Investigating the Impact of ChatGPT Use on Students' Critical Thinking Skills

Aidana Kani

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Aidana Kani

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Investigating the Impact of ChatGPT Use on Students' Critical Thinking Skills

has been approved by the Graduate School of Education Ethics Committee of Nazarbayev University.

You may proceed with contacting your preferred research site and commencing your participant recruitment strategy.

Yours sincerely,

Dr. Ahmet Aypay, PhD

On behalf of:
Dr Syed Abdul Manan, *PhD*
Chair, GSE Ethics Committee
Graduate School of Education
Nazarbayev University

Block C3, Room M027
Office: +7(7172)6016
Mobile: +77079240053
email: syed.manan@nu.edu.kz, gse.irec@nu.edu.kz

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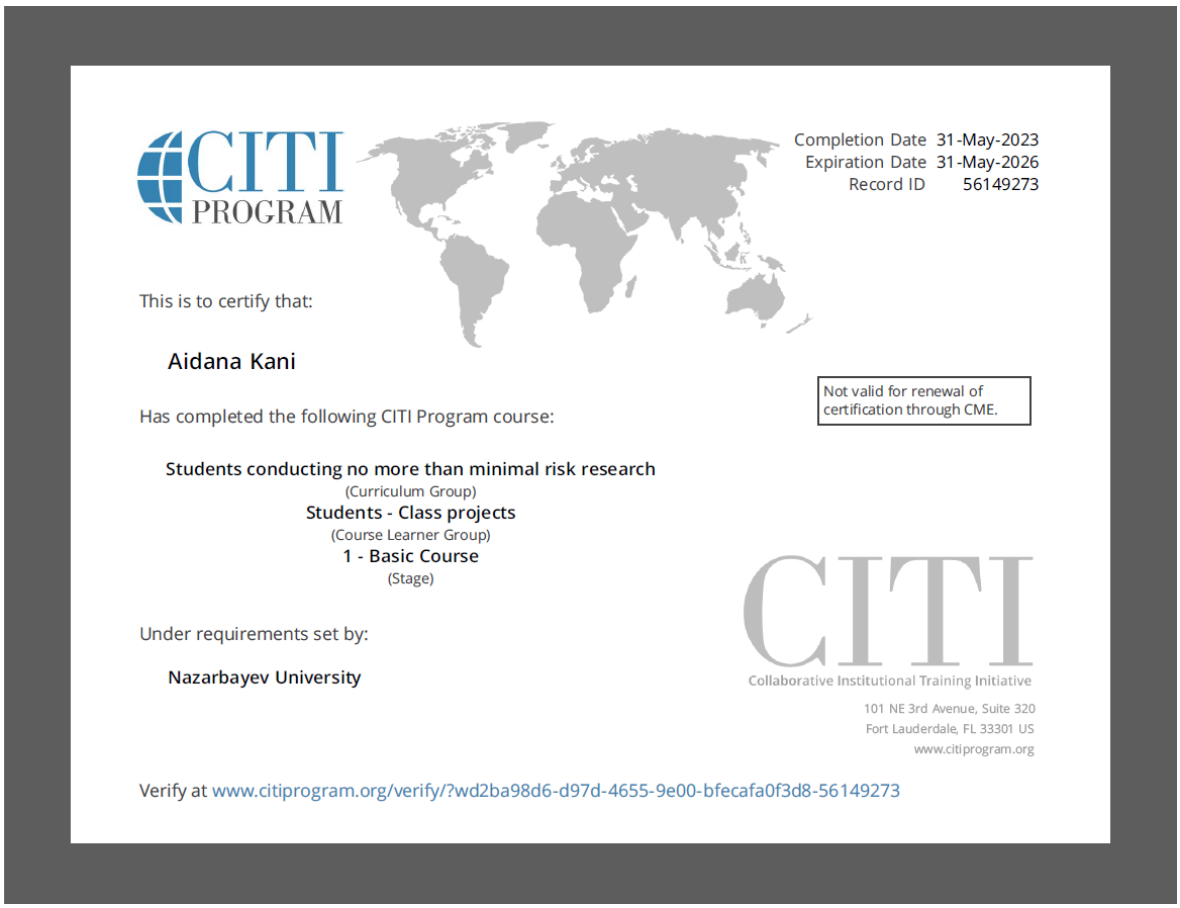

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ABSTRACT

Investigating the Impact of ChatGPT Use on Students' Critical Thinking Skills

The burgeoning application of artificial intelligence (AI) tools within educational settings, particularly with the advent of ChatGPT, has generated significant interest in understanding their impact on students' critical thinking skills. The purpose of this study was to examine the relationship between the use of ChatGPT and students' critical thinking skills at a single higher education institution (HEI) in Kazakhstan. In pursuit of the purpose, a quasi-experimental design was employed. The experimental group received training on effective ChatGPT use compared with the control group. The sample included 52 undergraduate students from different disciplines. Data was collected from a pre-and post-intervention assessment of critical thinking using the Cornell Class-Reasoning Test Form X (CCT-X) and a survey to assess student engagement in ChatGPT.

The findings reveal an initial negative correlation between ChatGPT usage and critical thinking skills, which shifts to improving critical thinking scores following the targeted instructional intervention. This suggests that while ChatGPT holds potential as a learning tool, its benefits can be maximized when coupled with structured guidance, responsible usage, and educator oversight to mitigate risks associated with academic integrity and developing critical thinking skills. Additionally, the study uncovers high ChatGPT usage among students, with diverse views on its impact. While some perceive benefits in supporting academic work, concerns exist regarding over-reliance, plagiarism, content accuracy, and its influence on self-driven research motivation. This research contributes to the discussion on AI in education by providing empirical evidence on ChatGPT's influence and calls for a holistic approach to AI integration, emphasizing digital literacy, ethical use, and strategies to maximize learning benefits while safeguarding critical thinking development.

Keywords: Artificial Intelligence (AI), ChatGPT, critical thinking skills, undergraduate students, education, higher education institution (HEI)

Аңдатпа

ChatGPT-дің студенттердің сыни ойлау дағдыларына әсерін зерттеу

Білім беру саласында, әсіресе ChatGPT пайда болғаннан кейін, жасанды интеллект (ЖИ) құралдарының қолданысы кеңейіп келе жатқандығы студенттердің сыни ойлау дағдыларына әсерін түсінуге елеулі қызығушылық байқалады. Бұл зерттеудің мақсаты Қазақстандағы бір жоғары оқу орнында (ЖОО) ChatGPT пайдаланудың студенттердің сыни ойлау дағдыларымен қатынасын зерттеу. Мақсатқа жету үшін, квази-эксперименталдық дизайн қолданылады. Бұнда әртүрлі мамандықтардан жиналған 52 бакалавр студенттері екі топқа бөлінеді және ChatGPT-ді тиімді пайдалану бойынша оқыту алған топ бақылау тобымен салыстырылады. Деректер жинау сыни ойлау дағдыларының алдын-ала және аралық бағалауын қамтылады. Ол үшін Корнелл сыныптық-ойлау тестінің X формасы (CCT-X) және ChatGPT-ді қолданудағы студенттердің белсенділігін бағалау үшін сауалнама қолданылады.

Нәтижелер ChatGPT қолдану мен сыни ойлау дағдылары арасындағы бастапқы теріс байланыстың барын көрсетеді және ол мақсатты оқыту араласуынан кейін сыни ойлау көрсеткішктерінің жақсаруына өзгереді. Бұл ChatGPT оқу құралы ретінде мүмкіндіктерге ие болғанымен, оның артықшылықтарын құрылымдық нұсқаулықтармен, жауапкершілікпен пайдаланумен және оқытушылардың қадағалауымен бірге академиялық адалдық пен сыни ойлау дағдыларын дамытуға байланысты тәуекелдерді азайту үшін барынша арттыруға болатынын көрсетеді. Сонымен қатар, зерттеуде студенттер арасында жоғары ChatGPT қолданысы және оның әсері туралы әртүрлі көзқарастары анықталады. Кейбір студенттер академиялық жұмысты қолдауда пайдасын байқаса да, оларда асыра пайдалану, плагиат, мазмұн дұрыстығы және өздігінен зерттеу мотивациясына әсері туралы

алаңдаушылық бар. Бұл зерттеуде студенттердің сыни ойлау дағдыларын дамыту мақсатында ChatGPT-ді білім бағдарламаларына сәтті интеграциялау үшін цифрлық сауаттылықты, этикалық пайдалануды және сыни ойлауды дамытуды қамтамасыз ете отырып, оқу артықшылықтарын барынша арттыру стратегияларын пайдалануды ұсыну арқылы білім берудегі ЖИ талқылауына эмпирикалық дәлелдер ұсынылады.

Кілт сөздер: Жасанды интеллект (ЖИ), ChatGPT, сыни ойлау дағдылары, бакалавриат студенттері, білім беру, жоғары оқу орны (ЖОО).

Абстракт

Исследование влияния использования ChatGPT на навыки критического мышления студентов

Растущее применение инструментов искусственного интеллекта (ИИ) в образовательной среде, особенно с появлением ChatGPT, вызвало значительный интерес к пониманию их влияния на навыки критического мышления студентов. Целью данного исследования было изучение связи между использованием ChatGPT и навыками критического мышления студентов в одном высшем учебном заведении (ВУЗе) в Казахстане. Для достижения цели был применен квазиэкспериментальный дизайн. Экспериментальная группа получила обучение эффективному использованию ChatGPT по сравнению с контрольной группой. Выборка включала 52 студентов бакалавриата различных специальностей. Данные были собраны с помощью предварительной и послеинтервенционной оценки критического мышления с использованием формы X теста по классификации мышления Корнелла (CCT-X) и опроса для оценки вовлеченности студентов в использование ChatGPT.

Результаты показали первоначальную отрицательную корреляцию между использованием ChatGPT и навыками критического мышления, которая смещается к улучшению результатов критического мышления после целенаправленного обучающего вмешательства. Это предполагает, что, хотя ChatGPT обладает потенциалом как учебный инструмент, его преимущества могут быть максимизированы при сочетании с структурированным руководством, ответственным использованием и контролем со стороны преподавателей для минимизации рисков, связанных с академической честностью и развитием навыков критического мышления. Кроме того, исследование выявило высокое использование ChatGPT среди студентов с разнообразными взглядами на его влияние. В то время

как некоторые видят преимущества в поддержке академической работы, существуют опасения по поводу чрезмерной зависимости, плагиата, точности содержания и его влияния на мотивацию к самостоятельным исследованиям. Это исследование вносит вклад в дискуссию об ИИ в образовании, предоставляя эмпирические доказательства влияния ChatGPT и выступая за сбалансированный подход к интеграции ИИ, подчеркивая цифровую грамотность, этическое использование и стратегии максимизации образовательных преимуществ при одновременной защите развития критического мышления.

Ключевые слова: Искусственный интеллект (ИИ), ChatGPT, навыки критического мышления, студенты бакалавриата, образование, высшее учебное заведение (ВУЗ).

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Chapter 1.

Introduction

Background to the Study

Artificial Intelligence (AI) tools, specifically ChatGPT, have rapidly emerged as a global phenomenon, captivating users worldwide who utilize them for diverse purposes, including information retrieval, inquiry, and content creation. As one of the most potent chatbots now in use (Choi et al., 2023), ChatGPT uses deep learning algorithms to produce texts in natural language. In 2023, in the month of April alone, ChatGPT had 173 million active users (Nerdynav, 2023). Its widespread adoption signifies the growing reliance on ChatGPT as a versatile tool across various domains.

The introduction of AI chatbots in education marks a major shift in how students use technology to access learning materials and interact with educational content. AI chatbots can offer instant feedback, personalized assistance, and individualized learning experiences (Kasneci et al., 2023; Rahman & Watanobe, 2023). These chatbots are powered by special programs that help them understand what you are asking (natural language processing) and learn how to answer better over time (machine learning algorithms) to enhance student engagement, improve learning outcomes, and cater to diverse learner needs. While AI tools offer exciting possibilities, some worry about how tools like ChatGPT might affect students' ability to think critically.

Ennis (1993) defined critical thinking as "reasonable reflective thinking focused on deciding what to believe or do" (p. 180). He expands on this by describing critical thinking as a combination of skills and attitudes. These include assessing the credibility of information sources, understanding and analyzing arguments, and creating and supporting logical positions. It is widely recognized as a vital skill for students, equipping them with the ability to solve complex problems, think independently, and engage in effective

decision-making. Given its significance, any potential influences of ChatGPT use on critical thinking skills must be examined to ensure that students' intellectual growth is not compromised.

Research Problem

Since its launch in November 2022, ChatGPT has garnered significant public interest and sparked discussions for its ability to produce contextually relevant responses that mimic the tone and style of human language (Choi et al., 2023). Specifically, its widespread use among students has raised concerns about its potential impact on students and the teaching and learning process in general. Recent surveys, such as the one conducted by Intelligent.com involving 1,223 university students, reveal that 30% of university students employed ChatGPT for educational tasks, with 46% of them using it frequently for academic assignments (Intelligent, 2023). These numbers prove that the utilization of ChatGPT by students for assignments is on the rise.

