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"**The Role of Digital Critical Reading in the Development of Investigative Thinking in the Era of Artificial Intelligence**"

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We, the undersigned professors appointed as members of the Degree Tribunal for the evaluation of the research work **"The Role of Digital Critical Reading in the Development of Investigative Thinking in the Era of Artificial Intelligence"**, presented by Viviana Katherine Cueva Cueva, with identity number 1150819132, under the tutorship of Mgs. María Dolores Avalos Obregon; we certify that we recommend the APPROVAL of this work for degree purposes. The research work and the author have been previously evaluated, and the author has been heard; having no further comments to make.

In accordance with the applicable regulations, we sign, in Riobamba, June 23th, 2026.

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Que, **Viviana Katherine Cueva Cueva** con CC: **1150819132**, estudiante de la **CARRERA DE PEDAGOGÍA DE LOS IDIOMAS NACIONALES Y EXTRANEROS**, Facultad de **CIENCIAS DE LA EDUCACIÓN, HUMANAS Y TECNOLOGÍAS**; ha trabajado bajo mi tutoría el trabajo de investigación titulado "THE ROLE OF DIGITAL CRITICAL READING IN THE DEVELOPMENT OF INVESTIGATIVE THINKING IN THE ERA OF ARTIFICIAL INTELLIGENCE", cumple con el 9 %, de acuerdo al reporte del sistema Anti plagio Compilatio Magister, porcentaje aceptado de acuerdo a la reglamentación institucional, por consiguiente autorizo continuar con el proceso.

Riobamba, 12 de junio de 2026

PhD. /Mgs. María Dolores Avalos Obregón
TUTOR(A)

DEDICATORY

To my beloved parents, María and Patricio, whose love, strength, and unwavering faith have guided me throughout my life. Thank you for every lesson, every word of encouragement, and every effort made to help me reach this moment. Mom, your kindness and trust have always given me the courage to move forward. Dad, your dedication and perseverance have inspired me to work hard and never lose sight of my goals. Today, this achievement is ours. Thank you for being my greatest support and inspiration. I love you both with all my heart.

Viviana Katherine Cueva C.

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To everyone who, in one way or another, was part of this journey and contributed to the fulfillment of this dream, I extend my deepest gratitude.

Viviana Katherine Cueva C.

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RESUMEN

La presente investigación analizó la relación entre la Lectura Crítica Digital y el Pensamiento Investigativo en estudiantes de octavo semestre de la carrera de Pedagogía de los Idiomas Nacionales y Extranjeros de la Universidad Nacional de Chimborazo, durante el período académico 2025–2S, en el contexto del uso académico de ChatGPT. El estudio se desarrolló bajo un enfoque mixto, con un diseño no experimental, correlacional y transversal. La fase cuantitativa incluyó una evaluación basada en tareas de desempeño aplicadas a 40 estudiantes, mientras que la fase cualitativa se realizó mediante entrevistas semiestructuradas a nueve participantes seleccionados según su nivel de desempeño. Los resultados evidenciaron niveles moderados y altos tanto en Lectura Crítica Digital como en Pensamiento Investigativo. Asimismo, el análisis correlacional mediante el coeficiente de Spearman reveló una relación positiva y significativa entre ambas variables ($\rho = 0.93$; $p < 0.001$). Los hallazgos cualitativos mostraron que los estudiantes que verificaban, contrastaban y reflexionaban sobre la información generada por ChatGPT desarrollaban procesos investigativos más sólidos, mientras que el uso pasivo de la herramienta se asociaba con aprendizajes superficiales. Se concluye que la Lectura Crítica Digital constituye una base fundamental para el desarrollo del Pensamiento Investigativo en entornos mediados por inteligencia artificial.

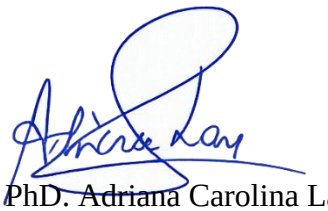
Palabras claves: Lectura Critica Digital, Pensamiento Investigativo, ChatGPT, Inteligencia Artificial, Verificación de la información.

ABSTRACT

This research analyzed the relationship between Digital Critical Reading and Investigative Thinking among eighth-semester students from the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic period, within the context of the academic use of ChatGPT. The study followed a mixed-methods approach with a non-experimental, correlational, and cross-sectional design. The quantitative phase involved a performance-based assessment administered to 40 students, while the qualitative phase included semi-structured interviews with nine participants selected according to their performance levels. The findings revealed moderate to high levels in both Digital Critical Reading and Investigative Thinking. In addition, Spearman's correlation analysis showed a strong and statistically significant positive relationship between both variables ($\rho = 0.93$; $p < 0.001$). Qualitative results indicated that students who verified, contrasted, and reflected on AI-generated information demonstrated stronger investigative processes, whereas passive use of ChatGPT was associated with superficial learning. The study concludes that Digital Critical Reading plays a fundamental role in the development of Investigative Thinking in AI-mediated academic environments.

Keywords: Digital Critical Reading, Investigative Thinking, ChatGPT, Artificial Intelligence, Information Verification.

Reviewed by:



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CHAPTER I. INTRODUCTION

1.1 Introduction

Higher education is currently being transformed by the rapid integration of digital technologies and artificial intelligence. In this evolving context, students are increasingly exposed to digital systems capable of generating, organizing, and presenting information. While these technologies provide valuable learning opportunities, important challenges related to the critical evaluation and interpretation of information have also emerged.

In digital environments, reading is no longer understood as a linear process focused solely on comprehension. Rather, it involves navigating multiple sources, assessing credibility, and interpreting information presented in diverse formats. Consequently, Digital Critical Reading has been recognized as an essential competence in higher education, as it enables the evaluation of the reliability, intentionality, and quality of information in contexts characterized by information overload (Liu et al., 2024).

At the same time, Investigative Thinking is considered a fundamental component of academic development. Through this competence, research questions can be formulated, evidence can be analyzed, and arguments can be constructed based on reliable information. Therefore, Digital Critical Reading is regarded as a foundational competence that supports the development of Investigative Thinking in academic settings.

This relationship has become increasingly relevant due to the widespread presence of artificial intelligence tools such as ChatGPT in educational contexts. However, ChatGPT is not examined in this study as an independent variable or instructional intervention; rather, it is considered part of the contemporary academic environment in which students interact with digital and AI-generated information. Therefore, the study focuses on understanding the relationship between Digital Critical Reading and Investigative Thinking within these emerging educational contexts.

Although growing attention has been given to digital literacy and artificial intelligence in education, limited research has been conducted on the relationship between

Digital Critical Reading and Investigative Thinking in authentic academic contexts, particularly within Latin American higher education. This gap highlights the need for empirical research. Therefore, the present study aims to determine the relationship between Digital Critical Reading and Investigative Thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic term, within academic contexts where students interact with AI-generated information such as ChatGPT.

For organizational purposes, the study is structured into five chapters. Chapter I presents the introduction, problem statement, justification, objectives. Chapter II develops the theoretical framework, including background studies and conceptual foundations. Chapter III describes the methodology, including research design, population, instruments, data analysis procedures and hypothesis. Chapter IV presents the results and discussion. Finally, Chapter V outlines the study's conclusions and recommendations.

1.2 Problem Statement

To begin with**,** digital information and artificial intelligence tools such as ChatGPT are increasingly relied upon by many university students for academic tasks and research activities. However, adequate source verification, evidence evaluation, or critical analysis are not always included in this use. Immediate access to information, explanations, and academic assistance is provided by these technologies, and they are frequently used in higher education (Kasneci et al., 2023). As a result, the quality of academic work and research processes may be declined when information is accepted without sufficient critical evaluation (Cotton et al., 2023).

In addition, this situation appears in Ecuadorian higher education institutions, where digital technologies and artificial intelligence have been integrated into students' daily academic practices. In Riobamba, digital resources and AI-based tools are increasingly used, which has changed the way information is searched, assignments are completed, and research-related tasks are approached (Chugñay & Pilco, 2024). Although important educational opportunities are offered by these technologies, new challenges are also created in how information is evaluated and verified. Local studies show that digital content is often interacted with by students without consistently applying systematic

verification processes, which can affect the quality of their academic work and decision-making (Ausay, 2025). In this context, stronger competencies in Digital Critical Reading and Investigative Thinking are required to support informed academic and research practices.

At Universidad Nacional de Chimborazo**,** particularly in the Pedagogía de los Idiomas Nacionales y Extranjeros program, digital resources are regularly engaged with throughout students' academic training. The searching, evaluation, comparison, and integration of information from multiple sources are required by academic assignments, research projects, and thesis development. Therefore, the information used must be critically assessed and analytical reasoning must be applied when completing academic tasks. The importance of Digital Critical Reading, which involves the critical evaluation and interpretation of digital information, and Investigative Thinking, which supports the analysis of evidence and the construction of knowledge through inquiry, are highlighted by these demands (UNESCO, 2024; Metzger, 2007).

However, eighth-semester students in this program actively participate in research-related activities, particularly thesis development. At this stage, information from multiple sources is searched, evaluated, and synthesized while arguments are supported with evidence. Nevertheless, a reliance on information without critical evaluation may be caused by the increasing exposure to easily accessible digital content. This situation may influence the development of investigative thinking and academic research skills.

Overall, despite a growing interest in digital literacy in education, empirical evidence remains limited regarding the statistical relationship between Digital Critical Reading and Investigative Thinking in Ecuadorian university contexts. Few studies have specifically examined how these competencies relate or correlate when performance-based measures are applied among students who regularly work with digital information. Therefore, this statistical relationship remains underexplored in higher education settings. This study seeks to determine the relationship between Digital Critical Reading and Investigative Thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic term

1.3 Problem formulation

What is the relationship between Digital Critical Reading and Investigative Thinking among Eighth-Semester Students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo in academic contexts where students interact with AI-generated information such as ChatGPT, during the 2025–2S academic term?

1.4 Justification

Initially, in the current context of higher education, academic activities have been increasingly influenced by the integration of digital technologies and artificial intelligence tools into learning environments. University students frequently interact by using online platforms to access, organize, and use information for academic purposes. In this context, tools such as ChatGPT have become part of contemporary academic environments by providing immediate access to AI-generated information. However, the growing exposure to digital information also requires students to develop critical and analytical competencies to evaluate the reliability, quality, and credibility of the information.

The importance of this study lies in its analysis of the relationship between Digital Critical Reading and Investigative Thinking in academic contexts where students interact with digital and AI-generated information. Although previous studies have explored digital literacy and artificial intelligence in education, there remains limited empirical evidence on how Digital Critical Reading and Investigative Thinking are related in real university contexts, particularly in Latin American higher education. Therefore, this research contributes to understanding these competencies in contemporary academic environments where AI-generated information is increasingly prevalent (Kasneci et al., 2023).

From an academic perspective, this study is particularly relevant within the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo. Eighth-Semester Students are involved in research processes and thesis development that require higher levels of information analysis, evidence evaluation, and academic reasoning. In this sense, strengthening competencies in Digital Critical Reading

and Investigative Thinking is essential to support students' academic formation and research development in digital academic environments.

Theoretical and practical contributions are also provided through this study. Theoretically, it contributes to the existing literature related to Digital Critical Reading, Investigative Thinking, and academic interaction with AI-generated information in higher education contexts. In practical terms, the study has several potential beneficiaries. Eighth-Semester Students of the Pedagogía de los Idiomas Nacionales y Extranjeros program may benefit from the findings by recognizing the importance of critically evaluating digital information and strengthening investigative processes in academic work.

Likewise, teachers within the program may use the results as a reference to promote pedagogical strategies focused on critical analysis, information evaluation, and responsible academic interaction with digital information in contemporary educational contexts. The study may also benefit the university community and future researchers interested in Digital Critical Reading, Investigative Thinking, and the role of AI-generated information in higher education, as the findings could serve as a reference for future academic and research initiatives.

Regarding feasibility, the study is viable because the researcher has direct access to the participants and to the institutional context in which the investigation is conducted. In addition, the necessary bibliographic, technological, and academic resources are available through digital databases, institutional support, and online platforms used during the research process. Therefore, the study is feasible within the established academic period and responds to a relevant educational need within the university context.

1.5 Objectives

1.5.1 General Objective

To determine the relationship between Digital Critical Reading and Investigative Thinking among Eighth-Semester Students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic term, within academic contexts where students interact with AI-generated information such as ChatGPT.

1.5.2 **Specific Objectives:**

- To describe the level of digital critical reading among students.
- To assess the level of investigative thinking of students.
- To analyze the relationship between Digital Critical Reading and Investigative Thinking in academic contexts where students interact with AI-generated information such as ChatGPT.
- To explain the quantitative results through the perspectives of students regarding this relationship in the context of ChatGPT usage.

CHAPTER II. THEORETICAL FRAMEWORK

1.6 Research Background

The development of digital critical reading and investigative thinking is rooted in classical theories of learning that emphasized the importance of higher-order cognitive processes. From an early perspective, Bloom (1956) established a hierarchical classification of cognitive skills, highlighting the progression from basic comprehension to analysis, evaluation, and creation. This model provided a foundation for understanding how students process and transform information into knowledge. In a similar direction, Dewey (1938) emphasized learning through experience, arguing that knowledge is constructed through inquiry and problem-solving. Later, Bruner (1961) reinforced this view by proposing discovery learning, where students actively construct meaning through exploration.

Building on these foundational theories, later research shifted toward a more structured understanding of thinking processes. Anderson and Krathwohl (2001) revised Bloom's taxonomy, emphasizing the cognitive operations involved in applying, analyzing, and evaluating information. This evolution contributed to the conceptualization of thinking as an active and systematic process, closely linked to academic inquiry.

