….

5. Have you noticed any changes in your analytical skills as a result of using AI tools for critical thinking tasks?

a) Yes ☐
b) No ☐

Please elaborate: ……
…..……
……

Thank you very much for your collaboration.

Interview transcript of Teacher 1

-Based on your academic background and your own interpretation, what do you define critical thinking as?

Well, my definition of critical thinking is the ability to... and the readiness, maybe, not to accept everything you receive, and not to easily believe everything that you see and hear. A critical thinker is not a gullible person, in my view. So, the simplest way of putting it, a critical thinker is not a gullible person.
And one aspect of critical thinking is that most, unfortunately, most university students have not been allowed to discover and nourish their critical thinking capabilities.

- How long have you been teaching at the university?
Well, I have been teaching for six continuous years. I taught for three years as a part-time teacher, years and years ago. Then I went to secondary school. Then I got this permanent teaching position as a university teacher since 2018. So, we can say that you have been teaching in higher education for nine years.

-During those nine years, have you encountered students that, by definition, are true critical thinkers?
Yes. They are very, very stubborn critical thinkers. Because most critical thinkers tend to be stubborn individuals. They have that readiness to reject. Because the critical thinker always is on, is looking for the flaws, is looking for possible cues whereby he or she can reject something. He's ready to reject, that's the critical thinker. But this category constitutes a very tiny minority, very few students are critical thinkers. Most students do not think critically at all. Most students are passive recipients of knowledge. A critical thinker is an active person, a staunch defender of ideas. Most critical thinkers have views of life, have mature views of life. And most non-critical thinkers have a very shallow understanding of life. They are always immature, no matter how old they are. They continue to passively receive, passively consume ideas that they get disposed to.

-Are you aware of the integration of artificial intelligence? And by that I mean the language models assisting students, especially in the past two years or so.
Well, the only thing that I'm aware of is artificial intelligence tools are the usability, the usefulness, It's on the increase and that students use it more than teachers. What I'm not aware of is whether it's being used. These tools are being used as a supplementary teaching aids intentionally by teachers. My students use them for their academic purposes, which might not be always honest. But students use them more than teachers. Students are much more aware of the benefits of these tools than their teachers. And of course, for teachers to deploy a tool, whether it is a supplementary tool or a private tool, such usage goes through a number of stages and has to be grounded on official documents that we receive from the Ministry of Higher Education and Sciences. Especially if it becomes part of the teaching process. It needs time to be implemented.
The formal implementation needs time actually to be possible and to get to the tangible level where it is used and where teachers are required to use it. But doing it on a purely personal level, doing it voluntarily, I don't think that so many teachers are even aware of the potential constructive contributions of these tools. Myself, I have never been eager enough to delve into this issue.

-Would you say that these tools affect their critical thinking negatively or positively, taking into consideration the people who already have critical thinking? Does that impact them in a negative way? Do they stop critically analyzing situations?

I don't think that the usage of these tools, especially uneducated usage, students use them blindly, I don't think that these tools will help them pick up proper critical thinking skills.
On the contrary, I think it will contribute to making them worse than they already are, more passive than they already are. Because they become more and more reliant on other sources of information. If you are already a critical thinker, then these tools may or may not be beneficial for you.
But I don't think that relying on these tools is like relying on a person. Because the more reliant you are on a person for your academic success or for your financial needs, the more passive you will be. So these tools, I suppose that in the long run, if not used appropriately, of course they are used appropriately, methodologically, methodically, then they could have positive aspects.

-Based on your observations, would you say that it makes it better or worse?
To be honest, I haven't even noticed this. Because you have to deal with a student on a purely individual basis to know their daily practices and what they do and don't do beyond the academic setting. Unless and until you are aware of their extracurricular activities, you should be aware of their extracurricular activities, You should have their extracurricular profile. Unless you have their profile at your disposal, you cannot tell if using artificial intelligence has positively or negatively impacted their critical thinking capabilities. In other words, I haven't made any conscious efforts in that direction, no.

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