While ChatGPT's capabilities can enhance learning by providing students with quick access to information and varied linguistic constructions, there is an increasing concern about its impact on the development of essential academic skills, particularly critical thinking. Critical thinking is integral to academic success and professional development, yet the reliance on AI-driven tools like ChatGPT might undermine this by encouraging a more passive approach to learning. Students might become accustomed to receiving information without engaging deeply with the content, thereby potentially stunting their ability to analyze, evaluate, and create new ideas independently.

The prevalent use of ChatGPT for completing university assignments has become a point of concern for scholars regarding its impact on developing scientific paper writing skills. Additionally, there are worries about students using the chatbot's text-generating capabilities to cheat on assignments and exams, as Flanagin et al. (2023) highlighted.

These concerns are not just theoretical. Cases of misuse, such as a student in Russia successfully defending a thesis predominantly authored by ChatGPT, highlight the ease with which students can substitute AI-generated content for genuine intellectual effort (Cherkesov, 2023). Alexander Zhadan apparently successfully defended his undergraduate diploma by submitting a thesis written by ChatGPT. Alexander himself made this public on his blog through an extensive report on how modern technology helped him save dozens of hours of personal time. Based on the report, he seems to have used ChatGPT to write the introduction and the theoretical parts. It took him 23 hours to write his thesis, of which 15 were spent writing and eight editing (Cherkesov, 2023). This incident not only sparked debates about academic integrity but also raised questions about the deeper educational implications of such technology. There were discussions about whether this could be considered ethical, whether it was plagiarism, and whether the work should be disqualified or still accepted. However, the student successfully defended his thesis and passed the anti-plagiarism test.

With its vast database of information and language generation capabilities, students may exploit the model to generate content for their academic assignments without proper attribution. Using AI chatbots for such purposes constitutes academic dishonesty and impedes students' cultivation of critical thinking and original research capabilities. More than half of university students (51%) consider using AI tools like ChatGPT for completing assignments and examinations as a form of academic dishonesty. This insight emerges from a recent survey by BestColleges, encompassing 1,000 presently enrolled undergraduate and graduate students conducted in March 2023. However, this study also showed that one in five university students openly admitted using AI to fulfill their academic tasks (Nietzel, 2023). Even though the students know that using ChatGPT for academic purposes is dishonest, they still resort to it.

This reliance on AI tools risks not only facilitating academic dishonesty but also potentially devaluing the educational process, where the focus shifts from learning and understanding to merely performing tasks. Moreover, the ability of tools like ChatGPT to circumvent plagiarism detection software further complicates the educational landscape, potentially allowing students to generate 'original' work that is not truly their own, further blurring the lines between assistance and cheating. Furthermore, research suggests that the use of ChatGPT may negatively impact the development of critical thinking, problem-solving, imagination, and research abilities in students (Kasneci et al., 2023; Kooli, 2023). Given the centrality of these skills for academic and professional success, reliance on ChatGPT may lead to detrimental downstream effects, such as a lack of originality and compromised decision-making (Kasneci et al., 2023). However, others believe that the potential of ‘good’ ChatGPT usage to cultivate critical thinking skills (Choi et al., 2023).

Given these complexities, there is a pressing need to explore more deeply how the use of ChatGPT and similar AI technologies in educational settings influences the development of critical thinking skills among students. This study will compare the effects of ChatGPT between two groups: students who received structured website on effective use of ChatGPT (experimental group) and those who did not receive such training (control group). This approach will help determine whether structured training can mitigate the potential negative impacts of ChatGPT usage on critical thinking skills. The outcome of this research could have significant implications for educational policies and teaching strategies, urging a reassessment of how AI tools are integrated into learning environments to support, rather than hinder, educational goals.

Although ChatGPT offers potential benefits in facilitating information retrieval and generating responses, the extent to which it influences students' critical thinking abilities remains unclear. The lack of detailed research on how ChatGPT affects critical thinking

skills presents a challenge for educators and policymakers looking to integrate this technology effectively into educational systems, according to Kazneci et al. (2023). This gap underscores the need for further exploration into the relationship between ChatGPT usage and the development of critical thinking skills among students. Conducting such research is crucial for maximizing the benefits of AI-based educational tools while addressing any drawbacks they might present.

Research Purpose and Questions

The purpose of this quantitative study is to explore the relationship between the use of ChatGPT, the AI tool, and the critical thinking skills of students at a single HEI in Kazakhstan. This investigation is guided by the following research questions:

1. What is the extent of students' engagement with ChatGPT?
2. What are students’ critical thinking levels?
3. What is the relationship between using ChatGPT and students’ critical thinking?

Significance of the Study

The incorporation of AI tools such as ChatGPT in education has sparked concerns about their potential impacts on students' critical thinking abilities. As the use of such tools becomes increasingly widespread across educational organizations, investigating their influence on critical thinking development becomes increasingly crucial.

The results of this study could significantly influence and inform educational practices and policies. As educators and administrators navigate the challenges and opportunities posed by AI tools, empirical evidence regarding their effects is essential. This research provides data-driven insights that can aid in the decision-making process concerning the incorporation of AI technologies into educational curricula. By gaining a deep understanding of how students interact with ChatGPT and the consequent effects on their development of critical thinking skills, educators can refine their teaching strategies.

This knowledge allows them to create tailored strategies that align with their educational objectives and effectively leverage AI tools. By developing customized approaches, educators can boost the impact of AI on critical thinking or mitigate any adverse effects if necessary. Ultimately, the study aims to support educators in fostering critical thinking abilities among students, equipping them with essential skills for success in a rapidly evolving digital world. The study also highlights the importance and need for ethical discussions surrounding responsible AI usage in educational contexts.

While it is acknowledged that the field of AI in education is receiving growing attention from researchers, much of the existing literature tends to focus on the broader implications of technology in learning environments. Specific investigations into the impact of advanced AI tools like ChatGPT on critical thinking remain unexplored in Kazakhstan. This study aims to fill this niche by providing targeted insights into how ChatGPT, as a sophisticated language model, influences developing and exercising critical thinking skills among university students. By focusing on this specific aspect of AI application, the study adds a nuanced layer to the existing body of research, enriching the understanding of AI's educational implications.

Definitions of Key Terms

Artificial Intelligence (AI): The intelligence exhibited by machines, particularly computer systems. In basic terms, it refers to computers' ability to mimic human cognitive abilities such as learning and problem solving.

ChatGPT (Chat Generative Pre-trained Transformer): A large language model (LLM) chatbot developed by OpenAI, which is trained on an extensive collection of text and code, enabling it to produce realistic and coherent conversations, translate languages, craft various types of creative content, and provide informative answers to your questions.

Critical Thinking Skill: The ability to objectively assess information and reach well-founded conclusions. It is a mental toolset that allows one to go beyond simply absorbing information and instead actively engage with it. It is not an inborn talent and can be developed through practice and education. The Cornell Critical Thinking Test, Level X, will be utilized to assess these skills.

Summary

In summary, this chapter has determined the critical need to explore the impact of ChatGPT usage on students' critical thinking skills. Since critical thinking is vital for students' academic and professional success, understanding the implications of ChatGPT's integration in educational contexts is paramount. Subsequent chapters will further explore various aspects of this research.

Outline of the Thesis

This thesis work consists of six chapters. The first chapter provides an introduction to the study, detailing its significance and the research questions it aims to address, while Chapter 2 provides a comprehensive literature review, critically analyzing, comparing, and synthesizing existing research on ChatGPT use and its impact on critical thinking. Chapter 3 details the research methodology employed, including the data collection procedures. Chapter 4 presents the research findings, and these results are discussed and interpreted in Chapter 5. Finally, Chapter 6 offers a comprehensive summary of the conducted research.

Chapter 2.

Literature Review

Introduction

This literature review examines the role of artificial intelligence (AI) tools, notably ChatGPT, in cultivating critical thinking skills within higher education (HE). Critical thinking—analyzing information, recognizing biases, and constructing well-reasoned arguments—is fundamental to higher education. (Facione, 1990). Since its launch by OpenAI in November 2022, ChatGPT has become a significant educational tool, evolving from the basic GPT-3.5 model to the advanced GPT-4, which supports non-text inputs. This evolution highlights ChatGPT's enhanced text generation capabilities, making it a valuable asset in education for creating content and enabling personalized learning.

However, this technological progress presents opportunities and challenges, such as reevaluating traditional learning methods and detecting AI-generated content. While ChatGPT shows promise for personalizing education and increasing student engagement (Kooli, 2023), it also raises several concerns, including the need for careful scrutiny of its ethical implications and its actual effect on critical thinking skills, which remains largely unexplored (Kasneci et al., 2023).

This review aims to determine whether ChatGPT acts as a facilitator or a barrier to critical thinking, which is crucial for navigating the complexities of HE. It discusses the broader impacts of AI on education, focusing on personalized learning, data privacy, and algorithmic bias, and examines empirical studies on ChatGPT's effectiveness in educational settings. The review calls for responsible AI use that enhances critical thinking without compromising academic integrity or ethical standards, highlighting the need for ongoing research into the optimal integration of AI in educational practices.

The Role of AI in Education

Integrating AI into educational settings significantly shifts how instruction is delivered and received. This review delves deeper into the multifaceted roles of AI in education, critically analyzing its potential to personalize learning, empower educators, and ultimately improve educational outcomes.

Personalization lies at the heart of AI's potential in education. Adaptive learning systems powered by AI can analyze student data, identify knowledge gaps, and curate individualized learning paths by analyzing a student's strengths and weaknesses (Farrokhnia, 2023). AI tutors, adaptive learning platforms, and educational games all contribute to meeting individual student needs. This approach aligns with constructivist learning theories, which posit that knowledge is actively built through individual experiences (Almulla, 2023). AI's massive data analysis capabilities fuel the development of adaptive learning systems that cater to individual learning styles, preferences, and challenges. Research illustrates how AI-driven personalized learning platforms significantly improve student outcomes by offering targeted support and resources (Haque et al., 2022). These platforms adjust the content difficulty based on learner performance and provide timely feedback, enhancing learning efficacy and student engagement. The rationale for exploring AI in education stems from the shortcomings of traditional, one-size-fits-all methods. Large class sizes and standardized curricula often fail to cater to individual needs, leading to disengagement and underachievement for a significant portion of the student population. AI offers a potential solution by customizing learning experiences for individual students, thus promoting a more effective and inclusive educational environment.

AI's impact extends beyond the classroom, simplifying and streamlining administrative tasks that traditionally consume substantial time and resources. Adeshola

and Adepoju (2023) highlight AI's ability to automate administrative tasks like grading and freeing educators' time for more strategic endeavors. Additionally, by analyzing student performance data, educators can identify areas where the curriculum needs improvement and adapt their teaching methods to address student needs better (Sağın et al., 2023). AI-powered systems can efficiently manage scheduling, attendance tracking, and grading, allowing educational institutions to allocate resources more effectively. Studies have shown that adopting AI in administrative operations can improve record-keeping accuracy and reduce operational costs (Chatwal et al., 2023). However, a critical analysis reveals potential drawbacks. Chan and Tsi (2023) raise concerns about data privacy and student assessment bias within AI systems. Additionally, the potential for AI to replace teachers necessitates careful consideration to ensure technology complements rather than diminishes the role of educators.

Furthermore, AI's role in supporting educators extends beyond automation. As highlighted by Chatwal et al. (2023), predictive analytics allows for proactive intervention by identifying students at risk of falling behind. This facilitates educators in implementing differentiated instruction, ensuring all students receive targeted support and promoting equitable learning opportunities. In addition, AI-based teaching assistants are redefining classroom interactions and learning engagement. These AI assistants can provide instantaneous feedback, answer students' queries, and facilitate personalized learning experiences outside the traditional classroom setting. Furthermore, they can assist teachers by offering insights into student performance and potential learning gap costs (Chatwal et al., 2023). Implementing AI teaching assistants has increased student motivation and improved learning outcomes, as they provide a responsive and adaptive learning environment. This approach acknowledges the heterogeneity of the learner population and strives to create an inclusive learning environment that effectively addresses each student's

diverse academic needs. Moreover, AI-driven analytics offer deep insights into student performance and learning patterns, enabling educators to refine their teaching strategies and interventions.

While the advantages of AI in education are transparent, ethical considerations surrounding privacy, data security, and algorithmic bias must be addressed. Ensuring the ethical use of AI involves implementing robust data protection measures and developing transparent, fair algorithms that mitigate bias (Gupta, 2023). AI has immense promise for personalizing learning, empowering educators, and improving educational outcomes. However, responsible implementation and ongoing research are essential to ensure AI is a tool for equity and progress within the educational landscape.