With the expansion of digital technologies, the concept of reading experienced a significant transformation. Traditional reading, which was primarily linear and text-based, evolved into a more complex activity influenced by digital environments. Ng (2012) argues that digital literacy involves not only technical skills but also the ability to interpret and evaluate information critically. Similarly, van Bergen et al. (2017) highlight that digital reading requires active engagement, as students must navigate, filter, and assess large amounts of information.

As a result of these transformations, digital critical reading emerged as a key competence in higher education. Ballam and Moltzen (2017) emphasize that students must develop the ability to evaluate the credibility and intent of digital information in order to construct valid knowledge. At the same time, investigative thinking has become increasingly relevant, particularly in university contexts where students are required to conduct research and produce academic work.

More recently, the integration of artificial intelligence has added a new dimension to these processes. Long and Magerko (2020) introduced the concept of AI literacy, emphasizing the importance of understanding and critically evaluating AI systems. This perspective highlights that students must not only access information but also assess the reliability of algorithm-generated content.

Overall, the research background reflects a clear evolution from traditional cognitive models toward digital and technology-mediated learning environments. This progression establishes the theoretical foundation for analyzing the relationship between digital critical reading and investigative thinking in contemporary higher education contexts.

1.7 State of the Art

Recent literature on digital critical reading and investigative thinking has increasingly emphasized the transformation of reading practices in digital environments. Scholars agree that digital reading is no longer a passive activity but a complex cognitive process involving the evaluation, selection, and integration of multiple sources. Liu et al. (2024) argue that effective digital reading requires continuous credibility assessment and the ability to manage information overload. In a similar vein, Salmerón et al. (2021) demonstrate that students who apply strategic reading processes in digital contexts achieve deeper comprehension and are more capable of identifying reliable sources.

This perspective aligns with studies that highlight digital literacy as a multidimensional competence. Leu et al. (2015) emphasize that online reading comprehension is closely linked to inquiry processes, as readers must formulate questions and evaluate information critically. Likewise, McDougall et al. (2022) argue that digital literacy extends beyond technical skills, requiring the ability to analyze bias, credibility, and the intent of information.

At the same time, research on investigative thinking reinforces its dependence on information processing skills. Xu and Chen (2024) found that students who engage in reflective reading practices demonstrate stronger abilities to formulate research questions and construct evidence-based arguments. Similarly, Facione (2020) highlights that higher-order cognitive skills such as analysis and evaluation are essential for academic inquiry.

More recently, the emergence of generative artificial intelligence, particularly ChatGPT, has introduced new dynamics into educational contexts. Kasneci et al. (2023) conclude that AI tools can enhance academic performance by supporting tasks such as idea generation and information organization. In the same vein, Halaweh (2023) suggests that ChatGPT can serve as a cognitive support tool when students actively evaluate its outputs.

However, the literature also presents a critical perspective regarding the risks associated with these technologies. Cotton et al. (2023) warn of issues with academic integrity, as students may rely on AI-generated content without proper verification. Similarly, Crompton Burke (2024) argues that the educational use of ChatGPT requires structured pedagogical approaches to ensure meaningful learning.

Empirical evidence further highlights this dual perspective. While some studies indicate improvements in learning outcomes, others show that students often lack the skills necessary to critically evaluate AI-generated information. This issue becomes more evident in developing educational contexts.

In Latin America, recent studies reveal that although students frequently use digital tools, they tend to prioritize speed over accuracy, which limits deeper analytical processes. In Ecuador, emerging research suggests that students use tools such as ChatGPT for academic tasks but have difficulty verifying information and identifying inaccuracies (Manzano-Flores et al., 2023).

To sum up, the existing literature demonstrates that digital critical reading and investigative thinking are closely interconnected in contemporary educational environments. However, it also reveals a significant gap, as few studies have examined how these competencies interact in real academic contexts where ChatGPT is actively used, particularly in Latin America and Ecuador.

1.8 Philosophical and Pedagogical Foundations

1.8.1 Constructivism and Inquiry-Based Learning:

Understanding how students interact with AI today requires returning to the roots of constructivism, where learning is far from being a passive intake of data; it is, instead,

a deliberate act of construction. This idea, famously championed by John Dewey (1938), suggests that education fails if it is not anchored in experience. For Dewey, the real magic happens when students face 'problem-solving' scenarios that blur the line between abstract theory and the messy reality of life. Lev Vygotsky (1978) added a crucial layer to this by reminding us that we do not learn in a vacuum. His focus on dialogue and social interaction remains strikingly relevant: knowledge is something we build together, through the very type of exchange that many students now attempt to replicate with digital tools.

This theoretical backbone is exactly what fuels inquiry-based learning. Here, the student is not a 'vessel' to be filled, but an investigator in their own right. Pedaste et al. (2015) break this down into a systematic cycle of questioning and reflection, which is precisely what defines a deep investigation. Ultimately, both constructivism and inquiry-based models demand that the learner stay in the driver's seat. It is this 'central agency' of the student that transforms a simple search for information into a process of critical engagement and genuine comprehension.

1.8.2 Taxonomy of Educational Objectives.

To truly grasp the depth of critical thinking, we have to look back at the hierarchical structure proposed by Benjamin Bloom (1956). His taxonomy is not just a dry list of skills; it is a roadmap that shows how a learner climbs from basic data retention toward the complexities of evaluation and creation. This progression is at the very heart of my research. It helps us see whether a student is just skimming the surface or actually crossing the bridge toward genuine, independent thought.

However, cognition is not a static ladder, and that is exactly what Anderson and Krathwohl (2001) captured when they revised Bloom's original work. By shifting the categories into active processes like remembering, analyzing, and creating, they reminded us that learning is actually a web of interconnected, dynamic actions. For this study, their framework is vital. It allows us to analyze whether using ChatGPT encourages deep analytical work or if it accidentally traps students in the lower levels of the taxonomy, preventing their cognitive engagement from ever moving past surface-level comprehension.

1.8.3 Reflective Practice in Higher Education.

The role of reflection in higher education is far more than just a theoretical concept; it is the engine that drives critical and investigative growth. Donald Schön (1983) famously challenged the idea of the passive professional by introducing the 'reflective practitioner.' His argument which still feels incredibly fresh is that we don't just learn by doing, but by looking back at what we did and questioning our own logic. This constant cycle of reinterpreting our experiences is what turns a simple task into a learning opportunity.

Expanding on this, Rodgers (2002) makes a crucial distinction: reflection is not just 'thinking about stuff.' It is a disciplined, almost systematic way of making meaning out of chaos. In the modern academic world, this kind of rigorous reflection has become a survival skill. It is what allows a student to stop and critically dissect information, especially when dealing with the polished, often deceptive nature of AI-generated content. Ultimately, reflective practice is the filter through which students refine their investigative process, ensuring they are not just consuming data, but actually analyzing it.

1.8.4 Connectivism: Learning in the Digital Age.

In today’s hyper-connected world, learning has moved far beyond the boundaries of the individual mind. George Siemens (2005**)** redefined our understanding of this shift by introducing Connectivism a theory that treats knowledge not as a static object to be stored, but as a fluid process distributed across vast digital networks. According to Siemens, the real skill is not just 'knowing' facts, but mastering the ability to navigate, connect, and evaluate shifting flows of information. In this view, knowledge doesn't just sit inside a person; it lives within the connections we build between people, tools, and platforms.

Stephen Downes (2012) takes this a step further, arguing that learning in the digital age is essentially about pattern recognition and filtering. It is about making informed decisions amid a chaotic network. This perspective is vital for my research because it places 'digital critical reading' at the center of the investigative process. For a student today, investigative thinking is not just about finding an answer, it is about

knowing which sources to trust and how to weave them together into something coherent. In short, being a good investigator now means being a skilled navigator of the digital web.

1.9 Variable 1: Digital Critical Reading (DCR)

1.9.1 Definition and Conceptualization of DCR:

Digital critical reading (DCR) represents a significant evolution from traditional literacy, specifically tailored for the complexities of the internet. Donald Leu et al. (2013) established the foundation for this by defining it as a set of 'new literacies' that force readers to not only locate and evaluate but also to synthesize information from a staggering variety of online sources. This is a much messier, more non-linear process than reading a printed page; it requires a constant juggling act between hyperlinks, multimodal media, and often clashing perspectives.

To navigate this chaos, Wineburg and McGrew (2017) introduce a vital layer to DCR through the concept of 'lateral reading.' They argue that being a critical reader today means looking away from a text to verify its origins checking other tabs and sources to determine who is behind the information. This active skepticism is exactly what the OECD (2018) emphasizes as a core competency for the 21st century. According to their framework, comprehension is useless if it is not paired with the ability to judge relevance and credibility. Therefore, DCR is not just about understanding a sentence; it is about questioning the source, verifying the facts, and interpreting every piece of data within the vast, and sometimes deceptive, digital landscape.

1.9.2 Evolution from Digital Literacy to Critical Literacy.

The shift from digital literacy to critical literacy is more than a simple change in definitions; it marks a fundamental transition from mastering technical tools to developing deep cognitive and analytical muscles. McDougall et al. (2018) argue that while digital literacy was once just about 'knowing how to use the tech,' today’s landscape demands much more. It requires a sophisticated level of critical evaluation and, perhaps most importantly, the ethical use of information. It’s no longer enough to be digitally fluent; one must be digitally responsible.

In a similar vein, Buckingham (2015) pushes this idea further by stressing that media literacy must uncover the 'invisible' elements of digital content: the hidden intentions, the underlying biases, and the power structures that dictate what we see on our screens. This evolution is central to my research. It proves that we must move beyond mere functional skills and strive for critical engagement. In an era where we are drowning in information, being able to navigate the vast digital ocean isn't just a technical skill—it’s an essential survival strategy for any serious investigator.

1.9.3 Structural Dimensions of DCR (Based on the Research Instrument)

1.9.3.1 Veracity and Authorship: Source Traceability and Fact-checking.

A fundamental dimension of Digital Critical Reading (DCR) lies in the ability to verify the credibility of information and accurately identify its source. In digital environments, where information is widely accessible yet often unregulated, readers cannot rely on surface-level evaluation. Instead, they must actively engage in verification processes. Wineburg and McGrew (2017) explain that expert readers tend to use “lateral reading,” a strategy that involves consulting multiple external sources to confirm the reliability of information, rather than trusting the content of a single webpage.

In a similar vein, Metzger (2007) argues that evaluating online credibility requires careful attention to authorship, accuracy, and reliability. This includes examining the author's background, checking supporting references, and determining whether the information is grounded in verifiable evidence. Taken together, these practices show that evaluating digital information is not a passive act but a deliberate and systematic process. This becomes especially relevant when interacting with AI-generated content, where information may appear coherent while lacking clear source traceability.

Such competencies are also reflected in international assessment frameworks. The Organisation for Economic Co-operation and Development (OECD, 2018) identifies the evaluation of quality and credibility as a central reading process, while the Association of College and Research Libraries (2016) emphasizes that authority should be understood as constructed and context-dependent.

1.9.3.2 Bias and Intentionality Analysis in Digital Discourse.

Another essential dimension of digital critical reading involves recognizing bias and understanding the intentions behind digital texts. Information found online is rarely neutral; it is often shaped by ideological positions, economic interests, or persuasive goals. As Buckingham (2015) points out, media literacy requires an awareness of how messages are constructed and how they reflect specific viewpoints and power dynamics.

Similarly, Leu et al. (2013) note that online reading demands the ability to evaluate multiple perspectives, which includes identifying bias and comparing information across sources. This process encourages readers to adopt a more analytical stance, moving beyond passive consumption toward critical engagement with content.

The relevance of this dimension is reinforced by contemporary digital competence frameworks. The European Commission's DigComp 2.2 (Vuorikari et al., 2022) highlights the identification of bias and misinformation as a key skill, while the OECD (2018) underscores the importance of detecting manipulation in complex digital environments.

1.9.3.3 Argumentative Quality Evaluation of Online Information.

A further dimension of digital critical reading focuses on evaluating the quality of arguments presented in digital texts. This involves examining how claims are structured, whether the evidence provided is relevant and sufficient, and how ideas are connected coherently. Kuhn (1991) emphasizes that argumentation is central to critical thinking, as it requires individuals to assess competing claims and justify conclusions based on evidence.

In addition, Facione (1990) identifies analysis and evaluation as core components of critical thinking, stressing the importance of recognizing inconsistencies and assessing the strength of arguments. In digital contexts, where misleading information can be presented convincingly, these skills are particularly important.

This evaluative capacity aligns with the "reflect and evaluate" processes described by the OECD (2018), where readers are expected to judge the quality and relevance of information. It also connects with the ACRL (2016) perspective, which views knowledge

construction as an ongoing scholarly conversation grounded in evidence and critical reasoning.

To consolidate the theoretical framework of this variable, the following table synthesizes the relationship between the structural dimensions of Digital Critical Reading (DCR) and the international standards for higher education. This alignment ensures that the performance tasks evaluated in this study are grounded in both classical cognitive theories and contemporary global frameworks for digital literacy.

Table 1.

Theoretical and Standard-Based Alignment of DCR Dimensions

Dimension	Theoretical Foundation	International Standards	Key Focus for Assessment
2.4.3.1 Veracity & Authorship	Wineburg & McGrew (2017); Metzger (2007)	**PISA 2018:** Evaluate Quality and Credibility. **ACRL:** Authority is Constructed.	Source traceability and cross-checking facts.
2.4.3.2 Bias & Intentionality	Buckingham (2015); Leu et al. (2013)	**DigComp 2.2:** 1.2 Identifying bias. **PISA:** Detecting manipulation.	Deconstructing hidden agendas and ideological stances.
2.4.3.3 Argumentative Quality	Kuhn (1991); Facione (1990)	**ACRL:** Scholarship as Conversation. **PISA:** Reflect and Evaluate.	Assessing logical strength and evidence sufficiency.