Understanding ChatGPT and Its Capabilities

ChatGPT, a large language model (LLM), has garnered significant attention for its ability to generate human-like text and engage in conversations. This overview will show how ChatGPT has become a pivotal tool in various domains despite its inherent limitations and challenges.

ChatGPT's capabilities stem from its underlying architecture. It is an advanced AI language model created by OpenAI, utilizing the GPT (Generative Pretrained Transformer) framework. ChatGPT has been recognized for its ability to produce responses that mimic human text. It operates on transformer-based neural networks and is trained on extensive datasets of text and code. This extensive training enables it to identify patterns in language and produce text that closely resembles content written by humans (Gupta, 2023). Key concepts underpinning ChatGPT's functionality include natural language processing (NLP) and generative pre-training. NLP techniques enable ChatGPT to understand the nuances of human language. At the same time, generative pre-training allows it to produce creative text formats, like code, scripts, musical pieces, and poems (Adeshola & Adepoju, 2023),

engage in conversations, answer questions, and create content across various domains. However, ChatGPT's capabilities extend beyond mere text generation. Its applications range from conversational agents and customer service bots to aiding in educational settings and content creation. Zhai (2022) highlighted its role in enhancing interactive learning environments by providing personalized feedback and tutoring services. Furthermore, its ability to understand and generate text in multiple languages makes it a versatile tool in global communication and localization efforts. Cotton at el. (2023) highlights its proficiency in language translation and content creation tasks. Adeshola and Adepoju (2023) further emphasize its potential for customer service applications and functioning as a personal assistant. These functionalities showcase ChatGPT's versatility and its ability to automate tasks traditionally requiring human intervention.

There are two versions of the ChatGPT: based on OpenAI's GPT-3.5 model, this chatbot initially relied solely on text prompts but evolved with the release of GPT-4 in March 2023 to include non-text inputs. ChatGPT-3.5 model is complimentary, while ChatGPT-4 costs 20$ a month. The primary differences between ChatGPT 3.5 and GPT-4 revolve around improvements in language understanding, response quality, and overall versatility. ChatGPT, once confined to text prompts, has undergone a significant upgrade with the introduction of GPT-4. This new iteration boasts a vastly improved understanding of language, allowing it to decipher complex prompts and generate accurate and relevant responses to the context. Additionally, GPT-4 benefits from a more affluent knowledge base, having been trained in a broader dataset of internet text. This translates to a greater diversity and depth in its responses.

Furthermore, GPT-4 maintains coherence across extended conversations, a vast improvement over its predecessor (Gupta, 2023). This enhanced ability to track context fosters smoother and more engaging interactions. Another noteworthy advancement is the

reduction of biases and errors in GPT-4's responses. While not eliminated, improved training techniques and a larger, more diverse dataset have contributed to this positive development. Perhaps the most intriguing upgrade is GPT-4's potential for multimodality. Unlike its predecessor, this version can theoretically understand and generate text and other forms of data, such as images.

It is important to remember that both ChatGPT models have limitations despite these advancements. They can still generate inaccurate or biased information, and their knowledge may not always be up-to-date. Kooli (2023) identifies challenges with factual accuracy and potential biases within the training data. Issues such as bias in AI, potential misuse, and the impact on job markets are prevalent themes. Sok and Heng (2023) argue that despite the advancements in AI, ensuring fairness, accountability, and transparency in models like ChatGPT remains a significant challenge. Understanding ChatGPT's limitations and potential biases is crucial for its responsible development and deployment. Addressing these limitations is essential for ensuring ChatGPT's reliability and ethical use. The deployment of ChatGPT has ignited debates on the nature of intelligence and creativity in AI. While some scholars posit that models like ChatGPT signify a step towards artificial general intelligence (AGI), others caution against overestimating AI's cognitive capabilities (Wu et al., 2023). Furthermore, discussions around the role of AI in education, ethics, and privacy underscore the need for comprehensive governance frameworks to mitigate risks associated with advanced NLP technologies.

Examining ChatGPT and its capabilities offers valuable insights into the evolution of NLP technologies and their societal impacts. This review underscores the significance of integrating ethical considerations and human-centric approaches in AI development by understanding the theoretical underpinnings and critically analyzing the model's applications and limitations. The ongoing discussions and debates in the literature highlight

the dynamic nature of AI research and the imperative for continuous exploration and evaluation of AI technologies like ChatGPT. Additionally, frameworks around bias and fairness must be considered. Kooli (2023) mentioned that mitigating potential biases within the training data is crucial for ensuring responsible development and deployment.

This above section thoroughly examines ChatGPT's functionalities, showcasing its potential and limitations within various frameworks. ChatGPT, a symbol of AI and NLP progress, offers promising automation, content creation, and human-computer interaction opportunities. However, it underscores the importance of ongoing research to address its limitations and ensure responsible development. As AI, huge language models (LLMs) advance, understanding their capabilities and potential issues is essential for utilizing their power responsibly.

ChatGPT in Education

The latest studies on using ChatGPT in educational settings reveal various perspectives and findings, reflecting both the potential and challenges of integrating this technology into education. The study by Fütterer et al. (2023), analyzing Twitter data from the initial period following ChatGPT's release, found mixed sentiments among education stakeholders. Approximately 52% of the tweets expressed positive views, highlighting the potential for ChatGPT to transform educational processes, such as by emphasizing critical thinking skills over routine tasks like grammar or spelling. On the other hand, 32% of tweets were negative, expressing concerns about students potentially outsourcing their thinking and writing and disrupting traditional assessment methods like essays. This study underscores the diverse reactions to ChatGPT in the education sector and highlights the need for balanced discussions regarding its integration.

A deluge of scholarly works has emerged in HE, exploring various applications and implications of ChatGPT. For instance, Dempere et al. (2023) conducted a systematic

review, and studies have shown that ChatGPT could address significant challenges in science education through automated assessment, guidance, and material suggestions. Others have explored its use in climate projections, public health, and even software bug fixing. Another notable study by Jeblick et al. (2023) involved radiologists assessing the quality of radiology reports produced by ChatGPT, finding them generally accurate but with some errors and omissions.

Studies have indicated that ChatGPT can increase student engagement (Rahman & Watanobe, 2023) and improve learning outcomes (Strzelecki, 2023). Chatbots also have the potential to provide real-time feedback, personalized assistance, and access to vast knowledge resources, which can augment the learning experience (Rahman & Watanobe, 2023). An article by Adeshola and Adepoju (2023) explored the integration of ChatGPT in education, examining its use in personalized learning, assessment, and content creation. The study concluded that while ChatGPT can automate routine tasks and enhance learning, educators must be mindful of its limitations, such as potential biases and safety concerns. Another perspective comes from educators who have used ChatGPT in classroom settings. They noted its ability to help students present ideas clearly and organize their thoughts, thereby facilitating a shift toward critical thinking. ChatGPT has also been utilized in computer science classes and as a tool for homework and revision.

Despite these advantages, educators remain cautious about the potential misuse of ChatGPT, stressing the importance of regulation and responsible use, particularly in maintaining academic integrity. One primary concern is the potential for overreliance on AI, which may hinder students' critical thinking abilities (Choi et al., 2023). The absence of human interaction in AI chatbot interactions may limit opportunities for collaborative problem-solving and deep understanding of concepts (Kasneci et al., 2023). There is a risk that students may become overly dependent on the automated responses of chatbots,

reducing their motivation to think critically and independently. The instance where ChatGPT successfully passed an MBA-level exam designed by Professor Adam Grant from the Wharton School of Business is an example of ChatGPT's ability to redefine human knowledge, causing concerns and creating dialogue in the field of education.

Overall, these studies and perspectives highlight the complex and multifaceted nature of ChatGPT's integration into educational settings. They emphasize the significance of balancing the advantages of AI technology in improving learning and teaching techniques against the limitations of offering ethical, safe, and responsible use. The use of AI tools in education has the potential to transform teaching and learning methods. Educators may maximize the potential of AI technologies to encourage critical thinking abilities in students by studying their history, evolution, integration in educational contexts, benefits, and limits. AI tools provide students with tailored, adaptive, and interactive learning experiences, allowing them to participate in higher-order thinking, problem-solving, and data review. To fully realize the promise of AI technologies in encouraging critical thinking abilities, educators and policymakers must adopt them responsibly, address ethical concerns, and develop effective teaching methodologies.

Critical Thinking in the Age of AI

The rise of AI presents a paradox for critical thinking. While AI offers immense potential to automate tasks and analyze data, it also necessitates a robust human ability to critically evaluate its outputs and navigate an increasingly complex information landscape. This review looks into the multifaceted concept of critical thinking, exploring its importance in education and professional life, theories surrounding its development, and the impact of digital tools and AI on this crucial skill.

Critical thinking defies a singular definition, but various perspectives illuminate its multifaceted nature. Synthesizing insights from authoritative sources produces a

comprehensive understanding. Scriven and Paul (1987) define it as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication" (Scriven & Paul, 1987, as cited in The Foundation for Critical Thinking, 2019, para. 3). It emphasizes active engagement with information, employing analysis, synthesis, and evaluation skills to arrive at sound judgments.

A few decades ago, Ennis (1987) proposed that critical thinking involves "reasonable, reflective, responsible thinking," focusing on making informed decisions (Ennis, 1987, p. 10). This definition emphasizes the thoughtful evaluation and judgment inherent in critical thinking. Building on existing ideas, Facione (1990) emphasizes the importance of specific cognitive abilities in critical thinking, including analysis, evaluation, and interpretation of information. These skills are further complemented by self-awareness of one's thought processes and positive traits like open-mindedness (Facione, 2011). In addition, Ennis (1987) offers a process-oriented perspective, viewing critical thinking as a systematic engagement with information to assess arguments. Building on this, Paul and Elder (2006) describe it as a cognitive skill and a habit of mind. This perspective emphasizes the need for disciplined intellectual engagement, active analysis of information, and awareness of one's biases and thought patterns. Critical thinking also extends beyond the individual. Lipman (2003) highlights the role of reasoned discourse and collaboration, suggesting that critical thinking skills develop through dialogue and exchanging ideas. McPeck (1981) furthers this notion, arguing that critical thinking is a collective activity where meaning is constructed through interaction and social exchange (McPeck, 1981, as cited in Cotton et al., 2023). These definitions highlight

the importance of educational practices that encourage exploration, questioning, and independent thinking skills.

These diverse perspectives combine cognitive rigor, self-reflection, and social interaction themes. Critical thinking empowers individuals to navigate and interpret information effectively, adapt to different contexts, and engage in meaningful discourse. This convergence underscores its multifaceted nature as both a skill and a disposition essential for intellectual engagement and reasoned decision-making.

Critical thinking underpins success in both education and professional life. In educational settings, it empowers students to become independent learners, capable of evaluating information, identifying biases, and forming well-reasoned arguments (Facione, 2011). This skill set is crucial for academic success and lifelong learning. Professionally, critical thinking is fundamental for problem-solving, decision-making, and innovation. Across diverse fields, professionals need to analyze data, assess risks and benefits, and generate creative solutions. A 2022 report by the World Economic Forum emphasizes critical thinking as a core skill required for future employment (World Economic Forum, 2022).

The analytical capabilities of ChatGPT are another noteworthy advantage. In today's information-rich environment, the ability to critically analyze information is paramount. ChatGPT can assist in this process by providing access to vast amounts of data and helping students assess its credibility (Strzelecki, 2023). Its personalized feedback and instant access to information can encourage students to think critically, analyze problems, and evaluate information (McPeck, 1981, as cited in Cotton et al., 2023). AI-powered chatbots like ChatGPT can engage students in dialogue, prompting them to reflect on their thinking processes and challenge their assumptions.

The rise of digital tools and platforms presents both opportunities and challenges for critical thinking. On the positive side, AI-powered tools can assist with information retrieval, data analysis, and identifying potential biases in research (Zhai, 2022). Educational technologies can create interactive learning environments that foster critical engagement with information (Azevedo, 2006). However, the pervasiveness of online information also presents limitations. The prevalence of "fake news" and echo chambers necessitates heightened vigilance in evaluating sources and identifying bias (Cotton et al., 2023). Furthermore, reliance on AI for tasks like summarizing information can lead to a decline in critical reading and analytical skills (Kooli, 2023).

A critical synthesis reveals the complex interplay between AI and critical thinking. While AI offers valuable tools, it does not replace the need for human judgment. Building strong critical thinking skills requires an educational approach that encourages questioning, analysis, and responsible use of technology. Critical thinking remains a cornerstone of success in a world increasingly shaped by AI. By fostering critical thinking skills through effective pedagogy and responsibly leveraging the power of AI, we can navigate the information age with greater clarity and analytical acumen.

ChatGPT's Influence on Critical Thinking

The rise of ChatGPT has sparked a surge of interest in its impact on critical thinking skills within educational settings. While some envision it as a transformative tool, others raise concerns about its potential drawbacks. This review critically analyzes the existing literature, exploring both the potential benefits and limitations of ChatGPT in fostering critical thinking.