Note. Own elaboration (2024), based on the Framework for Information Literacy for Higher Education (ACRL, 2016), the PISA 2018/2025 Assessment Frameworks (OECD), and the European Digital Competence Framework - DigComp 2.2 (2022).

1.10 Variable 2: Investigative Thinking (IT)

1.10.1 Definition and Scope of Investigative Thinking:

Investigative thinking is far more than a simple academic requirement; it is a systematic and intentional process of inquiry that involves questioning, analyzing, and actively constructing knowledge. John Dewey (1933) laid the groundwork for this by defining reflective thinking as an active, persistent, and careful consideration of any belief or knowledge in light of the evidence that supports it. For Dewey, thinking is not a passive or automatic act; it is a disciplined and conscious effort to find the truth.

This vision is complemented by Jerome Bruner (1961), who argued that true learning only happens through discovery. In Bruner's view, individuals must be active problem-solvers, engaging in exploration rather than just absorbing data. Together, Dewey's reflection and Bruner's discovery frame investigative thinking as a dynamic cycle fueled by curiosity, rigorous analysis, and evidence-based reasoning.

1.10.2 Standards for Critical and Investigative Thought

The growth of investigative thinking must be guided by clear, rigorous standards to avoid falling into mere speculation. Richard Paul and Linda Elder (2008) provided a vital framework for this, emphasizing that intellectual quality depends on specific standards: clarity, accuracy, precision, relevance, and depth. These aren't just abstract ideas; they are the practical criteria we use to evaluate both the questions we ask and the answers we find during research.

Ultimately, investigative thinking isn't just about 'having ideas.' It's about ensuring those ideas are well-founded, logically structured, and resistant to scrutiny. In the context of academic research, where every claim must be backed by evidence, these standards serve as the essential filter between a weak assumption and a solid investigative conclusion.

1.10.3 Functional Dimensions of IT (Based on the Research Instrument)

1.10.3.1 Problematization: Identification and Formulation of Research Questions.

The spark of investigative thinking is ignited by the ability to identify a problem and transform it into a meaningful research question. This phase, known as problematization, demands more than just curiosity; it requires a sharp awareness of the

gaps in our current understanding. Facione (2014) identifies this as the foundational step of any inquiry, as it defines the entire scope and trajectory of the study.

From a philosophical standpoint, John Dewey (1933) reminds us that all inquiry begins in a state of doubt or uncertainty a discomfort that drives us to find answers. Within this framework, Pirela and Almarza (2018) describe problematization as the 'triggering dimension.' It is the moment an information need evolves into a structured scientific quest, proving that investigative thinking is not merely about asking questions, but about recognizing which issues are worth exploring systematically.

1.10.3.2 Information Management and Synthesis: The Triangulation of Data

Once the problem is defined, the focus shifts to the ability to gather, organize, and synthesize data from a myriad of sources. This is where information is not just collected, but meaningfully integrated. Facione (1990) highlights that interpretation and analysis are the core 'engines' of this process, allowing us to make sense of complex and often conflicting data.

A critical part of this synthesis is triangulation. Mieles et al. (2012) emphasize that comparing different perspectives is the only way to ensure the validity and rigor of our findings. This reflects the heart of Information Literacy (ALFIN). As Pirela Morillo and Cortés Vera (2014) argue, the power of triangulation ensures that a researcher is not simply accumulating data like a library, but critically contrasting sources to build a solid foundation. In a digital world where information is often contradictory, this careful synthesis is the only path to reliable knowledge."

1.10.3.3 Inference and Logical Reasoning: Construction of Evidence-Based Arguments

The culmination of investigative thinking is the ability to draw conclusions and build arguments that stand up to scrutiny. This requires a mastery of logical reasoning and the capacity to justify every claim with evidence. Richard Paul and Linda Elder (2008) remind us that for reasoning to be sound, it must meet high intellectual standards of clarity, accuracy, and consistency.

Furthermore, Kuhn (1991) explains that true reasoning involves weighing evidence against alternative explanations, a process that significantly strengthens the quality of one’s arguments. This is precisely where the mobilization of mental schemes leads to the creation of something new. As Pirela et al. (2016) state, this dimension marks the final

transition: the student ceases to be a mere consumer of information and becomes a producer of knowledge, capable of generating well-founded, independent conclusions.

The Investigative Thinking (IT) construct is operationalized through three functional dimensions that integrate the cognitive processes of research with Information Literacy (ALFIN) standards. This alignment ensures that the instrument measures not only theoretical knowledge but also the practical ability to transform information into scientific evidence. Table 2 illustrates the relationship among the theoretical foundations, the international standards governing information management in higher education, and the specific focus of the performance test.

Table 2.

Theoretical and ALFIN-Based Alignment of IT Dimensions

Dimension	Theoretical Foundation	International Standards (ALFIN)	Key Focus for Assessment
2.5.3.1 Problematization	**Pirela Morillo** (2015); **Restrepo** (2003)	**ALFIN (ACRL):** Research as Inquiry.	Formulation of research questions and knowledge gap identification.
2.5.3.2 Information Management & Synthesis	**Pirela & Almarza** (2018); **Mieles et al.** (2012)	**ALFIN (SCONUL):** Gather & Evaluate (Triangulation).	**Data Triangulation**, source contrast, and evidence validation.
2.5.3.3 Inference & Logical Reasoning	**Pirela, Pulido & Mancipe** (2016); **Kuhn** (1991)	**ALFIN (ACRL):** Information Has Value / Knowledge Construction.	Construction of evidence-based arguments and logical conclusions.

*Note***.** Own elaboration (2024), based on the Framework for Information Literacy for Higher Education (ACRL, 2016)**,** the SCONUL Seven Pillars of Information Literacy **(2011)**, and the functional dimensions of investigative thinking and ALFIN proposed by Pirela Morillo (2015)

1.11 The Context of the Study: Artificial Intelligence in Higher Education

1.11.1 Generative AI (ChatGPT) as a Cognitive Tool

The sudden arrival of generative AI has not just influenced but fundamentally reshaped the academic landscape. Tools like ChatGPT are no longer just 'chatbots'; they have become sophisticated cognitive partners that change how students access and structure information. As Kasneci et al. (2023) suggest, these systems serve as cognitive tools that support complex tasks such as idea generation and text production. They do not just 'dump' data; they mediate the way students organize knowledge and explore different angles of a topic.

In this sense, ChatGPT acts as a form of 'cognitive scaffolding.' It allows students to externalize their thoughts, test hypotheses, and refine arguments through an iterative dialogue. However, the true power of this tool is not in the software itself, but in the user's ability to engage with it critically. This means that while AI can amplify learning, it simultaneously demands a higher level of Digital Critical Reading (DCR) and Investigative Thinking (IT) to ensure that the AI's output is handled with purpose and depth.

1.11.2 Systematic Review and Educational Promises

Systematic reviews of AI in universities reveal a landscape of both immense potential and clear boundaries. Zawacki-Richter et al. (2019) found that most AI developments focus on personalizing the student experience and optimizing assessment. Their work suggests that AI can make learning more efficient and tailored than ever before.

Similarly, Holmes et al. (2022**)** point out that these technologies can create highly adaptive environments that boost student engagement. Yet, they offer a vital warning: these benefits only materialize if there is pedagogical alignment. Technology alone is never the solution; it must be anchored within a sound educational framework that prioritizes learning over mere automation.

However, it is essential to balance these optimistic views with a more critical perspective**.** Neil Selwyn (2019) warns that the growing emphasis on artificial intelligence in higher education may prioritize efficiency, automation, and data collection over the human experience of learning. He argues that the increasing “datafication” of education risks reducing students to measurable outputs, potentially weakening the pedagogical relationship between teachers and learners.

This critical stance reinforces the idea that AI should not be understood as a replacement for human thinking or teaching, but rather as a tool that requires continuous human oversight, ethical awareness, and pedagogical intentionality. Therefore, the impact of AI in higher education depends not only on its capabilities but on how it is integrated into meaningful learning processes.

1.11.3 Academic Integrity and Ethical Challenges.

The rise of AI also brings a darker set of challenges, specifically regarding academic integrity. Cotton et al. (2023) argue that ChatGPT forces us to rethink what 'authorship' and 'originality' actually mean today. The risk is that students might lean too heavily on AI-generated answers, skipping the hard work of critical reflection.

This can trigger a 'cognitive dependency' where efficiency is valued more than true understanding, potentially stalling the development of autonomous thought. Therefore, Cotton et al. (2023) advocate for a shift: institutions shouldn't just ban AI, but foster a culture of responsible use and critical engagement. Integrity in the age of AI isn't just about not cheating; it's about using the technology reflectively to enhance, not replace, one's own intellect.

1.12 Interaction between DCR, IT, and the use of ChatGPT

1.12.1 The Role of DCR in Verifying AI-Generated Content

DCR is the essential 'shield' in this new era. While ChatGPT can be incredibly persuasive, it is not an oracle of truth. Kasneci et al. **(**2023**)** remind us that AI can confidently produce inaccuracies or even 'hallucinate' references. This is where DCR becomes a survival skill. The strategies of fact-checking and 'lateral reading'—as proposed by Wineburg and McGrew (2017)—are now more relevant than ever. Students must learn to validate AI outputs through cross-referencing, treating the AI as a source that must be interrogated rather than a final authority.

1.12.2 Synergies between Investigative Thinking and Strategic AI Interaction

Beyond simple verification, Investigative Thinking (IT) transforms how a student interacts with AI. Instead of using ChatGPT as a shortcut, IT encourages the student to use it as a 'brainstorming partner' to explore complex research questions. Holmes et al.

(2022) suggest that AI can actually support inquiry-based learning by providing diverse perspectives that spark curiosity.

This synergy is dynamic: IT enables the learner to identify gaps in the AI's logic and build upon its suggestions. In this model, the AI is a collaborator in the inquiry process, not a substitute for the investigator's mind. The relationship is not passive; it is a constant tug-of-war between the tool's suggestions and the student's critical judgment.

1.13 Legal Framework

1.13.1 Constitution of the Republic of Ecuador (2008)

The legal backbone of this study is the Constitución de la República del Ecuador, which protects education as a fundamental right. Article 27 is particularly relevant, stating that education must center on the holistic development of the person, specifically fostering critical thinking and reflection. Furthermore, Article 347 mandates the State to integrate ICT into the classroom. My research aligns perfectly with these mandates, as it seeks to develop the exact skills critical and investigative that the Constitution demands in our modern, tech-driven world.

1.13.2 Organic Law of Higher Education (LOES)

In the same vein, the Ley Orgánica de Educación Superior (LOES) requires universities to be engines of scientific research and innovation. It places a legal priority on developing analytical capacities in students. Therefore, integrating AI like ChatGPT isn't just a trend; it's a legal and academic necessity to ensure that this integration serves.

CHAPTER III. METHODOLOGY

1.1 Approach

The research approach employed in this study is mixed, combining quantitative (numerical data collection) and qualitative (descriptive data collection) techniques. The study follows a sequential explanatory design, in which quantitative data are collected and analyzed first, followed by a qualitative phase aimed at explaining and deepening the interpretation of the quantitative findings through students' perspectives. According to Hernández Mendoza and Samperio Monroy (2018), mixed methods research offers diverse perspectives for problem-solving by systematically integrating quantitative and qualitative procedures within a single study.

To achieve this, performance-based assessments scored using analytical rubrics were applied during the quantitative phase, while semi-structured interviews were conducted during the qualitative phase.

1.2 Research Modality

Due to the specific characteristics of this study, a descriptive-correlational research modality was selected. As Bhandari (2022) explains, correlational research investigates the relationships between variables without the researcher controlling or manipulating any of them. Furthermore, descriptive research focuses on observing and documenting phenomena as they occur. This modality allows the study to describe students' levels of Digital Critical Reading and Investigative Thinking through performance-based assessments, as well as to analyze the relationship between both variables within contemporary academic contexts where AI-generated information is increasingly present.

1.3 Research Design and Type

This study was framed within a non-experimental design, as it did not involve the manipulation of variables; instead, the phenomena were observed as they naturally occurred within the academic context and then analyzed (Neyra Fernández et al., 2019). The study focused on collecting data on students' Digital Critical Reading and Investigative Thinking within academic contexts where students interact with AI-generated information such as ChatGPT. However, as a correlational study, no causal relationship was assumed between the variables; instead, the analysis focused on identifying the strength and direction of their association.

Furthermore, the study is cross-sectional. According to Cvetkovic-Vega et al. (2021), cross-sectional studies are observational designs in which data are collected at a single point in time to describe a situation or to analyze relationships between variables.

Therefore, data were collected from eighth-semester students at a single point in time to assess their levels of digital critical reading and investigative thinking.

1.4 Study population

The population consisted of 40 eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo, located in Riobamba, Chimborazo Province, during the 2025–2S academic period. This semester was selected because students had already completed several research-related courses and were in the process of developing their thesis, making them an appropriate group for analyzing Digital Critical Reading and Investigative Thinking within academic contexts where AI-generated information, such as ChatGPT, is increasingly present.

Table 3.

Gender Distribution of the Participants

Gender	**Number of Students**
Female	27
Male	13
Total	**40**

Note: The table presents the gender distribution of participants in the study.

1.5 Sample

In this study, all 40 eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo participated in the performance-based assessment, constituting a census of the study population for the quantitative phase.

For the qualitative phase, a stratified purposive sampling technique was applied under a sequential explanatory sampling strategy. Participants were intentionally selected after the quantitative phase according to their performance levels in Digital Critical Reading and Investigative Thinking, as determined by the assessment results. Students

were classified into three performance levels (high, medium, and low) based on their total scores, and three participants from each level were selected, resulting in a total of nine students who participated in the semi-structured interviews.

Since the study followed a sequential explanatory design, the qualitative sample was selected after the quantitative phase in order to explain and deepen the interpretation of the quantitative findings through students' perspectives. This sampling strategy enabled the representation of diverse cognitive profiles and provided a broader understanding of the relationship between Digital Critical Reading and Investigative Thinking in AI-mediated academic contexts.

The following table presents the distribution of the qualitative sample by performance level.

Table 4.

Qualitative Sample

Code	DCR Score	IT Score	Performance Level
S -01	32	32	High
S -02	31	31	High
S -03	30	31	High
S -04	24	22	Medium
S -05	23	21	Medium
S -06	22	20	Medium
S -07	13	12	Low
S -08	11	11	Low
S -09	10	10	Low

Note. Participants were selected through stratified purposive sampling based on their performance levels (high, medium, and low) in both variables. Codes (S-01–S-09) were used to ensure anonymity.

1.6 Data Collection Techniques and Instruments

To fulfill the research objectives, different data collection techniques and instruments were employed, integrating both quantitative and qualitative approaches coherently. For the quantitative phase, a performance-based assessment was administered via Google Forms using the questionnaire option, which enabled structured task organization and standardized data-collection conditions for all participants.

The quantitative instrument consisted of two performance-based assessments: one focused on Digital Critical Reading and the other on Investigative Thinking. Each assessment included eight performance tasks aligned with the dimensions and indicators established in the operationalization table. The researcher designed the instruments based on international theoretical frameworks and standards related to digital reading, information literacy, and investigative competencies, including the PISA Digital Reading Framework, the ACRL Framework for Information Literacy, and ALFIN principles.

Additionally, some performance tasks incorporated prompts and AI-generated responses from ChatGPT as academic stimuli for critical analysis in digital academic scenarios. These materials allowed students to critically evaluate, verify, analyze, and interpret AI-generated information in realistic academic contexts. ChatGPT was not considered a research variable; rather, it was used as an assessment resource to generate authentic academic scenarios through which students could demonstrate Digital Critical Reading skills. The AI-generated materials included references, factual statements, arguments, and academic recommendations that participants were required to verify, contrast, evaluate, and interpret using reliable academic sources. In this way, ChatGPT served as a source of digital content for analysis rather than as the object of investigation itself.

However, for the first objective, the Digital Critical Reading assessment evaluated source traceability and fact-checking, bias and intentionality analysis, and argumentative quality evaluation through tasks requiring students to verify information, identify bias, contrast evidence, and assess argumentative consistency. For the second objective, the Investigative Thinking assessment focused on problematization, information management, synthesis, and logical reasoning through tasks requiring students to formulate research questions, identify variables, evaluate feasibility, analyze evidence, and construct evidence-based conclusions.

Although the tasks required students to write responses, all answers were evaluated quantitatively using an analytical rubric with four performance levels (Initial, Basic, Autonomous, and Strategic). Each item was scored on a scale from 1 to 4 points, with a maximum score of 32 points per variable. For the third objective, the scores obtained from both performance-based assessments were statistically analyzed to determine the relationship between Digital Critical Reading and Investigative Thinking. For the fourth objective, a semi-structured interview consisting of ten open-ended questions was conducted with selected participants to explain and deepen the interpretation of the quantitative findings through students' perspectives.

1.7 Operationalization of Variables

Table 5.

Operationalization of Variables

Variable	Dimension	Indicator	Task Type	Measurement Scale
Digital Critical Reading (DCR)	Source Traceability and Fact-checking	Verifies the authenticity of academic sources and references	Citation verification tasks	Analytical rubric (1–4)
		Contrasts AI-generated data with reliable sources	Data verification tasks	Analytical rubric (1–4)
		Evaluates author's credibility based on academic evidence	Source evaluation tasks	Analytical rubric (1–4)
	Bias and Intentionality Analysis	Identifies bias in AI-generated content	Critical analysis tasks	Analytical rubric (1–4)
		Contrasts AI claims with contextual reality	Contextual comparison tasks	Analytical rubric (1–4)
		Evaluates ethical and pedagogical implications of AI responses	Reflective analysis tasks	Analytical rubric (1–4)
	Argumentative Quality Evaluation	Distinguishes between evidence-based and opinion-based information	Comparative analysis tasks	Analytical rubric (1–4)
		Evaluates logical consistency of arguments	Argument evaluation tasks	Analytical rubric (1–4)
Investigative Thinking (IT)	Problematization and Formulation	Formulates structured research questions	Research formulation tasks	Analytical rubric (1–4)

	Identifies variables and their relationships	Variable identification tasks	Analytical rubric (1–4)
	Evaluates feasibility of research problems	Feasibility analysis tasks	Analytical rubric (1–4)
Information Management and Synthesis	Ranks sources based on academic reliability	Source ranking tasks	Analytical rubric (1–4)
	Synthesizes theoretical perspectives	Academic writing tasks	Analytical rubric (1–4)
	Selects relevant empirical evidence	Evidence selection tasks	Analytical rubric (1–4)
Inference and Logical Reasoning	Draws conclusions from data	Inference tasks	Analytical rubric (1–4)
	Proposes evidence-based recommendations	Argument construction tasks	Analytical rubric (1–4)

Note. This table presents a summary of the operationalization of the variables. The complete version, including detailed performance tasks and item descriptions, is presented in the annexes. All indicators were assessed through performance-based tasks using an analytical rubric with four levels: Initial (1), Basic (2), Autonomous (3), and Strategic (4).

1.8 Data analysis and interpretation techniques

The data obtained from the performance-based assessments were exported to Excel and analyzed using descriptive statistics, including frequencies, percentages, and means. This analysis provided a quantitative overview of students' levels of Digital Critical Reading and Investigative Thinking (Banda Dávila & Fernández Tineo, 2024).

Additionally, an inferential statistical analysis was conducted using Spearman's rho. This test was selected due to the ordinal nature of the data derived from analytical rubrics and the non-parametric characteristics of the dataset. Spearman's rho was used to determine the strength and direction of the relationship between both variables, addressing the third objective of the study.

To address the qualitative findings, information from the semi-structured interviews was transcribed and analyzed using thematic analysis. This approach allowed for the coding and categorization of recurring patterns (Mieles Barrera et al., 2012),

providing a deeper understanding of students' perspectives regarding Digital Critical Reading, Investigative Thinking, and the evaluation of digital and AI-generated information in academic contexts.

Finally, the results from both instruments underwent a data triangulation process (Aguilar Gavira & Barroso Osuna, 2015). By integrating the quantitative performance levels with the qualitative insights obtained from the interviews, the study achieved a broader understanding of the relationship between Digital Critical Reading and Investigative Thinking within contemporary digital academic environments.

1.9 Validation Instruments

It should be emphasized that the quantitative instrument used in this study was not a standardized instrument. It was specifically designed by the researcher to assess Digital Critical Reading and Investigative Thinking in AI-mediated academic contexts. The tasks were developed based on internationally recognized frameworks, including the PISA Digital Reading Framework, the ACRL Framework for Information Literacy, ALFIN principles, and the SCONUL Seven Pillars, ensuring alignment with established standards related to digital literacy and investigative competencies.

To ensure content validity, the quantitative instrument, the analytical rubric, and the semi-structured interview protocol were reviewed by the academic tutor and a university professor with experience in research and language education. The validation process assessed the clarity, coherence, relevance, and alignment of the instruments with the research objectives, dimensions, indicators, and theoretical framework. Based on their feedback, the necessary adjustments were incorporated, and the final versions of the instruments were prepared for application.

Prior to the final administration, a pilot test was conducted with five students (12.5% of the target population) who shared the same characteristics as the study participants. The pilot test was used to evaluate the clarity of the instructions, the appropriateness of the tasks, the estimated completion time, and the functionality of the analytical rubric. Based on the observations obtained, minor modifications were made to improve the wording and clarity of the instrument before its final application to the entire population.

Additionally, the AI-generated materials incorporated into some performance tasks were reviewed during the validation process to ensure their relevance, academic appropriateness, and alignment with the competencies being assessed.

The reliability of the quantitative instrument was supported through the consistent use of an analytical rubric applied to all responses. Given the performance-based nature of the tasks, internal consistency measures such as Cronbach's alpha were not considered appropriate. Instead, reliability was ensured through clear scoring criteria, standardized evaluation procedures, and the use of the same assessment rubric for all participants.

Furthermore, ethical considerations were taken into account throughout the research process. Informed consent was obtained from all participants, ensuring they were fully aware of the study's purpose and how their information would be used. Participation was voluntary, and students had the right to withdraw at any time without consequences. In addition, anonymity was guaranteed through the use of coded identifiers, preventing the disclosure of personal information. Finally, the data were handled responsibly, ensuring their integrity and avoiding any form of manipulation.

Research Hypothesis

Alternative Hypothesis (H_1)

H_1: There is a statistically significant relationship between digital critical reading and investigative thinking among Eighth-Semester Students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic term, within the context of academic use of ChatGPT.

Null Hypothesis (H_0)

H_0: There is no statistically significant relationship between digital critical reading and investigative thinking among Eighth-Semester Students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic term, within the context of academic use of ChatGPT.

CHAPTER IV. RESULTS AND DISCUSSION

1.1 Results

This chapter presents the quantitative and qualitative results of the study. The quantitative findings include an analysis of student performance on the Digital Critical Reading and Investigative Thinking assessments, as well as the correlation between these variables. The qualitative results, derived from semi-structured interviews, provide a deeper understanding of students' perspectives regarding the relationship between Digital Critical Reading and Investigative Thinking in academic environments where digital and AI-generated information, including content produced by ChatGPT, is increasingly present. The findings are organized according to the research objectives and are presented systematically through descriptive statistics and thematic analysis to provide a comprehensive overview of the results.

1.1.1 Quantitative Results

The quantitative results examine students' performance on the Digital Critical Reading and Investigative Thinking tests, which were assessed using structured tasks and analytic rubrics to ensure objective and consistent scoring. Several tasks within the Digital Critical Reading assessment were based on ChatGPT-generated academic scenarios, which served as stimuli for source verification, bias identification, and critical evaluation. These findings allow for the identification of performance levels and the statistical relationship between both variables. The analysis provides empirical evidence to support the interpretation of patterns observed in the data.

1.1.1.1 Descriptive Analysis of Digital Critical Reading and Investigative Thinking

The results indicate that students exhibit moderate to high levels of digital critical reading (M = 21.85) and investigative thinking (M = 21.30), considering that the maximum possible score is 32. This suggests that, overall, students demonstrate a relatively developed level of both competencies. However, the observed variability in scores indicates notable differences in the development of these skills among participants.

Table 6.

Mean Scores of Digital Critical Reading and Investigative Thinking

Variable	Mean
Digital Critical Reading (V1)	21.85
Investigative Thinking (V2)	21.30

Note. Scores were calculated on a scale from 0 to 32, based on the performance-based assessment.

1.1.1.2 Frequency Distribution by sections

In order to better describe the distribution of students' performance, the scores were categorized into three levels: low (8–15), medium (16–23), and high (24–32).

The results for digital critical reading show that 27.5% of students are at a low level, 35% at a medium level, and 37.5% at a high level.

Similarly, for investigative thinking, 30% of students are at a low level, 32.5% at a medium level, and 37.5% at a high level.

These findings indicate that, although a considerable proportion of students reach higher levels, a significant number still remain at basic stages, highlighting the need for pedagogical strategies to strengthen these competencies.

Table 7.

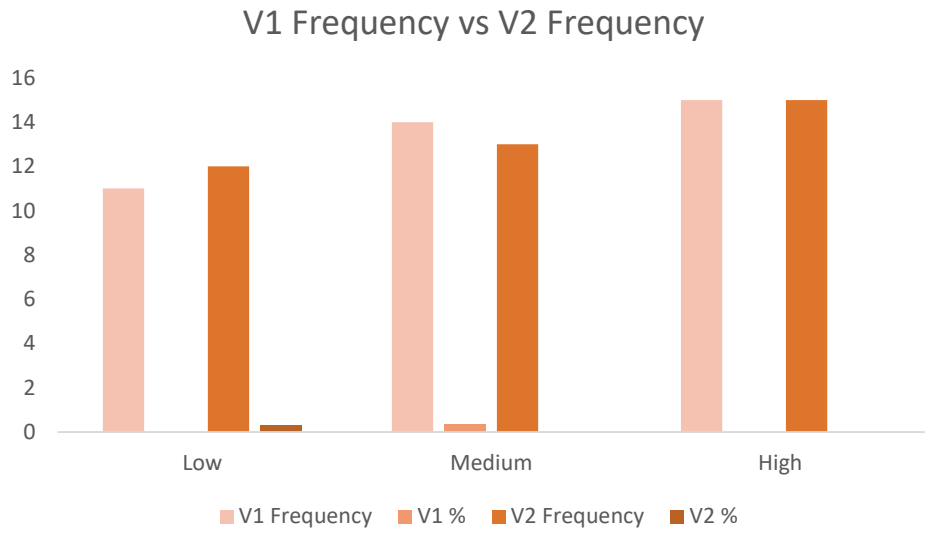
Frequency Distribution of Performance

Level	V1 Frequency	V1 %	V2 Frequency	V2 %
Low	11	27.5%	12	30%
Medium	14	35%	13	32.5%
High	15	37.5%	15	37.5%

Note. Levels were categorized as Low (8–15), Medium (16–23), and High (24–32)

Figure 1.