On the positive side, ChatGPT holds promise in encouraging inquiry and curiosity. Providing instant responses to a wide range of questions can stimulate a culture of student-driven exploration (Xiao & Zhi, 2023). This aligns with pedagogical principles that

emphasize discovery learning. Furthermore, AI tools provide individualized and adaptable learning experiences that respond to specific demands and learning styles. (Sok & Heng, 2023). ChatGPT can play a role in challenging assumptions and biases. Its interactive nature exposes students to a spectrum of viewpoints, prompting them to critically evaluate their own beliefs (Sok & Heng, 2023). This exposure is crucial for developing well-rounded critical thinking skills, as it equips students to analyze diverse perspectives and gain a more holistic understanding of complex issues.

However, the effect of ChatGPT on critical thinking is subtle. A study by Akastangga et al. (2023) suggests that while ChatGPT moderately improves critical thinking, it should be used alongside traditional methods to foster independent analytical skills effectively. Their quantitative analysis involved control and experimental groups, revealing notable differences in critical thinking post-intervention. Putra et al. (2023) employed a mixed-methods approach, conducting both qualitative interviews and quantitative surveys with students in higher education settings. They suggest that excessive reliance on ChatGPT for completing assignments in higher education may lead to a decrease in students' higher-order thinking skills (Putra et al., 2023). Even so, the study by Akastangga et al. (2023) provides insights into immediate effects but does not address long-term impacts on critical thinking skills. This limitation highlights the need for longitudinal research to understand how continuous interaction with ChatGPT affects critical thinking development over time.

The exploration by Arndt (2023) into the use of ChatGPT for systems thinking underscores the tool's mostly accurate and helpful responses across various subjects, highlighting the importance of users maintaining a critical stance towards the tool's feedback (Arndt, 2023). Similarly, Onal and Kulavuz-Onal (2024) observe that ChatGPT's application in HE can generate accurate and creative assessment tasks across disciplines,

though human evaluation remains essential for gauging its reliability and accuracy. However, no consistent definition or assessment method for critical thinking complicates comparisons and generalizations. Standardizing definitions and measurement instruments could enhance the reliability and comparability of research findings. Furthermore, studies by Guo and Lee (2023) and Xiao and Zhi (2023) highlight the potential of ChatGPT to improve critical thinking through interactive discussions and problem-solving activities. These findings, however, also point to a reliance on self-reported data, which may not objectively measure true skill enhancement and could benefit from more rigorous, objective assessments.

Despite these positive aspects, there are significant challenges and ethical considerations. Over-dependence on AI for answers could reduce engagement in deeper analytical processes crucial for critical thinking. The quality of ChatGPT's responses, contingent upon its training data, could also perpetuate existing biases (Wu et al., 2023). These issues underscore the necessity for educators to guide students in critically evaluating AI-generated content and maintaining a balance between technological aids and traditional educational methods.

However, critical analysis reveals limitations. While advanced, AI tools lack human empathy and the nuanced contextual understanding possessed by human instructors. Overreliance on AI-generated responses risks diminishing the benefits of collaborative and interactive learning experiences with peers and teachers (Wu et al., 2023). Ethical concerns, such as data privacy and algorithmic bias, need the proper use of AI tools in education (Kooli, 2023). Concerns have also been expressed regarding the tools' ability to generate biased or unverified material, which could mislead users and impede the development of critical analysis skills (Wu et al., 2023). Educators and students should be encouraged to analyze the information offered by AI critically, creating an

environment in which technology enhances rather than replaces critical thinking and analytical skills (Wu et al., 2023).

In essence, while ChatGPT offers valuable opportunities for enhancing critical thinking, its integration into education must be thoughtfully managed to ensure it supplements rather than supplants established teaching methods. Ongoing research is essential to fully understand its long-term effects and to devise strategies that optimize its educational benefits. Thus, ChatGPT stands as a potent tool in the educational arsenal, but one that requires careful implementation and oversight.

Ethical Considerations and AI Legislation

The burgeoning integration of ChatGPT and other artificial intelligence (AI) generated content into various sectors, including education, healthcare, and research, presents a complex landscape of ethical considerations and challenges. Critically analyzing recent literature reveals an intricate balance between the innovative potentials of ChatGPT and the paramount ethical considerations it necessitates. A notable example is China, where national policies specifically focus on AI's educational integration. According to Knox (2023), China's approach includes developing strategic educational policies incorporating AI to foster technological advancement while addressing ethical considerations such as privacy and security.

Privacy and security are paramount concerns when using ChatGPT, especially considering its vast data training set, which could encompass sensitive information. Wu et al. (2023) highlight the need for robust security measures to safeguard user data from breaches and misuse, emphasizing the significance of privacy in the widespread adoption of such technologies. The ambiguity in AI's decision-making processes raises questions of accountability and transparency. Kooli (2023) stresses the ethical challenge of algorithmic bias and the need for AI systems like ChatGPT to be transparent and explainable. This

ensures that users understand how information is generated and can trust the accuracy and impartiality of the content. The application of ChatGPT in healthcare underscores the importance of proactively addressing potential ethical issues. Wu et al. (2023) discuss concerns related to patient privacy, the integrity of the physician-patient relationship, and the potential for AI-generated content to carry biases that could impact patient care and outcomes.

In the realm of legislation, the European Union (EU) has taken proactive steps to translate ethical guidelines into legal frameworks. Floridi (2021) discusses the development and implications of the European Commission's Proposal for an Artificial Intelligence Act, which aims to regulate AI deployment through a risk-based approach. This legislative effort represents a significant milestone in pursuing lawful, ethical, and robust AI, demonstrating the EU's commitment to leading by example in the global discourse on AI governance (Floridi, 2021).

The European Commission's "Ethical Guidelines on the Use of Artificial Intelligence and Data in Teaching and Learning" (2022) plays a crucial role in education. This guideline, a component of the "Digital Education Action Plan" (2021-2027), aims to enrich educators' comprehension of AI's educational benefits while highlighting potential risks. Furthermore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has released "ChatGPT and Artificial Intelligence: A Quick Start Guide," which underscores the rapid adoption of ChatGPT. This guide provides details about the use of ChatGPT in HE, including its functionality, ethical implications, and risk-mitigation measures.

The European Commission's Directorate-General of Research and Innovation (DG R&I) acknowledges the revolutionary power of artificial intelligence (AI), notably generative AI, across academic fields. To solve ethical concerns and assure responsible

deployment, they published "Living Guidelines on the Responsible Use of Generative AI in Research" in March 2024.

In conclusion, while ChatGPT and related AI technologies offer unprecedented opportunities for innovation and efficiency across multiple fields, they also pose significant ethical challenges that need careful consideration and management. The future of responsible AI usage lies in the balance between leveraging its benefits and addressing the ethical implications through stringent policies, transparent practices, and an ongoing commitment to safeguarding privacy and security.

Summary

This literature study has carefully investigated the changing landscape of AI in education, with a particular emphasis on ChatGPT's function in boosting or possibly limiting the development of critical thinking abilities in higher education. Key findings highlight ChatGPT's advancements in technology, its use in personalized instruction, and its dual-edged influence on educational paradigms. Notably, while AI technologies such as ChatGPT provide intriguing possibilities for personalized and interactive educational experiences, they also pose obstacles, such as ethical considerations and the possibility of students being overly reliant on technology. The research emphasizes the significance of taking a balanced approach when incorporating AI technologies in educational contexts, including resolving ethical concerns, maintaining academic integrity, and ensuring that AI complements traditional teaching techniques.

Chapter 3.

Methodology

Introduction

This chapter describes the methodology used to investigate the relationship between ChatGPT usage and students' critical thinking skills. It is divided into parts that include study design, research method, sampling strategy, data collecting processes, data analysis tools, and ethical issues. Each section explicitly justifies the selection of specific methods and instruments.

Research Design

This study used a quasi-experimental methodology to assess the impact of ChatGPT use on students' critical thinking abilities. In this design, participants were randomly assigned to one of two groups: an experimental group that got the intervention (instruction on how to use ChatGPT effectively) and a control group that did not. However, participants were not randomly sampled. Only those students who gave consent participated in the data collection process, which made this research quasi-experimental. Comparing the two groups' outcomes allowed for the assessment of the intervention's impact (O'Dwyer & Bernauer, 2014). This design accommodated the practicality of selecting participants from naturally occurring groups while maintaining the research's internal validity (Shadish et al., 2002).

The study included experiments to explore the association between ChatGPT use and students' critical thinking skills. The experiment involved adopting ChatGPT as an AI tool in a controlled setting and testing participants' critical thinking skills before and after the intervention using the Cornell Class-Reasoning Test, Form X (CCT-X).

This design enabled the inference of causal relationships between the use of ChatGPT and changes in critical thinking skills. However, there were three significant

threats to validity. The first was the difficulty in controlling for important confounding variables such as AI tools other than ChatGPT. Students might have used other AI tools outside the control of the researcher. The second was a regression to the mean. The students who scored higher in the first test might score lower, and students who scored low might score higher in the second implementation of the critical thinking test. These two reasons were stated in the literature by Harris et al. (2006). The third was the interactive effects. Although the researcher made every effort not to bring students together by randomly assigning them to groups, and the university was large enough so that students in this study might not have known one another, students might have still interacted beyond the researcher's control. These three threats to internal validity could have weakened the researcher’s causal inference.

The quantitative quasi-experimental design was well-suited to investigating the differences among variables. Using the ChatGPT AI tool, the independent variable was manipulated to observe its effects on the dependent variable, students' critical thinking skills.

Research Site and Sample Selection

The research site for this study, where the experiment was conducted, was a national university in Astana. The selection of the university was based on factors such as accessibility, willingness to participate, and availability of resources. The site was selected for convenience.

Participants were selected through a method known as convenience sampling. As defined by O'Dwyer and Bernauer (2014), convenience sampling involved choosing individuals who were readily accessible to the researcher and was characterized by selecting subjects based on availability rather than random selection. A promotional letter was written to students asking them to participate in the research, and this letter was sent

out through chats and public pages on social network platforms, such as Telegram and VKontakte (VK), which are popular among the student population. These platforms were chosen due to easy access to the target demographic. Following the survey completion, participants were randomly sampled into the experimental segment of the study, maintaining methodological rigor within the bounds of the selected sample.

Several key parameters defined eligibility: participants had to be current undergraduate students enrolled at this university. This criterion was established to maintain the study's focus on a homogeneous group with similar educational backgrounds and experiences. Further, students needed to express willingness to participate in the study's survey and experimental components, ensuring informed consent and active engagement throughout the research process.

A total of 87 students initially responded to a promotional letter asking for their participation. However, to maintain the integrity of the data, responses were included from students who had consented to participate, completed the survey without leaving relevant sections incomplete, and completed pre-and post-tests. Ultimately, 52 students provided complete and usable data for the analysis. They are first, second, third, and fourth-year students from three schools: the School of Engineering and Digital Sciences, the School of Sciences and Humanities, and the School of Mining and Geosciences. The participants consisted of male (n =22) and female (n =20) students predominantly aged between 21 and 23 years (10 students chose not to say their gender), representing a balance across different academic years and programs.

Following the initial recruitment through convenience sampling (participants who voluntarily participated), which targeted accessible students via social networks, those who completed the preliminary survey were subjected to random assignment. This step was crucial for the experimental phase, aiming to evenly distribute any pre-existing differences

among participants across the experimental and control groups, thus enhancing the validity of the findings.

Research Data Collection Instruments

This study used an open-accessed critical thinking assessment tool, the Cornell Class-Reasoning Test, Form X (CCT-X), developed by Ennis and Paulus (1965). Originally designed to evaluate students from grades 4-14, the CCT-X was chosen for its objective assessment of critical thinking skills and alignment with inquiry-based learning principles, a crucial aspect of this investigation. The test comprises 72 multiple-choice questions across 12 item groups, each presenting three answer choices (“yes,” “no,” “maybe”) with only one correct response. The sample question is: “Suppose you know that Bill is next to Sam. Then would this be true? Sam is next to Bill.” The correct answer is "YES". If Bill is next to Sam, then Sam must be next to Bill. It must be true, so a circle is drawn around "YES."

The test focuses on concrete familiar, symbolic, and suggestive content most relevant to practical reasoning situations. According to Ennis and Paulus (1965), concrete familiar content refers to specific, known objects or qualities, while symbolic content uses symbols instead of specific terms. Suggestive content is familiar, but the truth status might differ from its validity status, potentially leading to biased reasoning. The 12-item group in the test includes six content items, with four being concrete familiar, one symbolic, and one suggestive. The test produces an overall score reflecting a range of critical thinking competencies, including deduction, evaluation, observation, assessing the credibility of external statements, identifying underlying assumptions, and interpreting meaning (Mecit, 2006). Usually, it takes approximately 50 minutes to complete the test, and it typically yields a mean reliability estimate of 0.83 (Ennis & Paulus, 1965). To optimize participant engagement and completion rates while maintaining the core assessment of conditional

reasoning principles, a modified version containing 48 items was employed (see Appendix E). This modification involved removing the second and third concrete familiar content with 12 questions in each while preserving the original structure of 12-item groups, each focusing on a specific principle or combination of principles of conditional logic. It was recommended by Ennis and Paulus (1965). After the modification of the test, the internal consistency of the test, as measured by Cronbach's alpha, was 0.82, suggesting a high level of reliability (Table 9).

An online survey was developed to gather insights into students' experiences with ChatGPT. It comprised 27 questions, both close-ended and open-ended. The survey included five background questions and 20 questions about experiences with ChatGPT (see Appendix C). This survey, designed to capture students' experiences, underwent a rigorous validation process to enhance the trustworthiness of the data collected. Initially, the subject matter expert (thesis supervisor), proficient in educational research, assessed the survey questions for relevance and appropriateness, drawing on their expertise to refine and align the items with the study's overarching objectives (Mason et al., 2020). Subsequently, a pilot test was conducted involving 6 participants separate from the primary study sample. It helped to identify any ambiguities or confusing elements within the survey, providing valuable insights into the overall comprehensibility of the questions (Litwin, 1995).

Concurrently, a reliability analysis, including Cronbach's alpha, was conducted to assess the internal consistency of the survey instrument, ensuring that the items consistently measured the intended constructs (O'Dwyer & Bernauer, 2014). By subjecting the survey to this rigorous validation process, the study aimed to ensure that the collected data accurately and meaningfully reflected participants' experiences with ChatGPT, contributing to the credibility and robustness of the research findings. The reliability results, with Table 1 presenting the overall scale reliability statistics and Table 2 detailing

item-specific reliability, are given below. In Table 1, the scale demonstrated Cronbach's alpha of 0.78 (*M* = 0.95, *SD* = 0.81). This alpha level suggested an acceptable internal consistency for the scale.

Table 1

Scale Reliability Statistics of the Survey

M	*SD*	Cronbach's α	*N*
0.95	0.81	0.78	10

Table 2 provides a more granular look at the item reliability statistics for the Likert scale questions, labeled Q22_1 through Q22_10. Mean scores (*M*) for the survey items ranged from 2.63 to 3.48, with standard deviations (*SD*) indicating variability from 1.33 to 1.47. Item-rest correlations varied from 0.39 to 0.70, showing moderate to strong correlations between individual items and the total score. When considering removing each item, Cronbach's alpha ranged narrowly from 0.73 to 0.77, suggesting that no single item would significantly alter the overall internal consistency of the scale.

Table 2

Item Reliability Statistics of the Survey

	M	*SD*	Item-rest correlation	If item dropped Cronbach’s α
Q22_1	2.63	1.33	0.39	0.77
Q22_2	2.92	1.41	0.70	0.73
Q22_3	3.13	1.46	0.45	0.76
Q22_4	3.48	1.34	0.44	0.76
Q22_5	3.02	1.45	0.39	0.77
Q22_6	2.92	1.40	0.46	0.76
Q22_7	2.77	1.34	0.41	0.77
Q22_8	2.92	1.36	0.37	0.77
Q22_9	2.92	1.47	0.40	0.77
Q22_10	2.73	1.37	0.45	0.76

It is important to note that two questions from the original survey were removed from this reliability analysis. These items were excluded based on preliminary analysis, which suggested that their removal would enhance the scale's consistency and reliability. Consequently, the results presented here reflect the reliability statistics post-removal, providing a refined perspective on the survey's internal consistency.

The website designed to facilitate the effective use of ChatGPT was developed on Durable, a platform for creating new websites, and was specifically provided to the participants of the experimental group as an intervention. The homepage features a welcoming introduction, outlines the main topics, and includes a section for participants to leave comments or feedback.

The content is structured into three focused training sessions:

1. **Training Session 1: Getting Started with ChatGPT**—This session covers the basics of using ChatGPT for academic purposes.
2. **Training Session 2: Effective Communication with ChatGPT**—Participants learn strategies for effectively engaging with ChatGPT to achieve the desired outcomes.
3. **Training Session 3: Quality Assurance and Feedback** - This session teaches participants how to assess and enhance the quality of responses from ChatGPT for academic tasks.

Additionally, the website recommends several books that are beneficial for further learning. The sources for the website’s content, including these books and selected YouTube channels, are detailed in the "Literature" section.

This website was sent to participants’ emails after the survey and pre-critical thinking test. It was explained that they have three weeks to look through the website and provided literature and ask any questions they have.

Data Analysis Procedures

The influence of ChatGPT usage on students' critical thinking was investigated using a sophisticated, multi-phase analysis that included descriptive and inferential statistical methodologies. Initially, the study used descriptive statistics, such as means, standard deviations, and frequencies, to describe participant characteristics and ChatGPT engagement rates. This foundational step, informed by O'Dwyer and Bernauer's discussion on the importance of summarizing data, provided a baseline understanding of the study cohort and set the stage for deeper inferential analysis (O'Dwyer & Bernauer, 2014). The study then used inferential statistics to determine the efficiency of ChatGPT in improving critical thinking abilities. T-tests were used to assess changes in pre-test and post-test scores and determine the significance of any observed differences.

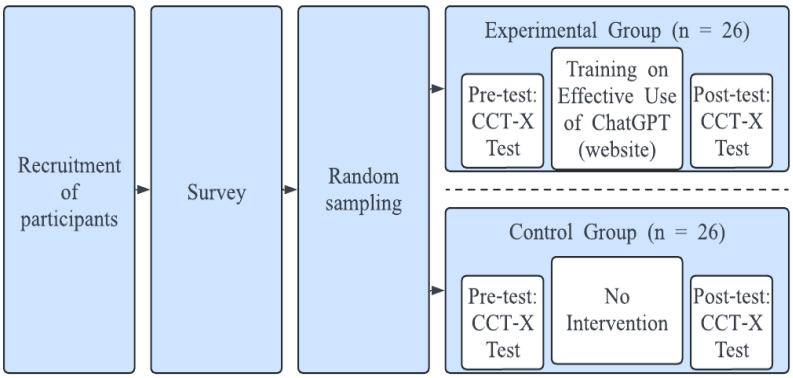
Additionally, the ANOVA test was applied to examine variations across multiple groups, revealing the nuanced effects of ChatGPT interaction on critical thinking across different demographics (O'Dwyer & Bernauer, 2014). Correlation and regression analyses further explored the relationship between ChatGPT use and critical thinking. These analyses allowed for examining predictive relationships and controlling potentially confounding variables, offering more profound insights into how ChatGPT engagement correlated with improvements in critical thinking (O'Dwyer & Bernauer, 2014).

Data Collection Procedure

Figure 1 presents the data collection procedure for examining the ChatGPT's impact on students' critical thinking skills.

Figure 1

Flowchart of the Data Collection Procedure



Note. Adapted from "ChatGPT effects on cognitive skills of undergraduate students: Receiving instant responses from AI-based conversational large language models (LLMs)," by Essel, H. B., Vlachopoulos, D., Essuman, A. B., & Amankwa, J. O., 2024, *Computers and Education. Artificial Intelligence*, 6, 100198-.

The data collection procedure consists of the following steps:

1. **Recruitment of the participants:** A promotional letter was sent to students to ask them to participate in the research. This letter was sent out through chats and public pages on social networks where students are active, such as Telegram and VK.
2. **Getting participants' consent:** Informed consent forms were sent to the participants.
3. **Survey:** The survey collected students' perceptions and experiences regarding ChatGPT usage and its influence on critical thinking skills.
4. **Sampling**: From the total number of students that filled out the survey, 52 students were randomly sampled to participate in the experimental part of the data collection.
5. **Randomly assigning groups into experimental and control groups**: Participants were randomly assigned to two groups.
6. **Pre-test**: Baseline assessment of participants' critical thinking skills with CCT-X.

7. **Experimental Group**: This group received training on how to use ChatGPT effectively: http://usingchatgpteffectively.mydurable.com (see Appendix D).
8. **Control Group**: The control group did not receive specific ChatGPT usage instructions.
9. **Engagement with ChatGPT**: The experimental group interacted with ChatGPT during the instructional intervention for one month.

Following Creswell (2009), Table 3 outlines the notation used in this quasi-experimental design. "R" signifies random assignment, "O_1" denotes the pre-test, "X" represents the experimental group's exposure to the intervention (training), and "O_2" indicates the post-test assessment. Notably, both groups participate in pre-and post-testing, whereas only the experimental group receives the treatment.

Table 3

Quasi-experimental Design Table Regarding the Research Model

Groups	Randomization	Pre-test	Treatment	Post-test
G_E	R	O_1	X	O_2
G_C	R	O_1	-	O_2

Note. G_E = Experimental group

G_C = Control group

R = Randomly assigning into groups

O_1 = Experimental and Control group pre-test application

O_2 = Experimental and Control group post-test application

10. **Post-test**: To ensure reliable measurement of critical thinking skill changes, participants complete a post-test using the same instruments administered previously.

11. **Data Analysis**: Data analysis involved examining pre-test and post-test scores from both groups to assess changes in critical thinking skills. Statistical tests, including t-tests and ANOVA, were employed to compare the experimental and control groups. Correlation and regression analysis were used to investigate possible correlations between variables.
12. **Findings and Discussion**: The results of the data analysis were presented, and implications regarding the impact of ChatGPT instructions on practical usage and its relationship with critical thinking skills were discussed.

Following this quasi-experimental design, the impact of providing instructions on using ChatGPT effectively on students' critical thinking skills can be examined. The comparison between the experimental and control groups will allow for an assessment of the influence of instructions on the participants' utilization of ChatGPT and its impact on critical thinking abilities.

Ethical Considerations

It was essential that the research strictly adhered to ethical considerations. When conducting research, it was crucial to receive informed consent from participants, safeguard them from physical and emotional harm, respect their privacy and anonymity, and maintain strict confidentiality of data (Lichtman, 2013, as cited in O'Dwyer & Bernauer, 2014).

In this research study, the active participation of individuals was entirely voluntary. All participants received a comprehensive informed consent document detailing the study's purpose, significance, potential benefits, and any associated data collection risks. Before engaging in the experiment, each respondent received a detailed informed consent form stating that their involvement was voluntary and that non-participation would entail no repercussions. Participants were assured of their right to withdraw from the study at any

point without penalty. Furthermore, even after the completion of data collection, students could request the removal of their data. However, the survey and the experimental part of the data collection process were not anonymous; participants were asked to write their names and contact numbers, as contact with participants throughout the process was necessary. The consent form provided to participants emphasized their confidentiality and the non-anonymity of responses. That is why letters and numbers were used rather than their real names, ensuring the anonymity of individual responses throughout the study. Their real names were not used in any publications or reports resulting from the study.

The collected data were stored in encrypted files and databases to prevent unauthorized access, and hard copies of documents were kept in a locked drawer. Access to the data was limited to the researcher alone. Strong and unique passwords were employed for all research-related accounts and databases and were updated regularly to enhance security.

After the research concluded and three years after the thesis was completed, data were securely disposed of to maintain confidentiality and protect participants' privacy. Therefore, no identifying information about participants was disclosed to safeguard the identities of the research subjects.

Expected Benefits and Possible Risks

The use of ChatGPT in this study provided multifaceted benefits. Firstly, the study offered a comprehensive understanding of how ChatGPT could be used effectively, providing participants with a practical understanding of its responsible use in an educational context. By imparting this knowledge, participants were empowered to navigate the nuances of ChatGPT, fostering a sense of digital literacy that is critical in today's educational landscape. Secondly, a vital outcome of this research was its potential to develop guidelines and recommendations for the seamless integration of AI

technologies, including ChatGPT, into educational curricula. This knowledge transfer was expected to be particularly useful for teachers, offering them valuable information about how ChatGPT can influence critical thinking skills. This knowledge allowed educators to tailor their teaching methods to suit educational goals, leveraging the power of AI tools to enhance learning. Ultimately, the study aimed to act as a catalyst for educators by equipping them with the tools needed to develop critical thinking abilities among students, thereby preparing them for success in an ever-changing digital world.

The potential risks associated with this research were minimal, primarily centering on the invasion of privacy and keeping confidentiality, as the data collection process was not anonymous. That is why confidentiality was rigorously upheld. Safeguarding participants' privacy and ensuring their data anonymization was paramount, mainly when dealing with sensitive information like critical thinking abilities. Personal details, including participants' names, remained undisclosed to any third party, and robust data security measures were implemented to prevent unauthorized access or breaches.

Additionally, participants in the critical thinking tests might have experienced discomfort or stress. They were informed of their right to opt out of participation at any point if they found it uncomfortable to continue. No punishments or rewards were associated with not completing or completing the critical thinking tests, as participation was voluntary. Furthermore, steps were taken to avoid potential contamination of results due to interactions between members of the experimental and control groups outside the study. To achieve this, students were randomly assigned to either group before the pre-test, with neither the participants nor the researcher having prior knowledge of their group assignment. There were no significant disparities in critical thinking abilities that emerged after the pre-test, which is why groups were left as before.