Distribution of Performance Levels in Digital Critical Reading and Investigative Thinking



Note. The figure shows the percentage distribution of students across low, medium, and high performance levels in both variables.

1.1.1.3 Dimensional Analysis of Digital Critical Reading

To obtain a more detailed understanding of students' performance, both variables were analyzed by dimensions derived from the structure of the instrument. This approach allows for the identification of specific strengths and weaknesses within each variable, providing deeper pedagogical insights beyond general results.

Digital Critical Reading (V1) by Dimensions

D1: Source Traceability & Fact-checking (Items 1–3)

D2: Bias & Intentionality Analysis (Items 4–6)

D3: Argumentative Quality Evaluation (Items 7–8)

Table 8.

Dimensions of Digital Critical Reading

Dimension	Mean

D1: Source Traceability & Fact-checking	**2.63**
D2: Bias & Intentionality Analysis	**2.52**
D3: Argumentative Quality Evaluation	**2.70**

Note. Means are based on a 1–4 rubric scale (Initial to Strategic).

The results show that students demonstrate their highest performance in argumentative quality evaluation (M = 2.70), indicating a relatively stronger ability to distinguish between opinion and evidence and to recognize basic elements of academic argumentation.

The dimension of source traceability and fact-checking (M = 2.63) also shows a moderate level, suggesting that students are generally capable of verifying information and identifying unreliable sources, although not consistently at an advanced level.

In contrast, the lowest performance is observed in bias and intentionality analysis (M = 2.52). This indicates that students experience greater difficulty in identifying contextual bias, hidden assumptions, and evaluating the underlying intentions present in digital information sources.

These findings reveal that while students possess foundational digital critical reading skills, more complex competencies related to critical interpretation and contextual judgment require further development.

1.1.1.4 Dimensional Analysis of Investigative Thinking (V2)

- **D1**: Problematization & Formulation (Items 1–3)
- **D2:** Information Management & Synthesis (Items 4–6)
- **D3:** Inference & Logical Reasoning (Items 7–8)

Table 9.

Dimensions of Investigative Thinking

Dimension	**Mean**
D1: Problematization & Formulation	**2.78**
D2: Information Management & Synthesis	**2.65**
D3: Inference & Logical Reasoning	**2.60**

Note. Means are based on a 1–4 rubric scale (Initial to Strategic).

The results indicate that students perform better in problematization and formulation (M = 2.78), suggesting that they are relatively capable of structuring research questions and identifying basic variables within a study.

The dimension of information management and synthesis (M = 2.65) reflects a moderate ability to evaluate sources and integrate theoretical perspectives, although not consistently at a high level of academic rigor.

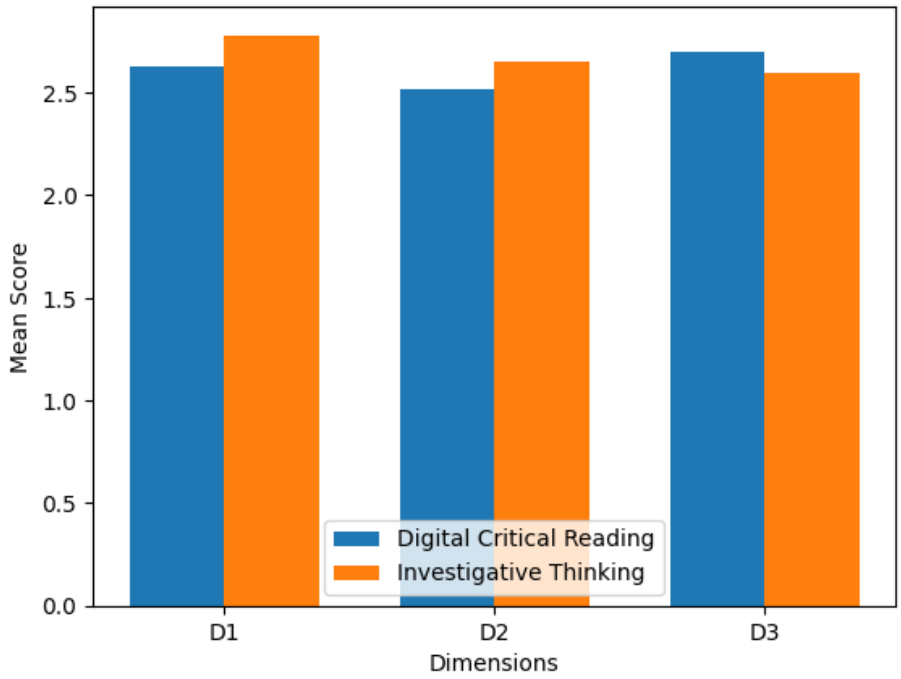
The lowest performance is observed in inference and logical reasoning (M = 2.60), indicating that students have difficulty drawing conclusions from data, identifying contradictions, and generating evidence-based recommendations.

These results suggest that while students can initiate the research process, they encounter challenges in higher-order cognitive processes required for analytical reasoning and scientific argumentation.

1.1.1.4.1 Comparative Analysis by Dimensions

Figure 2.

Mean Scores by Dimensions for Digital Critical Reading and Investigative Thinking



Note. The figure provides a comparative overview of the mean scores across dimensions for both variables. It can be observed that students tend to perform

slightly higher in problematization and argumentative evaluation, while lower scores are found in bias analysis and logical reasoning.

This visual comparison reinforces the differences identified in each dimension without introducing new patterns beyond those presented in the tables.

1.1.1.5 Correlational Analysis

Table 10.

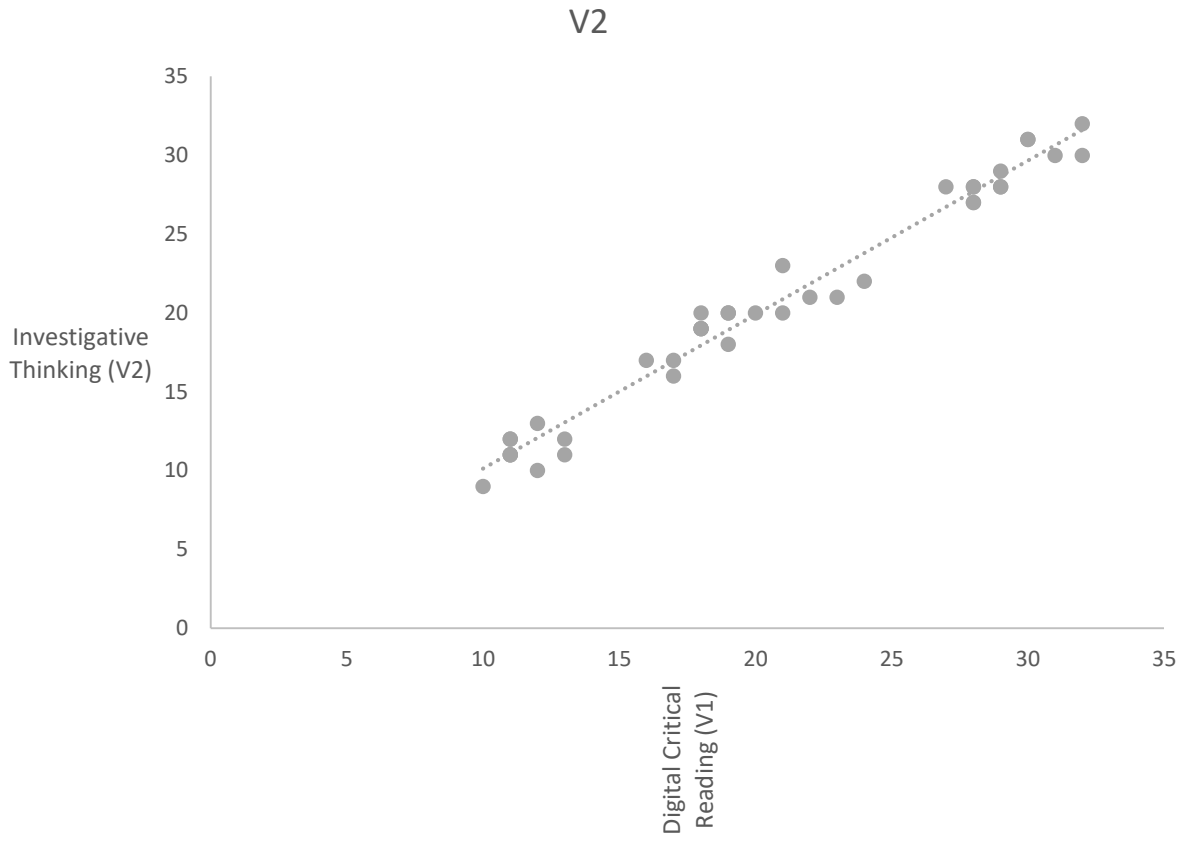
Correlation between Digital Critical Reading and Investigative Thinking

Variables	ρ	p-value
V1 – V2	0.93	< 0.001

Note. Spearman's rho (ρ) indicates the strength and direction of the relationship.

Figure 3.

Relationship between Digital Critical Reading (V1) and Investigative Thinking (V2).



Note. The scatter plot indicates a strong positive relationship between both variables (ρ = 0.93, p < 0.001).

A Spearman's rank-order correlation was conducted to examine the relationship between Digital Critical Reading and Investigative Thinking. The analysis revealed a strong positive correlation ($\rho = 0.93$, $p < 0.001$), indicating a statistically significant association between the two variables. Based on these results, the alternative hypothesis (H_1) was accepted, while the null hypothesis (H_0) was rejected.

These findings suggest that students who demonstrated higher levels of digital critical reading also tended to achieve higher levels of investigative thinking. In practical terms, the ability to critically evaluate, verify, and interpret digital information appears to be closely connected to students' capacity to formulate research problems, analyze evidence, and construct evidence-based conclusions.

Furthermore, the strength of the correlation suggests that both variables share cognitive processes related to analysis, reasoning, evaluation, and evidence-based judgment. These findings indicate that students who achieved higher levels of Digital Critical Reading also tended to demonstrate higher levels of Investigative Thinking. Therefore, the results support the existence of a close relationship between both competencies within the academic context examined in this study.

1.1.2 Qualitative results

The qualitative results explore students' perspectives through semi-structured interviews, offering a deeper understanding of how they interpret and experience the relationship between digital critical reading and investigative thinking. This analysis seeks to explain and enrich the quantitative findings, particularly regarding ChatGPT use, by identifying emerging themes and patterns in students' responses.

1.1.2.1 Digital Critical Reading

This category analyzes how students evaluate, interpret, and verify the information provided by ChatGPT in academic contexts. The findings show contrasting approaches, ranging from pragmatic use focused on task completion to more reflective practices based on verification and critical judgment.

Some participants prioritize the usefulness and clarity of the response over its accuracy. One student noted that *"I first read the answer and see if it more or less responds to what I need […] I do not always verify it because I want to finish the task quickly"* (I-DCRIT-01-2026). In a similar line, another participant stated that *"if the*

answer is well written, I usually take it as a guide, although I do not always confirm if all the information is correct" (I-DCRIT-02-2026). These accounts suggest that the formal tone and coherence of ChatGPT responses can generate confidence and reduce the likelihood of verification.

However, the analysis of the testimonies revealed a facet of active skepticism in a group of participants. Far from passively accepting the content generated by artificial intelligence, these students employ external validation strategies to confront the information received. The triangulation process described by participant I-DCRIT-07-2026 is particularly revealing, as they indicated that they usually seek *"more information in other sources to contrast and verify if it is correct"*. Under the same premise of academic rigor, student I-DCRIT-08-2026 emphasized the need to verify sources, acknowledging that "not all information on the internet is reliable," demonstrating a critical awareness of data volatility and the importance of comparing sources.

In addition, a stronger sense of academic responsibility emerges in some testimonies. One participant expressed that "*even though I work and have many responsibilities, I do not feel comfortable using ChatGPT only to get information […] I prefer to spend more time […] to make sure I really understand what I am doing"* (I-DCRIT-09-2026). This reflects a deliberate use of ChatGPT as support rather than as a substitute for learning.

Overall, the findings indicate that digital critical reading is associated with the capacity to question, verify, and reflect on AI-generated content, going beyond mere comprehension toward a more autonomous and responsible academic practice.

1.1.2.2 Investigative Thinking

This category examines how students process information, develop ideas, and construct knowledge based on the use of ChatGPT. The results suggest that although the tool facilitates access to information, developing original ideas requires deeper cognitive engagement.

Several interviewees acknowledged that finding information is easier than generating their own ideas. One student explained that *"it is easier to find information because ChatGPT gives examples and explanations […] developing my own ideas takes more time"* (I-DCRIT-03-2026). Similarly, another participant indicated that *"ChatGPT can give a base, but then you have to interpret that information and adapt it to your work"* (I-DCRIT-05-2026), highlighting the need for personal transformation of the content.

A broader set of testimonies shows more elaborated processes of analysis, where students actively compare, select, and integrate information. As one participant mentioned, *"I develop my ideas by contrasting the information with other sources and connecting it with what I already know"* (I-DCRIT-07-2026). Similarly, another student stated that *"I identify the main ideas, compare them with other readings, and then write my own conclusions"* (I-DCRIT-09-2026). These responses show a higher level of cognitive involvement, where information is not only received but also reinterpreted and restructured.

Furthermore, participants recognized that the absence of analysis negatively affects academic quality. One student pointed out that *"without analysis, we can use incorrect information or ideas that are not well supported"* (I-DCRIT-06-2026), emphasizing the role of critical thinking in ensuring the reliability and coherence of academic work.

By way of reflection, these findings suggest that investigative thinking involves selecting, interpreting, and reconstructing information, with ChatGPT serving as a starting point rather than a definitive source.

1.1.2.3 Relationship Between Digital Critical Reading and Investigative Thinking

This category explores how digital critical reading influences the development of investigative thinking. The findings indicate that both variables are closely connected, particularly in the way students interact with ChatGPT.

A number of interviewees noted that critical reading skills enable a more effective use of the tool. For example, one student stated that *"critical reading helps evaluate if a response is reliable and identify when more information is needed"* (I-DCRIT-04-2026). By the same token, another participant mentioned that *"it helps to use ChatGPT as support and not as the only source"* (I-DCRIT-06-2026), suggesting that critical evaluation promotes a more balanced and strategic use of AI.

In the same vein, deeper analysis was associated with stronger research skills. One participant explained that "*when students analyze information deeply, they learn to question and justify their ideas"* (I-DCRIT-08-2026). In the same line, another student noted that *"deeper analysis helps to create more coherent conclusions and avoid using information without evidence"* (I-DCRIT-09-2026). These responses show that critical

reading practices directly support the development of investigative thinking by fostering analysis, argumentation, and evidence-based reasoning.

However, some testimonies also reveal that dependence on ChatGPT may limit both processes. One participant admitted that *"sometimes I get used to asking everything, and that can make me think less on my own"* (I-DCRIT-02-2026), indicating a potential reduction in cognitive effort when the tool is used uncritically.

The findings suggest that students perceive a more critical use of ChatGPT as being associated with deeper analysis and reflection, whereas passive use is perceived as potentially limiting independent engagement with information.

Overall, the findings suggest that the relationship between Digital Critical Reading and Investigative Thinking is influenced by how students engage with information generated by ChatGPT. Participants perceived that critical use of the tool encourages greater reflection and verification of information, whereas passive use may reduce opportunities for independent analysis.

1.1.2.4 Reflection on the Use of ChatGPT

This category examines students' perceptions regarding the impact of ChatGPT on their academic work and thinking processes. The results show both positive contributions and potential limitations.

Several participants recognized that ChatGPT facilitates academic tasks, particularly in organizing ideas and generating initial content. One student stated that *"it has helped me to generate initial ideas and structure my work better"* (I-DCRIT-05-2026). This suggests that the tool plays a supportive role in the early stages of academic production.

At the same time, some participants expressed concerns about dependency. One student admitted that *"sometimes I get used to asking everything, and that can make me depend on the tool"* (I-DCRIT-02-2026), indicating that excessive reliance may reduce independent thinking.

In contrast, other responses reflect a more balanced and reflective use of ChatGPT. As one participant explained, *"it gives ideas and perspectives, but students must create their own work based on their own criteria"* (I-DCRIT-07-2026). In a like manner, another student noted that *"it helps me organize my thoughts, but I try not to depend completely on it"* (I-DCRIT-09-2026), emphasizing the importance of maintaining autonomy in the learning process.

In general, participants perceived ChatGPT as a useful academic support tool when used critically and responsibly. Its impact depends largely on the student's ability to regulate its use and to integrate it within a broader process of analysis and reflection.

1.2 Discussion

The results of this study show a strong and statistically significant relationship between Digital Critical Reading and Investigative Thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo. The Spearman's rho coefficient ($\rho = 0.93$) indicates a strong association, suggesting that students who are more capable of critically evaluating digital information also tend to perform better on tasks that require investigative reasoning. This finding is consistent with Tolentino Escarcena and Sánchez Trujillo (2025), who concluded that greater development of critical reading is associated with higher levels of research competencies. Their results showed a statistically significant effect of critical reading on research competencies, with a 95% confidence interval ranging from 0.943 to 1.061. Although conducted with postgraduate students, their findings support the relationship observed in the present study, suggesting that critical reading skills contribute to the development of research-related abilities.

This finding is closely related to current understandings of digital literacy. Villa López et al. (2025) found a positive and significant relationship between digital literacy and critical thinking among future teachers, concluding that higher levels of digital literacy are associated with more developed critical thinking skills, particularly in evaluation, analysis, synthesis, and critical judgment. These findings are comparable to the results of the present study, where students with stronger Digital Critical Reading skills also demonstrated higher levels of Investigative Thinking. Similarly, Leu et al. (2013) highlight that digital reading involves evaluating and synthesizing information from multiple sources. In this study, students who actively verified sources and questioned the information they encountered were more likely to demonstrate stronger investigative thinking, indicating a statistically significant relationship between Digital Critical Reading and Investigative Thinking among eighth-semester students and reinforcing the close relationship between Digital Critical Reading and academic inquiry.

The results also reflect the growing influence of artificial intelligence in educational settings. Luckin et al. (2016) point out that AI can enhance learning when it supports cognitive processes such as analysis and synthesis rather than replacing them. Likewise, Zawacki-Richter et al. (2019) emphasize that integrating AI into higher education requires pedagogical approaches that promote deeper learning. More recently, Kasneci et al. (2023) explain that tools such as ChatGPT demand active and critical engagement from students to avoid superficial understanding. In the present study, participants with higher levels of Digital Critical Reading reported practices such as source verification, information contrast, and critical reflection when using AI-generated information. These findings are consistent with the view that meaningful engagement with digital information is associated with stronger Investigative Thinking skills.

The quantitative results are further supported by the qualitative findings obtained through the semi-structured interviews. Students from different performance levels described how they used AI tools when completing academic tasks. Those with higher performance levels mentioned verifying sources, questioning the reliability of responses, and reflecting on how they used the information. In contrast, lower-performing students tended to accept AI-generated content with minimal questioning. As Wineburg and McGrew (2017) suggest, effective online reading requires strategies such as source verification and cross-checking information, which were more evident among the higher-performing participants in this study.

From a cognitive perspective, the results also reveal differences between basic and higher-order thinking skills. While students showed relatively better performance in tasks such as identifying sources and formulating research questions, they experienced more difficulty in areas such as bias detection, argumentation, and logical inference. This pattern reflects what Bloom (1956) describes as the distinction between lower-order and higher-order cognitive processes. In addition, Schön (1983) emphasizes that reflective thinking plays a key role in professional and academic development, which helps explain why students who lacked deeper reflection tended to rely on more superficial interpretations of information.

Finally, it is important to consider that the strength of the correlation may be influenced by the conceptual proximity between the two variables. Both Digital Critical Reading and Investigative Thinking involve similar cognitive processes, particularly in

tasks that require analysis and evaluation. Rather than weakening the findings, this overlap suggests that both competencies are closely connected and tend to develop together in academic contexts. In line with this, Holmes et al. (2022) argue that the effective use of AI in education depends on students' ability to critically engage with information, while Cotton et al. (2023) warn that a lack of critical evaluation can lead to superficial learning and undermine academic integrity.

CHAPTER V. CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

- It has been determined that students demonstrated moderate to high levels of Digital Critical Reading and Investigative Thinking, although difficulties remained in bias analysis and logical reasoning.
- It has been identified that students performed better in source verification and argumentative evaluation than in the critical interpretation of digital information.
- It has been confirmed that Investigative Thinking was more developed in the formulation of research problems than in inference and evidence-based reasoning.
- It has been established that a strong and statistically significant positive relationship exists between Digital Critical Reading and Investigative Thinking ($\rho = 0.93$; $p < 0.001$).
- It has been concluded that the findings provide empirical evidence supporting the strengthening of Digital Critical Reading as a means of fostering Investigative Thinking in university students.

1.2 RECOMMENDATIONS

- Activities focused on source verification, fact-checking, and the evaluation of digital information should be incorporated into classroom instruction.
- The identification of bias, intentionality, and limitations in digital and AI-generated content should be promoted through classroom tasks.
- Research-based activities requiring evidence analysis, argumentation, and conclusion building should be integrated into the learning process.
- The critical evaluation and verification of information obtained from digital sources and AI-generated content should be encouraged before such information is incorporated into academic work.

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ANNEXES

Annex 1. Operationalization of Variables

Variable	Conceptual Definition	Dimension	Indicator (What is measured)	Performance Task (Item)	Measurement Scale
V1: Digital Critical Reading	The ability to critically interpret and evaluate digital texts, considering the credibility, relevance, andreliability of information in digital environments (Liu, 2012; McDougall et al., 2018).	**Source Traceability and Fact-checking**	Ability to verify the real existence of academic references using reliable databases	Item 1: Use Google Scholar to verify three AI-generated citations and identify which are false; provide APA references for valid sources	Analytical rubric (1–4): Initial, Basic, Autonomous, Strategic
			Ability to contrast AI-generated statistical	Item 2: Verify EF EPI ranking of Ecuador and correct inaccurate data	Analytical rubric (1–4)

		data with official sources		
		Ability to evaluate the credibility of authors based on academic production and bibliometric evidence	Item 3: Analyze the academic validity of "Dr. Marcus Hale" using Google Scholar and justify its use as a source	Analytical rubric (1–4)
	Bias and Intentionality Analysis	Ability to identify contextual and cultural bias in AI-generated content	Item 4: Analyze bias in AI-generated dialogue for rural Chimborazo context	Analytical rubric (1–4)
		Ability to contrast AI claims with local institutional and regional reality	Item 5: Compare AI statement about access to technology with UNACH reality	Analytical rubric (1–4)
		Ability to critically evaluate ethical and pedagogical	Item 6: Analyze ethical stance of AI in grading scenario and identify omitted risks	Analytical rubric (1–4)

			implications of AI responses		
		Argumentative Quality Evaluation	Ability to distinguish between evidence-based and opinion-based texts using academic criteria	Item 7: Compare two texts and identify which contains scientific evidence	Analytical rubric (1–4)
			Ability to evaluate logical consistency and verification processes in AI arguments	Item 8: Analyze AI reasoning and identify missing validation criteria	Analytical rubric (1–4)
V2: Investigative Thinking	A higher-order cognitive process that involves inquiry, analysis, and the construction of knowledge through systematic reasoning and evidence-based decision making (Paul &	**Problematization and Formulation**	Ability to formulate structured research questions including variables, population, and context	Item 1: Transform a vague idea into a formal research question	Analytical rubric (1–4)

	Elder, 2008; Facione, 2011).				
			Ability to identify independent and dependent variables and explain their relationship	Item 2: Analyze variables and expected relationship in a hypothesis	Analytical rubric (1–4)
			Ability to evaluate feasibility of research problems based on contextual conditions	Item 3: Assess feasibility of AI research in rural Chimborazo and propose adjustments	Analytical rubric (1–4)
		Information Management and Synthesis	Ability to rank sources according to scientific reliability and academic value	Item 4: Rank sources (Scopus, blog, social media) and justify choice	Analytical rubric (1–4)
			Ability to synthesize contrasting theoretical perspectives using academic writing conventions	Item 5: Write a paragraph integrating two authors with contrastive connectors	Analytical rubric (1–4)

		Ability to select relevant empirical evidence aligned with the research variable	Item 6: Identify relevant abstract for digital reading comprehension	Analytical rubric (1–4)
	Inference and Logical Reasoning	Ability to generate logical conclusions based on contradictory data	Item 7: Infer relationship between AI use and grammar performance	Analytical rubric (1–4)
		Ability to formulate pedagogical recommendations based on research findings	Item 8: Propose recommendation based on study results about AI use	Analytical rubric (1–4)

Annex 2. Instruments for Collecting Information

Digital Critical Reading Performance Test

UNIVERSIDAD NACIONAL DE CHIMBORAZO

FACULTAD DE CIENCIAS DE LA EDUCACIÓN, HUMANAS Y TECNOLOGÍAS

LICENCIATURA EN PEDAGOGÍA DE LOS IDIOMAS NACIONALES Y EXTRANJEROS

TOPIC:

The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence

Student's Name: _____

Age: _____

Gender: _____

Semester: _____

Objective:

To assess the level of digital critical reading among students.

Purpose:

This instrument aims to evaluate the student's ability to verify the authenticity of AI-generated academic data, identify hidden biases in digital discourse, and judge the argumentative quality of information through fact-checking and source traceability.

Instructions:

- Analyze the provided AI-generated texts.
- Use external academic databases (e.g., Google Scholar) to verify facts and citations.
- Provide evidence-based answers for each task.
- **Time:** 45 minutes.

DIMENSION 1: Source Traceability and Fact-checking

1. **A student asks ChatGPT for sources on "AI in education".**

"The integration of AI in classrooms is generating debate about the future of learning. ***Aparicio (2023)*** *highlights that AI efficiently analyzes large volumes of information.* ***García-Vidal et al. (2024)*** *in Nature Education conclude that recursive neural networks increase mnemonic retention by 42% in primary school compared to traditional methods. However,* ***Mertala and***

Fagerlund (2022) *emphasize understanding students' preconceptions about AI in order to design effective digital literacy programs."*

Task. Of the three citations above, use reliable academic sources (e.g., Google Scholar) to identify which one does not exist. For those that do exist, copy the link to the original article and its APA-formatted reference.

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2. **In an essay generated by ChatGPT you read the following statement:** *"Ecuador ranks* ***#60*** *out of 123 countries (EF English Proficiency Index 2025) in English proficiency with 466/800 points, a low level."*

Task: Search for "Ecuador English ranking EF EPI". Is the position #60 out of 123 countries correct? If not, write the actual EF EPI 2025 ranking.

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3. **ChatGPT recommends studying the method of** *"Dr. Marcus Hale, of the Global English Institute,"* **a supposed expert who published** *The Fluency Code: Mastering English in 90 Days (2024).*

Task: Search for this author on Google Scholar.

Does the author have a verified profile and actual publications in English language teaching?

Based on your search, would you use this author as a primary source for your thesis on English language learning? Why?