Finally, introducing new technology such as ChatGPT comes with the potential risk of unintended consequences such as dependency. To address this issue, the study included training sessions that provided participants with practical guidance on how to use ChatGPT.

Summary

In this chapter, the various methodological procedures used within this study are presented. These procedures encompass the research design, data collection methods and procedures, and ethical considerations. Each aspect of the methodology has been thoughtfully selected, with detailed explanations and supporting literature.

Chapter 4.

Findings

Introduction

This chapter presents data on the relationship between the use of ChatGPT and students' critical thinking. Data were collected through a 27-item survey and a 48-item critical thinking test and then analyzed. The results of this analysis, conducted using Jamovi, are displayed in tabular and graphical forms.

The current chapter aims to present the main findings derived from the analysis of data from the above-mentioned survey and critical thinking test. The chapter is divided into three main sections based on the research questions the study seeks to answer, along with relevant findings and appropriate themes. The research questions are presented below:

1. What is the extent of students' engagement with ChatGPT?
2. What are students’ critical thinking levels?
3. What is the relationship between using ChatGPT and students’ critical thinking?

Demographic Characteristics of the Participants

The background information of the respondents will first be presented to provide a broader picture. Overall, 87 undergraduate students participated in the survey. They are first, second, third, and fourth-year students from three schools of one university in Kazakhstan: the School of Engineering and Digital Sciences, the School of Sciences and Humanities, and the School of Mining and Geosciences.

First, the frequency distribution of the students will be presented through an analysis of their ages, gender, majors, class levels, GPAs, and participation in extracurricular activities. The initial step involved removing data from students who chose not to participate did not consent to participation, failed to complete the survey, or left certain relevant sections of the survey incomplete. Out of these 87 participants, 69 completed the survey. However, only 52 respondents completed surveys, including names,

which is essential for the subsequent experimental phase of the research, where their responses were analyzed. Consequently, 52 sets of complete responses remained from the initial 87 students. Table 4 presents the demographic characteristics of the participants, providing context for understanding student engagement in ChatGPT (Research Question 1).

Table 4

Demographic Characteristics of Participants

	Categories	*n*	% of Total
Age	18-20	22	42.31%
	21-23	30	57.69%
Gender	Female	20	38.46%
	Male	22	42.31%
	Prefer not to say	10	19.23%
School	School of Engineering and Digital Sciences	18	34.62%
	School of Sciences and Humanities	21	40.38%
	School of Mining and Geosciences	13	25.00%
Class Level	1	12	23.08%
	2	13	25.00%
	3	13	25.00%
	4	14	26.92%
GPA	1.67-2.00	1	1.92%
	2.01-2.32	0	0
	2.33-2.67	5	9.62%
	2.68-2.99	17	32.69%
	3.00-3.33	17	32.69%
	3.34-3.66	10	19.23%
	3.67-4.00	2	2.85%

As seen in Table 4, most of the participants fall in the 21-23 age category, comprising 57.69% of the sample, indicating that the study mainly involves older undergraduate students. Also, the gender distribution shows more male participants (42.31%), with female participants closely following at (38.46%), while a notable

proportion preferring not to disclose their gender (19.23%), which shows a slight gender imbalance in the sample.

The School of Sciences and Humanities is represented most (40.38%), followed by the School of Engineering and Digital Sciences (34.62%). Additionally, respondents are evenly distributed across the different grade levels, but Level 4 has a slight edge at 26.92%. The GPA ranges widely, with the majority falling between 2.68-3.99, highlighting a broad academic performance spectrum. Notably, 32.69% of participants have GPAs within the 3.00-3.33 range.

The data presented in Figure 2 shows student participation in extracurricular activities: the ratio of students who indicated non-participation (55.77%) is higher than that of those who confirmed participation (44.23%).

Figure 2

Student Participation in Extracurricular Activities

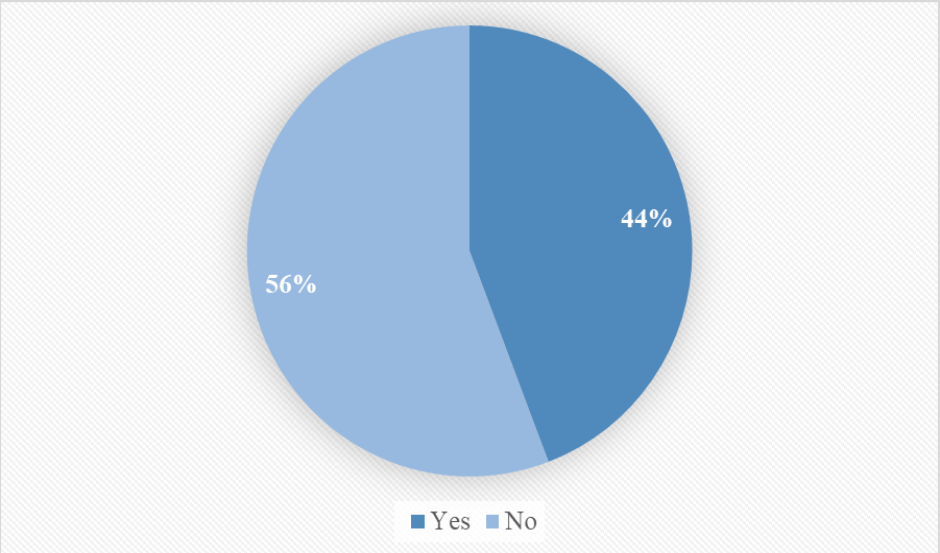


Table 5

Students' Weekly Extracurricular Activity Frequency

Categories	*n*	% of Total
1-3 times per week	11	21
4-6 times per week	6	12

7-10 times per week	3	6
more than 11 times per week	5	10
do not participate	27	52

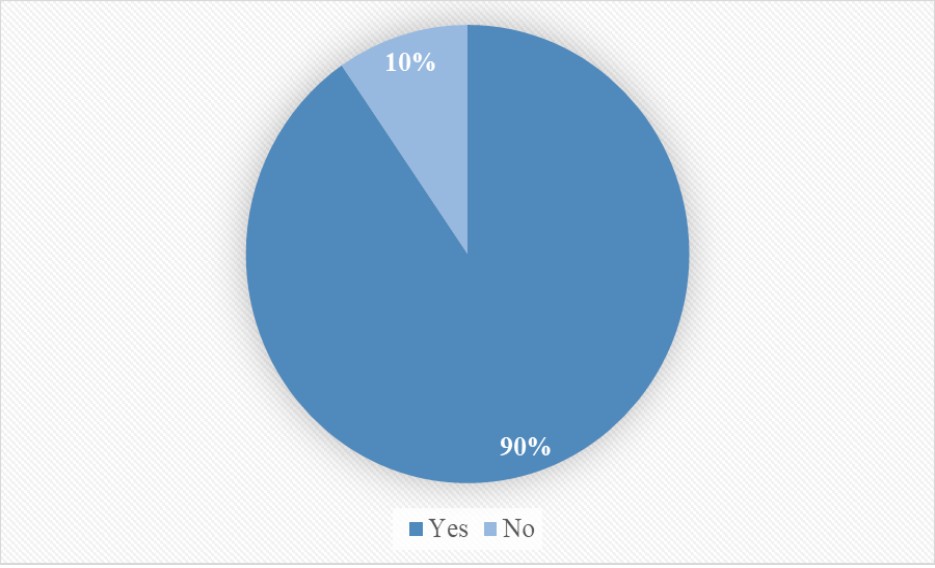
Concerning the frequency of participation, Table 5 provides a detailed view of the student participation in extracurricular activities. It reflects a different distribution across different frequencies of weekly participation. A noticeable majority of active participants, namely 11 students (21%), study 1-3 times a week. Three students (6%) reported participating 7-10 times per week, indicating intense participation. Additionally, five students (10%) participate in extracurricular activities more than 11 times per week. The data also shows that a significant portion of the surveyed students (27 students; 52%) are not involved in extracurricular activities.

Research Question 1: What is the extent of students' engagement with ChatGPT?

Close-ended questions and a Likert-scale questionnaire comprising 10 items regarding students' engagement with ChatGPT were included to address the research question. The answers are presented below using descriptive statistics.

Figure 3

Students Responses on ChatGPT Usage



According to Figure 3, most participants, accounting for 90.4% (47 out of 52), reported using ChatGPT. This overwhelming usage underscores the AI's integration into the students' academic and possibly personal research activities.

Table 6 further segments the interaction with ChatGPT by frequency of use. A notable 31% of students engage with ChatGPT 1-3 times per week, while both the 4-6 times per week and more than 11 times per week categories share an equal distribution of 21% each. A significant 17% reported using ChatGPT 7-10 times per week, indicating a relatively high dependence on the tool. It is critical to note that 10% indicated they do not use ChatGPT at all.

Table 6

Students' Weekly ChatGPT Use Frequency

Categories	*n*	% of Total
1-3 times per week	16	31
4-6 times per week	11	21
7-10 times per week	9	17
more than 11 times per week	11	21
do not participate	5	10

Table 7 presents the descriptive statistics of students' engagement with ChatGPT and its perceived impact on their critical thinking abilities. A Likert scale was employed to capture the students' responses, with the results indicating varying levels of agreement across the items. The data indicate varied perceptions among students regarding the use of ChatGPT. Among the items listed, the highest mean score was reported for the belief that using ChatGPT for academic purposes is considered plagiarism (M = 3.48, SD = 1.34), indicating a significant concern among students about the authenticity of work when using this AI tool.

Table 7

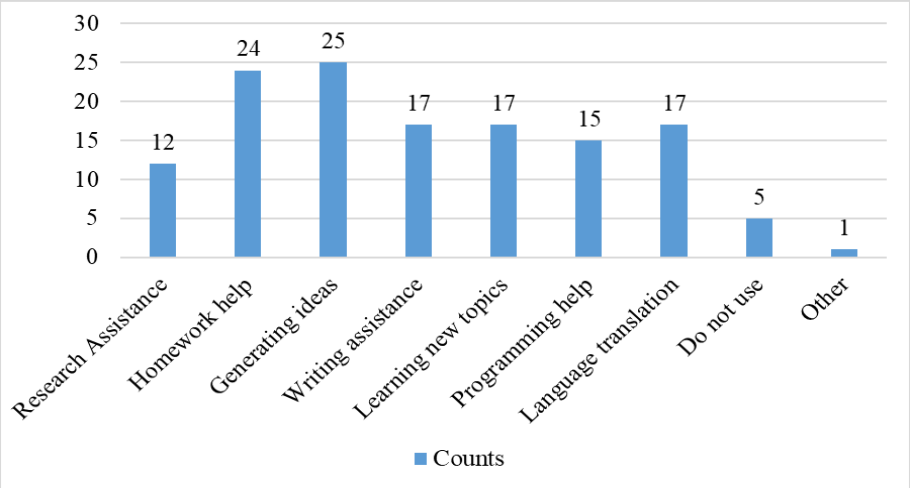
Descriptive Statistics of Students' Engagement with ChatGPT and Its Impact on Critical Thinking

	Items	*M*	*SD*
1	I often cross-reference the information provided by ChatGPT with other sources.	2.63	1.33
2	I think using ChatGPT has affected my motivation to engage in independent research or critical analysis.	2.92	1.41
3	I think the faculty should be involved in explaining how to use ChatGPT correctly.	3.13	1.46
4	I think using ChatGPT for academic purposes is plagiarism.	3.48	1.34
5	I think over-reliance on ChatGPT impacts my ability to evaluate the credibility of sources.	3.02	1.45
6	I experienced cases where ChatGPT provided inaccurate or biased information.	2.92	1.40
7	I know how to use ChatGPT responsibly.	2.77	1.34
8	I use ChatGPT responsibly in a manner that aligns with ethical guidelines and academic integrity.	2.92	1.36
9	My interaction with ChatGPT influenced my ability to form my own opinions on complex topics.	2.92	1.47
10	I think that excessive use of ChatGPT might hinder my long-term critical thinking skills.	2.73	1.37

Additionally, students strongly felt that faculty should be involved in explaining how to use ChatGPT correctly (*M* = 3.13, *SD* = 1.46). Concerns about over-reliance on ChatGPT potentially impacting the ability to evaluate the credibility of sources were also evident (*M* = 3.02, *SD* = 1.45). Conversely, the item with the lowest mean score indicates that students less frequently cross-reference the information provided by ChatGPT with other sources (*M* = 2.63, *SD* = 1.33).

Figure 4

Purposes for Using ChatGPT Among Students



The investigation into students' use of ChatGPT revealed different applications of the tool for various academic activities. As can be seen in Figure 4, the most prominent use is to generate ideas (*n* = 25). This was closely followed by 'Homework help' (*n* = 24), suggesting its perceived use in providing support outside classroom settings.