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DIMENSION 2: Bias and Intentionality Analysis

4. **ChatGPT was asked to provide a sample dialogue for a first-year high school English class in a rural area of Chimborazo. The AI generated a dialogue where two young people,** *"Marie and Sarah," talk about buying tickets for the New York subway and eating at Starbucks.*

Task. What bias or lack of context do you identify? Would it affect student learning?

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5. **An essay generated by ChatGPT states:** *"The implementation of AI in Ecuador is simple, since all university students have high-speed internet and state-of-the-art devices in their homes."*

Task. Compare this statement with the reality at UNACH. What is the intention behind the AI: optimism, real data, or a pattern from developed countries?

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6. **The AI is asked:** ***"Is it ethical for a future language teacher to use ChatGPT to grade their students' essays?"*** **The AI responds:** "*Some say yes because of the speed; others say no because of the ethics. It's a personal decision for the teacher."*

Task. Evaluate the AI's response: Does it maintain a pedagogical stance or is it a 'neutral' response that avoids in-depth debate?

From your perspective as a future teacher, what ethical risk did the AI fail to mention in its response?"

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DIMENSION 3: Argumentative Quality Evaluation

7. **Two paragraphs are presented on** *"The Impact of Incidental Reading on Vocabulary".*

Text A : *"Vocabulary learning through extensive reading is extremely effective, as students naturally commit words to memory. By simply reading a book appropriate to their level, a student can effortlessly learn hundreds of new terms, ensuring the vocabulary stays in their mind forever thanks to the context of the story."*

Text B: *According* ***to Waring and Takaki (2003),*** *incidental reading is limited: after reading a short novel, students recognized 42% of new words in an immediate test, but after three months, they only remembered 6% of the words with a single encounter; more than eight encounters are needed to have a 50% probability of retention.*

Task. Which of the two texts offers technical evidence and which offers a general opinion?

Mention a key difference in the language used (e.g., use of percentages, authors, or specific technical terms).

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8. **You ask the AI,** "*Why is ChatGPT a reliable tool for academic research?"* **The AI replies,** *"It's reliable because it uses advanced language models designed to provide accurate answers, and by being accurate, it ensures that the information it delivers to the user is highly trustworthy for their studies."*

Task. Does AI explain how to verify the truth, or does it simply say that it is reliable 'because it is accurate'? What is missing from its argument that prevents you from accepting its answer as a certain truth in your thesis?

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Analytical Rubric: Variable 1: DCR

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Analytical Rubric: Variable 1 (Digital Critical Reading)

Topic:

The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence

Objective:

To assess the level of digital critical reading among students.

Purpose:

To guide the evaluation of students' performance in the Digital Critical Reading test, based on their ability to verify the authenticity of digital information, identify bias in AI-generated content, analyze intentionality, and evaluate the argumentative quality of academic discourse through evidence-based reasoning.

Instructions:

- Use this rubric to evaluate students' responses to the test.
- Select the level that best represents the student's performance.
- Consider accuracy, critical analysis, and use of evidence.

1. Analytical Rubric: Variable 1 (Digital Critical Reading)

Dimension	Item / Task	Initial (1 pt)	Basic (2 pts)	Autonomous (3 pts)	Strategic (4 pts)	Observations
D1: Source Traceability & Fact-checking	**Item 1:** Verification of 3 AI citations.	Fails to identify the fake citation; provides no links or references.	Identifies the fake citation, but the links or APA references are incorrect or incomplete.	Identifies the fake citation and provides correct links; APA references have minor errors.	Accurately identifies the fake citation and generates flawless APA 7th ed. references and links.	
	Item 2: EF EPI data contrast.	Does not perform the search or accepts the AI's incorrect data as true.	States it is incorrect but fails to find the actual ranking or the specific year (2025).	Finds the actual ranking but does not explain the discrepancy with the AI data.	Successfully contrasts the official 2025 data, correcting the rank and score with precision.	

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	Item 3: Author profile (Dr. Hale).	Does not verify the author; accepts validity without academic criteria.	Searches for the author but doubts veracity without clear bibliometric arguments.	Determines the author is fake/non-academic based on the absence of Scholar profiles.	Critically evaluates the lack of trajectory and solidly justifies why it is not a primary source.	
D2: Bias & Intentionality Analysis	**Item 4:** Rural Chimborazo dialogue.	Does not perceive the cultural bias (Starbucks/NY) in the rural context.	Identifies the context as foreign but does not explain the impact on student learning.	Describes the bias and explains how lack of cultural relevance demotivates students.	Analyzes the AI's training bias and proposes a contextual adaptation for Chimborazo.	
	Item 5: UNACH Reality vs. AI.	Accepts the AI's claim about high-speed internet/devices as true.	Identifies it as a generalization but does not contrast it with local institutional reality.	Contrasts the claim with the real digital divide at UNACH/Chimborazo with logical arguments.	Deconstructs the AI myth, categorizing it as a developed-country pattern vs. local reality.	
	Item 6: Ethics in grading.	Considers the AI's response to be	Notes the AI is "neutral" but fails to identify specific	Evaluates the AI's neutral stance and identifies at least one	Analyzes the lack of pedagogical judgment in AI	

		sufficient or correct.	ethical risks for the teacher.	ethical risk (e.g., algorithmic bias).	and proposes a critical, grounded ethical stance.	
D3: Argumentative Quality Evaluation	**Item 7:** Text A vs. Text B.	Does not distinguish between general opinion and technical evidence.	Chooses Text B but fails to identify the technical elements (percentages/authors) that validate it.	Correctly identifies the technical text and describes the specific differences in the language used.	Justifies the superiority of scientific evidence by analyzing data precision versus opinion.	
	Item 8: AI Verification logic.	Believes the AI is reliable "because it says so" (circular reasoning).	Notes something is missing in the argument but fails to identify which verification processes were omitted.	Explains that the AI does not cite real-time sources and that its "accuracy" argument is fallacious.	Breaks down the AI's circular fallacy and demands external verifiability criteria to accept truth.	

Investigative Thinking Performance Test.

UNIVERSIDAD NACIONAL DE CHIMBORAZO

FACULTAD DE CIENCIAS DE LA EDUCACIÓN, HUMANAS Y TECNOLOGÍAS

LICENCIATURA EN PEDAGOGÍA DE LOS IDIOMAS NACIONALES Y EXTRANJEROS

Topic:

The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence

Student's Name: _____

Age: _____

Gender: _____

Objective:

To assess the level of investigative thinking among students.

Purpose:

To measure the student's capacity for scientific reasoning, including the formalization of research problems, the identification of variables, and the logical synthesis of information required for academic inquiry in language teaching.

Instructions:

- Apply research methodology principles to solve the proposed scenarios.
- Use technical terminology (Independent/Dependent variables, feasibility, etc.).
- Ensure your responses demonstrate logical consistency and pedagogical judgment.

DIMENSION 1: Problematization and Formulation

1. **A student has a vague idea for a research topic:** *"How to use ChatGPT to learn English."*

Task: Transform this idea into a formal research question for an undergraduate thesis.

You must include: Variables (Cause and Effect), Population (who), and Context (where).

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2. **You are presented with the following hypothesis:** *"Frequent use of ChatGPT for translation reduces the ability of B1-level language students to produce their own writing."*

Task:

Identify the independent variable (cause) and the dependent variable (effect).

Briefly explain the type of relationship you expect between them. Does more use of AI lead to less original writing, or the opposite?

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3. **You want to investigate** *"The impact of using Generative AI on teaching Quechua in remote communities without access to electricity."*

Task:

Evaluate the feasibility of this research problem. Is it possible to carry it out as proposed?

If you consider it not feasible, what adjustments would you make to the context or the technology so that the research can be conducted in the reality of the Chimborazo province?

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DIMENSION 2: Information Management and Synthesis

4. **You are searching for sources on the topic***: "Artificial Intelligence in language teaching."* **You find the following:**

   a. An article published in a Scopus-indexed journal (Q1) from 2024
   b. A Twitter (X) thread by a technology expert with 100k followers
   c. A blog post on the official OpenAI website

Task:

Rank the sources from the most reliable (1) to the least reliable (3). Write the corresponding number next to each option (A, B, C).

Briefly justify why the source ranked as number 1 has greater scientific value than the source ranked as number 3.

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5. **You have these two premises for your theoretical framework:**

Rose Luckin (2018): "AI personalized learning and rapidly improves fluency."

Neil Selwyn (2019): "Excessive use of AI creates dependency and reduces students' critical thinking."

Task:

Write a paragraph summarizing both points of view using a contrastive connector (e.g., however, on the contrary, nevertheless). Cite both authors correctly.

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6. **The research objective is** *"To evaluate digital reading comprehension in university students."* **Three abstracts are presented:**

Abstract 1:

Ramos-Soto et al. (2023): Analyzes connection quality and digital divide in access to educational platforms for Ecuadorian students.

Abstract 2:

Delgado et al. (2020): Evaluates metacognitive strategies and levels of deep understanding in digital versus paper texts in university students.

Abstract 3:

Benedetto et al. (2013): Investigates visual fatigue and blink frequency using E-ink screens versus traditional LCD monitors.

Task:

Which of the three summaries is truly relevant to your variable? Explain why the other summaries (the ones you discarded) do not directly contribute to the object of study.

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DIMENSION 3: Inference and Logical Reasoning

7. **In your research at UNACH, you obtain the following result**: *"90% of students use ChatGPT to translate texts, but 75% of them failed the applied grammar proficiency exam."*

Task:

Based on this numerical contradiction (90% use vs. 75% failure), what logical inference can you draw about whether the use of AI guarantees actual learning of language structure? Justify your conclusion.

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8. **Data from a study shows that students who use AI to generate study outlines get better grades than those who use AI to write their entire essays.**

Task:

Write a Pedagogical Recommendation (maximum 4 lines) for Language teachers, explaining why prioritizing AI as an organizational tool (outlines) is more effective than as a substitute for writing (full essays), based exclusively on this finding.

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Analytical Rubric: Variable 2: IT

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Analytical Rubric: Variable 2 (Investigative Thinking)

Topic:

The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence

Objective:

To assess the level of investigative thinking among students.

Purpose:

To guide the evaluation of students' performance in the Investigative Thinking test, based on their ability to formulate research problems, identify variables, manage and synthesize academic information, make logical inferences, and propose evidence-based pedagogical recommendations within the context of language education.

Instructions:

- Evaluate responses based on methodological rigor and logical reasoning.
- Select the level that best represents performance.
- Focus on coherence, feasibility, and academic argumentation.

3. Analytical Rubric: Variable 2 (Investigative Thinking)

Dimension	Item / Task	Initial (1 pt)	Basic (2 pts)	Autonomous (3 pts)	Strategic (4 pts)	Observations
D1: Problematization & Formulation	**Item 1:** Formal research question.	Keeps the idea vague; fails to structure a formal thesis question.	Includes variables but omits the population or the geographic/temporal context.	Formulas a complete question including all variables and sociodemographic components.	Structures a high-level methodological question, delimited and with operable variables.	
	Item 2: Variable identification.	Fails to identify cause/effect or confuses both variables.	Identifies the variables but fails to explain the type of relationship (direct/inverse) expected.	Identifies variables and coherently explains the logical relationship between AI use and writing.	Rigorously analyzes the dependency relationship and justifies the	

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					direction of the hypothesis.	
	Item 3: Feasibility (GPT-5/Quechua).	Considers the study feasible exactly as proposed.	Identifies the lack of electricity but fails to propose logical technological/contextual adjustments.	Evaluates the infeasibility and proposes realistic adjustments (e.g., solar panels or zone change).	Performs a critical technical/ethical feasibility analysis and redesigns the problem for local reality.	
D2: Information Management & Synthesis	**Item 4:** Source ranking (A, B, C).	Fails to rank correctly or prioritizes social media/blogs over Scopus journals.	Ranks correctly but the justification for why Scopus is superior is weak or subjective.	Justifies the hierarchy based on peer-review criteria and scientific indexing.	Analyzes the scientific value of Q1 sources vs. the volatility of commercial/social media sources.	

	Item 5: Synthesis paragraph (APA).	Only copies the phrases; fails to use connectors or cite correctly.	Uses a connector but fails to integrate both ideas into a single coherent paragraph.	Synthesizes both stances using a contrastive connector and cites in APA format acceptably.	Constructs a fluid academic paragraph that bridges both authors with flawless APA 7 citations.	
	Item 6: Abstract selection.	Chooses an irrelevant abstract for the variable (e.g., Abstract 1 or 3).	Chooses Abstract 2 but fails to clearly explain why the others do not contribute to the study.	Justifies the relevance of Abstract 2 based on the object of study (digital comprehension).	Analyzes the thematic and methodological pertinence of Abstract 2, discarding peripheral info.	

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D3: Inference & Logical Reasoning	**Item 7:** Inference (90% use / 75% failure).	Concludes that AI helps despite the failure data provided.	Identifies the contradiction but fails to draw a logical conclusion about actual learning.	Logically infers that using AI for translation does not guarantee grammatical competence.	Develops a complex inference regarding the difference between "task completion" and "learning."	
	Item 8: Pedagogical recommendation.	Fails to draft a recommendation based on the	The recommendation is too general or exceeds the requested 4-line limit.	Writes a clear recommendation that prioritizes outlines over full text substitution.	Drafts a strategic, brief recommendation grounded directly in the evidence from the item.	

Semi-Structured Interview Guide

UNIVERSIDAD NACIONAL DE CHIMBORAZO

FACULTAD CIENCIAS DE LA EDUCACIÓN, HUMANAS Y TECNOLOGÍAS

LICENCIATURA EN PEDAGOFIA DE LOS IDIOMAS NACIONALES Y EXTRANJEROS.