It is also significant to note that five students reported not using ChatGPT, raising questions about the barriers to adoption. Finally, in the 'Other' category, one student answered “Comprehensive answer on topics of interest (study, career, general knowledge).”

Table 8

Frequency of ChatGPT Use for Academic Purposes

Categories	*n*	% of Total
Daily	41	79
Weekly	5	10
Monthly	1	2
Rarely	5	10

When focusing on using ChatGPT specifically for academic purposes, as detailed in Table 8 – 79% of the respondents reported using ChatGPT daily, which may suggest a high dependency on AI for academic support. The weekly and monthly usage is 10% and 2%, respectively, with an additional 10% reporting rare usage. These numbers suggest a trend towards incorporating ChatGPT into academic tasks regularly.

Research Question 2: What are students’ critical thinking levels?

This section thoroughly examines undergraduate students' critical thinking levels to investigate Research Question 2. The analysis begins with descriptive statistics, offering a baseline understanding of the student's abilities. This is followed by a paired t-test, which probes the connection between students' critical thinking levels. The findings from these analyses are presented in the sections that follow.

Descriptive Statistics of Undergraduate Students' Critical Thinking Levels

First, Table 9 presents the scale reliability statistics of the critical thinking test used in this study. The internal consistency of the test, as measured by Cronbach's alpha, was 0.82, suggesting a high level of reliability. The statistics (M = 0.55, SD = 0.16) indicate that while the individual differences in critical thinking levels were present, they were not widely varied, denoting a relatively narrow dispersion of scores around the mean. The high Cronbach's alpha value and the low standard deviation indicate that the critical thinking test is reliable and yields consistent scores across undergraduate students.

Table 9

Scale Reliability Statistics of CCT-X Test

M	*SD*	Cronbach's α	*N*
0.55	0.16	0.82	48

Table 10 details the descriptive statistics for pre-test and post-test scores in both control and experimental groups.

Table 10

Descriptive Statistics for Pre-Test and Post-Test Scores in Control and Experimental Groups

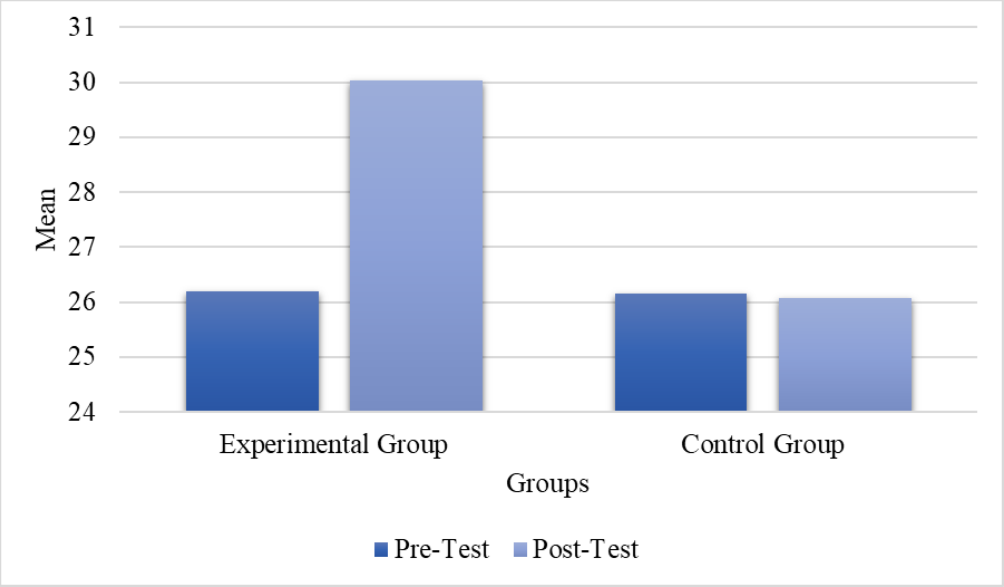
Statistic		Control Group		Experimental Group		Total Results	
		Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
n		26	26	26	26	52	52
M		26.15	26.08	26.19	30.04	26.17	28.06
SE		1.73	1.72	1.35	1.57	1.09	1.19
SD		8.83	8.78	6.90	7.99	7.84	8.55
Min		16.00	15.00	16.00	19.00	16.00	15.00
Max		44.00	42.00	39.00	43.00	44.00	43.00
Skewness	Skewness	0.71	0.60	0.26	0.14	0.56	0.29
	SE	0.46	0.46	0.46	0.46	0.33	0.33

As seen in Table 10, in the experimental group, there was a noticeable increase in the mean score from the pre-test (*M* = 26.19) to the post-test (*M* = 30.04), which is visually represented in Figure 5 as a significant rise in the height of the bar corresponding to the post-test, suggesting an improvement following the experimental conditions. The control group, however, showed little decrease, with a pre-test mean of 26.15 and a post-test mean of 26.08.

The total results combining both groups also reflected an increase from the pre-test (*M* = 26.17) to the post-test (*M* = 28.106). This overall enhancement in post-test scores may indicate the effectiveness of the experimental intervention. Skewness for the total results decreased from the pre-test (0.56) to the post-test (0.29), suggesting a distribution that more closely resembles a normal curve in the post-test.

Figure 5

Pre-Test and Post-Test Mean Scores Comparisons Between Experimental and Control Groups



Note. For the experimental group, the mean pre-test score is 26.19, and the post-test score is 30.04. For the control group, the mean pre-test score is 26.15, and the post-test score is 26.18.

Students' Pre-Test and Post-Test Score Comparison for Control and Experimental Groups

This section details the outcomes of pre-test and post-test evaluations for the control and experimental groups. To examine the intervention's effects, two paired sample t-tests were conducted for the control and experimental groups (see Table 12.)

Table 11

Paired Samples T-test Results: Students' Pre-Test and Post-Test Score Comparison for Control and Experimental Groups

Group		Paired Difference				*t*	*df*	*p*
		M	*SE*	95% Confidence Interval				
				Lower	Upper			
Control	Pre-Test-Post-Test	0.08	0.08	-0.64	0.80	0.22	25.00	0.828
Experimental	Pre-Test-Post-Test	-3.85	0.55	-4.97	-2.72	-7.05	25.00	< .001

Note. $H_a\ \mu_{\text{Measure 1 - Measure 2}} \neq 0$

[a] 7 pair(s) of values were tied

In Table 11, for the experimental group, the mean scores from the pre-test to the post-test showed a significant change (M = -3.85, SE = 0.55, $t(25)$ = -7.05, $p < .001$), which was statistically significant. This indicates a significant increase in the scores of the experimental group from pre-test to post-test, supporting the hypothesis that there was a significant effect due to the experimental conditions. However, the control group t-test does not show a statistically significant difference in the scores (M = 0.08, SE = 0.08, $t(25)$ = 0.22, p = .828). This indicates no significant change in the measure before and after the control condition.

Between-Group Comparisons of Critical Thinking Scores

Prior to conducting the main analyses, preliminary tests were performed to assess the data's adherence to the assumptions of normality and homogeneity of variances. As shown in Table 12, the Shapiro-Wilk test indicated that scores were not normally distributed for both the pre-test ($W = 0.89$, $p < .001$) and post-test ($W = 0.91$, $p < .001$) assessments. Levene's test confirmed the homogeneity of variances, with non-significant results for both pre-test ($F = 2.92$, $p = .093$) and post-test ($F = 0.35$, $p = .556$) scores. This satisfies the assumption of equal variances between the two independent groups. Given the violation of the normality assumption, the non-parametric Mann-Whitney U test was employed to compare critical thinking scores between the control and experimental groups. The results of this test are presented in Table 13.

Table 12

Assumptions of Between-Group Comparisons of Critical Thinking Scores

Assessments	Normality Test (Shapiro-Wilk)		Homogeneity of Variances Test (Levene's)	
	W	*p*	*F*	*p*
Pre-test	0.89	< .001	2.92	.093
Post-test	0.91	< .001	0.35	.556

There was no statistically significant difference in pre-test scores between the groups ($U = 329.50$, $p = .883$, $r = .03$), indicating that the groups were comparable at baseline. However, post-test scores showed a statistically significant difference ($U = 228.00$, $p = .045$, $r = .33$), with the experimental group demonstrating a mean rank higher than that of the control group. These findings indicate that the intervention was associated with differences in critical thinking scores between the groups. The effect size ($r = .33$) was moderate, suggesting that the difference observed between the groups may have practical significance.

Table 13

Mann-Whitney U Test: Results for Between-Group Pre-Test and Post-Test Critical Thinking Scores

Assessments	*U*	*p*	Mean difference	95% Confidence Interval		*r*
				Lower	Upper	
Pre-test	329.50	0.883	0.00	-3.00	4.00	0.03
Post-test	228.00	0.045	4.00	0.00	9.00	0.33

Research Question 3: What is the relationship between using ChatGPT and students' critical thinking?

To address this question, the study investigates differences in critical thinking scores among students categorized by their frequency and manner of ChatGPT use. The investigation involved creating targeted survey items to measure how interactions with ChatGPT might influence students' abilities to analyze, evaluate, and synthesize information. Data collected from these survey questions and critical thinking tests help identify differences in critical thinking across different user groups. The section will present a comprehensive statistical analysis, including applying t-tests, non-parametric tests, ANOVA, multiple regression, and chi-square tests to assess the differences in critical thinking scores associated with various patterns of ChatGPT usage and other relevant factors.

The Relationship between Students' Critical Thinking and Using ChatGPT

The purpose of the analysis was to determine whether there were significant differences in student critical thinking test scores associated with ChatGPT use. The comparison involved the mean scores of students who used ChatGPT versus those who did not. Table 14 shows that preliminary tests for parametric analysis indicated significant

deviations from normality for both pre-test and post-test results. The Shapiro-Wilk test indicated a violation of normality (pre-test: $W = 0.89$, $p < .001$; post-test: $W = 0.93$, $p = .004$). Levene's test showed homogeneity of variances for the pre-test ($F = 2.78$, $p = .102$) but indicated a violation for the post-test ($F = 5.38$, $p = .025$). Given the violations of these two key assumptions, a nonparametric test was considered more appropriate for data analysis (see Table 15).

Table 14

Assumptions of Students' Critical Thinking and Using ChatGPT

Assessments	Normality Test (Shapiro-Wilk)		Homogeneity of Variances Test (Levene's)	
	W	*p*	*F*	*p*
Pre-test	0.89	< .001	2.78	.102
Post-test	0.92	.003	8.35	.006

Consequently, the Mann-Whitney U test assessed the difference in critical thinking scores. As can be seen in Table 15, the results revealed a statistically significant difference in the critical thinking scores after using ChatGPT. Specifically, for the pre-test, a significant difference was observed between the groups ($U = 17.00$, $p = .002$). The post-test results also showed a significant difference ($U = 8.50$, $p < .001$), further supporting a notable association between ChatGPT use and differences in student's critical thinking skills.

Table 15

Mann-Whitney U Test: Results of Students' Critical Thinking Scores and Using ChatGPT

Assessments	*U*	*p*		95% Confidence Interval		*r*
			Mean difference	Lower	Upper	
Pre-test	17.00	0.002	-14.00	-20.00	-7.00	0.86
Post-test	13.50	0.001	-16.00	-21.00	-6.00	0.89

The Relationship between Students' Critical Thinking Test and Class Levels

The Kruskal-Wallis test and a one-way ANOVA with Welch's correction were used to evaluate the association between students' pre and post-critical thinking scores and their class levels. As seen in Table 16, for the pre-test, it was found to be a borderline violation of the homogeneity of variances assumption, as revealed by Levene's test, $F = 2.76$, $p = .052$. Additionally, the Shapiro-Wilk test suggested a marginal deviation from normality, $W = 0.96$, $p = .063$. However, the post-test did not pass the normality test ($W = 0.95$, $p = .46$), so the non-parametric Kruskal-Wallis test was used to assess differences after the intervention (see Table 20.)

Table 16

Assumptions of Students' Critical Thinking Test and Class Levels

Assessments	Normality Test (Shapiro-Wilk)		Homogeneity of Variances Test (Levene's)	
	W	*p*	*F*	*p*
Pre-test	0.96	.063	2.76	.052
Post-test	0.95	.0.46	0.22	.885

Table 17 shows that the analysis revealed a statistically significant difference in pre-critical thinking scores among the different class levels, Welch's $F(3, 25.83) = 3.63$, $p = .026$.

Table 17

One-Way ANOVA: Results of Students' Pre-critical Thinking Test Scores and Class Levels

	F	*df1*	*df2*	*p*
Pre-test	3.63	3	25.83	0.026

Table 18

Group Descriptives: Pre-Test

Class Level	*n*	*M*	*SD*	*SE*
1	12	23.33	6.64	1.92
2	12	25.17	8.21	2.37
3	13	23.46	5.04	1.40
4	15	31.60	8.28	2.14

Table 19 displays post-hoc comparisons using the Tukey Honestly Significant Difference (HSD) test, which revealed that the mean score for class level 4 (*M* = 31.60, *SD* = 8.28) was significantly higher than for class level 1 (*M* = 23.33, *SD* = 6.64) (see Table 18), mean difference = -8.27, *p* = 0.024, and class level 3 (*M* = 23.46, *SD* = 5.04), mean difference = -8.14, *p* = 0.023. No other class-level comparisons were statistically significant in the pre-test.