Semi-Structured Guide for 8th-Semester Students at UNACH.

This interview is part of the research entitled:

"The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence."

This study aims to determine the relationship between digital critical reading and research thinking in eighth-semester students of the National and Foreign Language Pedagogy program at the National University of Chimborazo, during the 2025-2S academic period, within the context of the academic use of artificial intelligence tools such as ChatGPT. Specifically, it seeks to understand students' experiences and perceptions regarding the use of ChatGPT, particularly concerning how they analyze information and develop their own ideas in their academic work.

The instrument has been designed based on the literature review and the specific objectives of the research. Your participation is voluntary, and the information collected will be treated confidentially and used exclusively for academic purposes.

1. **Title**: Interview with 8th semester students at UNACH
2. **Objective**: To explain the quantitative results through students' perspectives regarding this relationship in the context of ChatGPT use.

General Information

4. **Date:** _____
5. **Place:** _____
6. **Start Time:** _____
7. **End Time:** _____
8. **Interviewee Code:** _____
9. **Interviewer:** _____

Interview Questions:

ICE BREAKER

1. If you had to describe the final stage of your university education with a song, which one would you choose?

GENERALS

Category 1: Digital Critical Reading

2. When you read a ChatGPT response, what do you do first to decide if it's useful for your academic work?
3. Have you ever noticed that ChatGPT gave you incorrect or unreliable information? What happened?
4. Why do you think it's sometimes difficult for students to spot errors, biases, or limitations in ChatGPT responses?
5. When ChatGPT gives you an answer, do you analyze how it arrived at that conclusion, or do you focus primarily on the final result? Why?

Category 2: Investigative Thinking

6. When you use ChatGPT, what do you find easier: finding information or developing your own ideas? Why?
7. How do you develop your own ideas or conclusions from the information ChatGPT provides?
8. If you stopped analyzing the information ChatGPT gives you, how do you think that would affect the quality of your academic work?

Category 3: Relationship between Digital Critical Reading and Investigative Thinking

9. Do you think critical reading skills help you use ChatGPT more effectively? Why?
10. Do you think analyzing information more deeply helps improve research skills? Why or why not?

Category 4: Reflection

11. How has the use of ChatGPT influenced the way you think and develop your academic work?

Annex 3. Instrument Validation Documents

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Validation of Research Instruments

Theme: The Role of Digital Critical Reading in the Development of Investigative Thinking in the Era of Artificial Intelligence.
General objective: To determine the relationship between digital critical reading and investigative thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic period, within the context of academic use of ChatGPT.

Author: Viviana Katherine Cueva Cueva
Evaluator: Mgs. Johanna Carolina Herrera
Academic tutor: Mgs. María Dolores Avalos Obregón

Type of instrument: Performance-Based Test

Rating scale:

Poor	Fair	Average	Good	Excellent
1	2	3	4	5

Aspect 1:

Criteria	1	2	3	4	5
1. Does the instrument gather data suitable and relevant for the research topic?					✓
2. Do the items have a logical relation with the study objectives?					✓
3. Do the items have a connection with the study variables?					✓
4. Does the instrument display clear decision categories, dimensions or items?					✓
5. Is there a logical organization with the items display?					✓
6. Do the items contain clear and concise instructions to use the instrument?					✓
7. Are the items clear, appropriate and relevant to the target audience?					✓

Aspect 2:

Principles of Assessment	Criteria description	1	2	3	4	5
Validity	Does the instrument measure what it intends to measure?					✓
Reliability	Is the test consistent or free from random errors; presenting constant conditions across two or more administrations? **Does the instrument give precise directions, and use an appropriate rubric for scoring?**					✓
Authenticity	Does the instrument reflect "real-world" language, containing language that is as natural as possible?					✓
Practicality	Is the test appropriate regarding logistical aspects (time, budget, and administrative issues) involved in making, giving, and scoring the instrument?					✓
Washbak	Does the instrument have a positive impact on the participants?					✓

Note: Designed by Fuertes, N (2025)

Validated by (Name and surname): Johanna Carolina Herrera
ID: 0602786563
Signature

Dirección de Postgrado
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Validation of Research Instruments

Theme: The Role of Digital Critical Reading in the Development of Investigative Thinking in the Era of Artificial Intelligence.
General objective: To determine the relationship between digital critical reading and investigative thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic period, within the context of academic use of ChatGPT.

Author: Viviana Katherine Cueva Cueva
Evaluator: Mgs. Thorrna Carolina Herrera
Academic tutor: Mgs. María Dolores Avalos Obregón

Type of instrument: Semi-structured Interview Guide

Rating scale:

Poor	Fair	Average	Good	Excellent
1	2	3	4	5

Aspect 1:

Criteria	1	2	3	4	5
1. Does the instrument gather data suitable and relevant for the research topic?					✓
2. Do the items have a logical relation with the study objectives?					✓
3. Do the items have a connection with the study variables?					✓
4. Does the instrument display clear decision categories, dimensions or items?					✓
5. Is there a logical organization with the items display?					✓
6. Do the items contain clear and concise instructions to use the instrument?					✓
7. Are the items clear, appropriate and relevant to the target audience?					✓

Aspect 2:

Principles of Assessment	Criteria description	1	2	3	4	5
Validity	Does the instrument measure what it intends to measure?					✓
Reliability	Is the test consistent or free from random errors; presenting constant conditions across two or more administrations? **Does the instrument give precise directions, and use an appropriate rubric for scoring?**					✓
Authenticity	Does the instrument reflect "real-world" language, containing language that is as natural as possible?					✓
Practicality	Is the test appropriate regarding logistical aspects (time, budget, and administrative issues) involved in making, giving, and scoring the instrument?					✓
Washbak	Does the instrument have a positive impact on the participants?					✓

Note: Designed by Fuenies, N (2025)

Validated by (Name and surname): Thorrna Carolina Herrera
ID: 0603786563
Signature

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Validation of Research Instruments

Theme: The Role of Digital Critical Reading in the Development of Investigative Thinking in the Era of Artificial Intelligence.
General objective: To determine the relationship between digital critical reading and investigative thinking among eighth-semester students of the Pedagogía de los Idiomas Nacionales y Extranjeros program at Universidad Nacional de Chimborazo during the 2025–2S academic period, within the context of academic use of ChatGPT.

Author: Viviana Katherine Cueva Cueva
Evaluator: Mgs. Thoanna Carolina Herrera
Academic tutor: Mgs. María Dolores Avalos Obregón

Type of instrument: Analytical Rubrics

Rating scale:

Poor	Fair	Average	Good	Excellent
1	2	3	4	5

Aspect 1:

Criteria	1	2	3	4	5
1. Does the instrument gather data suitable and relevant for the research topic?					✓
2. Do the items have a logical relation with the study objectives?					✓
3. Do the items have a connection with the study variables?					✓
4. Does the instrument display clear decision categories, dimensions or items?					✓
5. Is there a logical organization with the items display?					✓
6. Do the items contain clear and concise instructions to use the instrument?					✓
7. Are the items clear, appropriate and relevant to the target audience?					✓

Aspect 2:

Principles of Assessment	Criteria description	1	2	3	4	5
Validity	Does the instrument measure what it intends to measure?					✓
Reliability	Is the test consistent or free from random errors; presenting constant conditions across two or more administrations? **Does the instrument give precise directions, and use an appropriate rubric for scoring?**					✓
Authenticity	Does the instrument reflect "real-world" language, containing language that is as natural as possible?					✓
Practicality	Is the test appropriate regarding logistical aspects (time, budget, and administrative issues) involved in making, giving, and scoring the instrument?					✓
Washbak	Does the instrument have a positive impact on the participants?					✓

Note: Designed by Fuertes, N (2025)

Validated by (Name and surname): Thoanna Carolina Herrera
ID: 0603786563
Signature

Annex 4. Informed Consent

INFORMED CONSENT

I, Dagana Gregoria Solis Vera, with ID number 1726534694, declare that I have been informed and invited to participate in the research study entitled: "The Role of Digital Critical Reading in Developing Investigative Thinking in the Era of Artificial Intelligence." This research is conducted by the student **Viviana Katherine Cueva Cueva**, under the supervision of **Mgs. Maria Dolores Avalos Obregón.**

Purpose of the Study: The objective is to determine the relationship between digital critical reading and investigative thinking in the context of ChatGPT use.

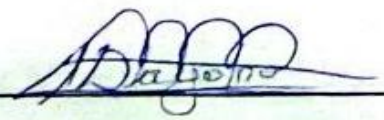
Participation and Activities:

I will complete a Digital Critical Reading test, an Investigative Thinking test, and participate in a semi-structured interview about the use of ChatGPT and its relation to both variables.

Confidentiality: My identity will remain anonymous through codes. The information collected will be used only for academic purposes.

Voluntary Participation: My participation is voluntary, and I may withdraw at any time without consequences. There is no economic compensation.

Consent: I have read and understood the information and voluntarily agree to participate.

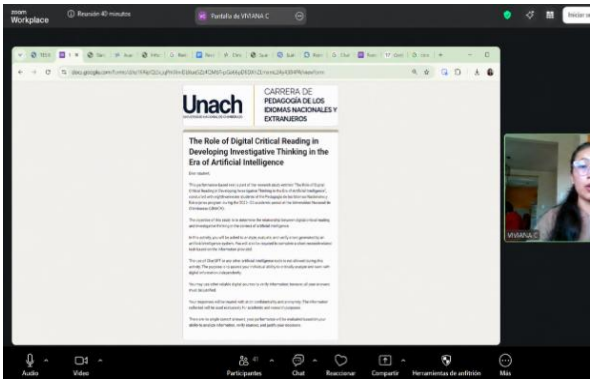
Participant's Signature: 

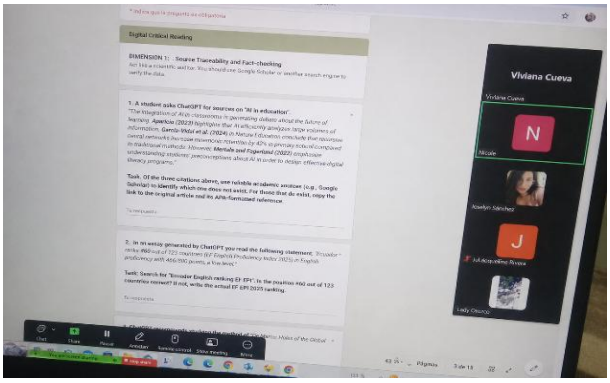
Date: February 2nd, 2026

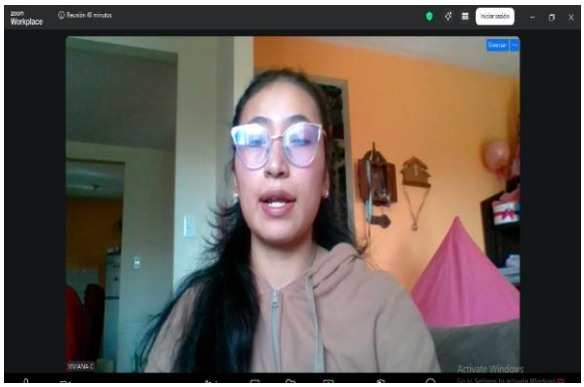
If you have any questions, during any stage of the study, you may contact: Mgs. Maria Dolores Avalos Obregón | mavalos@unach.edu.ec

Annex 5: Evidence

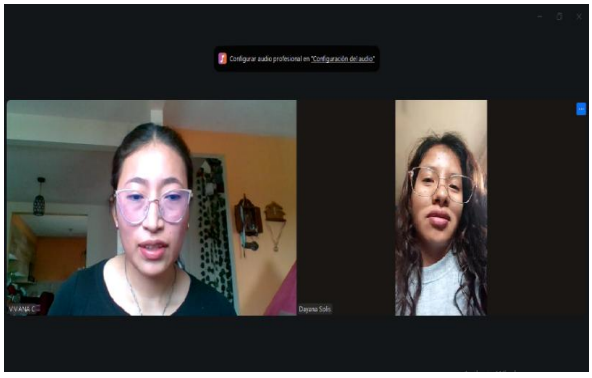
Application of the performance test through the Zoom application

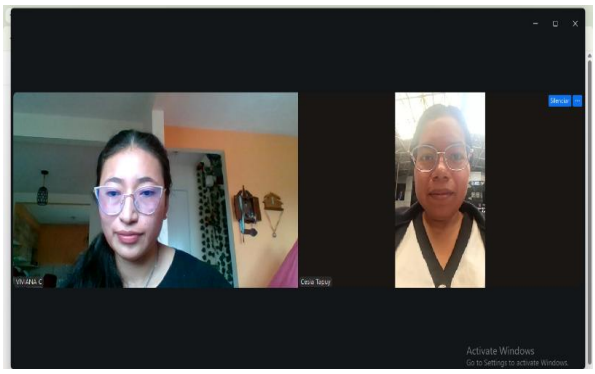


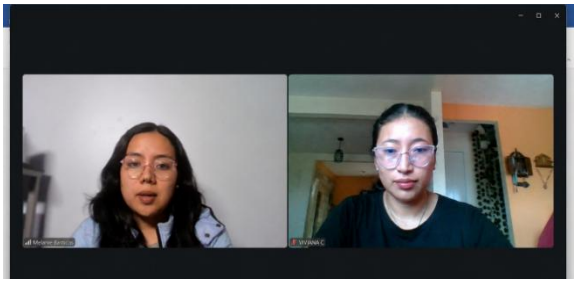




Interviews with the selected students







Link of Performance Test: https://forms.gle/RukWg7o1xX7V9Gcf6