Table 19

Tukey Post-Hoc Test: Pre-Test

		1	2	3	4
1	Mean difference	—	-1.83	-0.13	-8.27*
2	Mean difference		—	1.71	-6.43
3	Mean difference			—	-8.14*
4	Mean difference				—

Note. p < 0.05*

Table 20

Kruskal-Wallis Test for Post-Test

χ^2	*df*	*p*	ε^2
10.95	3	0.012	0.21

A Kruskal-Wallis test examined the post-test differences in critical thinking scores across various class levels. In Table 20, The Kruskal-Wallis test showed a significant difference in scores between class levels, $\chi^2(3) = 10.95$, $p = 0.012$, with an effect size of $\varepsilon^2 = 0.21$. The significant result from the Kruskal-Wallis test aligns with the pre-test findings from Welch's ANOVA. Students in higher class levels exhibited higher critical thinking scores, suggesting an association between class level and the development of critical thinking skills.

The Relationship between Students' Critical Thinking and the Frequency of ChatGPT Usage

Because the normality assumption was not met, the Kruskal-Wallis test was used to analyze the effect of ChatGPT usage frequency on students' critical thinking test scores prior to the intervention. Table 21 shows statistically significant findings from the Kruskal-Wallis test for the pre-test ($\chi^2(4) = 16.30$, $p = 0.003$, with an effect size of $\varepsilon^2 = 0.32$). The same results indicated the post-test ($\chi^2(4) = 15.19$, $p = 0.004$, with an effect size of $\varepsilon^2 = 0.30$).

Table 21

Kruskal-Wallis Test: Results of Students' Critical Thinking Scores and the Frequency of ChatGPT Usage

Assessment	χ^2	*df*	*p*	ε^2
Pre-Test	16.30	4	0.003	0.32
Post-Test	15.19	4	0.004	0.30

Table 22

Group Descriptives for Pre-Test

Categories	*n*	*M*	*SD*	*SE*
more than 11 times per week	11	20.91	3.33	1.00
1-3 times per week	16	27.75	6.95	1.74
7-10 times per week	9	25.56	9.50	3.17

4-6 times per week	11	24.27	6.31	1.90
do not use ChatGPT	5	38.00	4.85	2.17

Group descriptive statistics, in Table 22, provide insight into the differences in pre-critical thinking test scores across varying frequencies of ChatGPT usage (see Table 20.) Notably, the highest mean score was observed among students who did not use ChatGPT (*M* = 37.60; *SD* = 6.27; *SE* = 2.80). Conversely, the lowest mean score was reported by students who used ChatGPT more than 11 times per week (*M* = 18.73; *SD* = 3.32; *SE* = 1.00). Similar patterns were observed in the post-test results.

The Relationship between Students' Critical Thinking and Gender

To investigate the distribution of critical thinking test scores among students, the scores were categorized into three groups based on tertiles, representing low, medium, and high achievement levels. The tertiles were determined by calculating the 33rd and 66th percentiles of the dataset, resulting in the following classifications: scores of 21 and below were categorized as 'Low,' scores between 22 and 30 were designated as 'Medium,' and scores above 30 were classified as 'High.'

As seen in Table 23, this categorization yielded 18 students in the 'Low' group, 16 in the 'Medium', and 18 in the 'High' group. A chi-square test was conducted to assess the distribution of critical thinking skills across different genders, as displayed in Table 24.

Table 23

Contingency Table of Students' Critical Thinking and Gender

Critical thinking skill	Male	Female	Not given
Low	6 (33%)	6 (33%)	6 (33%)
Medium	7 (44%)	9 (56%)	0
High	9 (50%)	5 (28%)	4 (22%)
Total	22 (42%)	20 (38%)	10 (19%)

As shown in Table 24, the chi-square test found no statistically significant relationship between gender and critical thinking skills, $\chi^2(4) = 7.60$, $p = 0.107$.

Table 24

A chi-square Test Result: Students' Critical Thinking and Gender

χ^2	*df*	*p*
7.60	4	0.107

The Relationship between Students' GPA and other Predictors

A linear regression analysis was conducted to investigate the predictors of students' GPA, using a model that included age, gender, class level, school, critical thinking skill, and frequency of ChatGPT usage. The model was significant, accounting for 65% of the variance in GPA, $R = 0.81$, $R^2 = 0.65$, $F(14, 37) = 4.95$, $p < .001$.

Table 25

Linear Regression Model for Predicting Students' GPA

R	R^2	*F*	*df1*	*df2*	*p*
0.81	0.65	4.95	14	37	< .001

As shown in Table 26, the model revealed that high critical thinking skill was a significant positive predictor of GPA; students with high critical thinking skills scored 1.92 points higher than those with low skills, $t(37) = 5.50$, $p < .001$. The frequency of ChatGPT usage also emerged as a significant predictor. Compared to students using ChatGPT more than 11 times per week, those who did not use ChatGPT had a GPA of 1.13 points higher, $t(37) = -2.75$, $p = .009$. Additionally, using ChatGPT 1-3 times per week, 4-6 times per week, and 7-10 times per week was associated with a GPA increase of 0.76, 0.85, and 1.13 points, all with p-values of .042.

Table 26

Linear Regression Coefficients for Predictors of Student GPA

Predictor	Categories	Estimate	*SE*	*t*	*p*
Intercept [a]		4.84	0.44	10.27	< .001
Age	21-23 – 18-20	0.26	0.26	0.98	0.332
Gender	Female – Male	0.13	0.28	0.48	0.636
	Prefer not to say – male	-0.42	0.35	-1.21	0.233
School	School of Engineering and Digital Sciences – School of Sciences and Humanities	-0.16	0.29	-0.54	0.591
	School of Mining and Geosciences – School of Sciences and Humanities	-0.26	0.31	-0.85	0.400
Class Level	2 – 1	-0.23	0.37	-0.63	0.529
	3 – 1	0.21	0.34	0.62	0.536
	4 – 1	0.72	0.40	1.80	0.080
Critical thinking skill	High – low	1.92	0.35	5.50	< .001
	Medium-low	0.19	0.34	0.57	0.570
Use of ChatGPT	Yes – No	-1.19	0.56	-2.14	0.039
ChatGPT use frequency	1-3 times per week – more than 11 times per week	-0.76	0.36	-2.11	0.042
	7-10 times per week – more than 11 times per week	-0.85	0.40	-2.10	0.042
	4-6 times per week – more than 11 times per week	-1.13	0.41	-2.75	0.009
	do not use ChatGPT – more than 11 times per week	NaN	NaN	NaN	NaN

Note. The linear model contains aliased coefficients (singular fit)

[a] Represents reference level

No other variables in the model, including age, gender, class level, or school of study, were significant predictors of GPA.

Effect of Training on Critical Thinking Abilities

Due to the failure to meet the normality assumption for critical thinking score distributions, a non-parametric approach was used. The Mann-Whitney U test was used to assess the differences in critical thinking scores between the control and experimental groups. The analysis found statistically significant differences across the two groups. As

demonstrated in Table 27, the findings revealed a statistically significant difference between the groups ($U = 179.00$, $p = .003$). According to Cohen's guidelines, the effect size was 0.47, indicating a medium effect.

These findings suggest that the students in the experimental group, who received the intervention, generally scored higher on the critical thinking test than those in the control group, as further detailed in Table 28.

Table 27

Mann-Whitney U Test: Comparison of Change in Critical Thinking Scores Between Control and Experimental Groups

U	*p*	Mean difference	95% Confidence Interval		r
			Lower	Upper	
179.00	0.003	2	1.00	3.00	0.47

Table 28

Descriptive Statistics for Change in Critical Thinking Scores in Control and Experimental Groups

Group Identity	*n*	*M*	*SD*	*SE*
Experimental	26	2.08	2.65	0.52
Control	26	-0.08	1.79	0.35

Table 28 shows descriptive data on the change in critical thinking scores. The experimental group ($n = 26$) had a mean increase of 2.08 ($SD = 2.65$, $SE = 0.52$) in their scores, while the control group ($n = 26$) showed a mean change of -0.08 ($SD = 1.79$, $SE = 0.35$). These descriptive findings supplement the Mann-Whitney U test results, indicate differences in critical thinking score changes between the groups under the experimental conditions.

Summary

This chapter reported the results of this investigation. It was found that there is a high engagement with ChatGPT among students, with a notable percentage using it daily for academic purposes, which is associated with lower critical thinking scores. Additionally, perceptions of ChatGPT's impact were generally positive, with students recognizing the tool's contribution to their academic and cognitive growth and acknowledging the necessity for critical engagement to maximize benefits.

Further analysis showed that higher critical thinking skills were associated with higher GPAs, and variations in the frequency of ChatGPT usage were linked to differences in these outcomes. It was an improved scores in the experimental group compared to the control group. These results suggest that while AI tools like ChatGPT are becoming an integral part of student's academic environments, their influence on educational outcomes, such as critical thinking and academic performance necessitates thoughtful consideration and implementation.

Chapter 5.

Discussion

Introduction

The following section discusses an in-depth analysis of the data reported in the preceding chapter, which focuses on addressing the research questions of the study. The study's aim is to explore the connection between students' engagement with ChatGPT and their critical thinking skills, which represents a significant addition to the academic discourse on educational technology. By comparing the findings to current research, the discussion provides insight into the dual nature of AI in HE. In light of these discussions, subsequent sections will interpret existing research results, explore the study's implications for educational policy and practice, and situate the research within a broader theoretical context.

Balancing Benefits and Challenges: Integrating ChatGPT in Academic Settings

The investigation into the students' engagement with ChatGPT reveals its substantial integration into students' academic pursuits, reflecting broader digitalization trends in HE. A significant majority of students (90.4%) use ChatGPT for academic tasks ranging from idea generation to homework assistance, indicating the tool's integration use in supporting and extending learning beyond traditional classroom settings. This aligns with Sarofian-Butin (2024), highlighting ChatGPT's diverse educational application, from assisting in understanding complex subjects to improving writing skills and conducting preliminary research. According to Zhai (2022) and Kasneci et al. (2023), ChatGPT's position as a virtual guide is personalized to student needs, allowing students to receive personalized responses and make suggestions based on their previous performance, desires, and learning progress, demonstrating its transformative potential in academic contexts. This widespread usage emphasizes ChatGPT's vital contribution to digitalization in higher education, mirroring Watson and Romic's (2024) findings on the increasing use of AI in scholarly research and

learning. Additionally, about 79% of students use ChatGPT for academic purposes on a daily basis, indicating a high dependency on AI for academic support, a trend also observed by Guo and Lee (2023). However, this engagement pattern also shows the changing landscape of educational resources, where AI tools like ChatGPT are becoming indispensable student aids. The inclusion of ChatGPT in academic settings has underscored a transformative shift in how students approach learning.

Moreover, students expressed a positive disposition towards ChatGPT, appreciating its user-friendly interface and the instant feedback it provides, enhancing their learning experience and contributing to their academic growth. The recognition of ChatGPT as a beneficial educational tool suggests that students have developed a positive emotional connection with this technology, viewing it as a reliable and helpful companion in their learning journey, a sentiment supported by Chan et al. (2023). Users not only find the interaction with ChatGPT stimulating and fun but also appreciate the gamified experience it offers, where the anticipation of receiving responses from an AI feels thrilling. This hedonic motivation aspect has been instrumental in shaping users' generally favorable and significant attitudes toward technology (Tiwari et al., 2023).

While the tool facilitates personalized learning experiences and is a valuable resource for enhancing academic competencies, it also introduces challenges such as potential over-reliance and concerns over academic integrity. It is essential to note the concern about students' frequent usage of ChatGPT in their academic life without knowing the ethical considerations and how to use it effectively. Though students showed a high agreement in a statement that using ChatGPT for academic purposes is plagiarism, it was also noted that the number of students who cross-reference the information that ChatGPT provided is low, reflecting a worry in developing critical digital literacy skills (Day, 2023). Other studies looked at plagiarism not from the student’s side but from ChatGPT’s side. Gašević et al.

(2023) argue that ChatGPT encourages plagiarism and cheating by producing replies comparable to existing sources, while Tlili et al. (2023) highlight its susceptibility to generating false information and democratizing plagiarism. In addition, there is a lack of trustworthiness, incorrect data, skewed material, inability to judge source credibility, lack of ethical worries, lack of human interaction, and an elevated level of learners' reliance on the chatbot (Kasneci et al., 2023; Zhai, 2022). ChatGPT can generate publishable content with fabricated data, posing a significant threat to the reliability of scientific literature (Liebrenz et al., 2023). In parallel, the results of the present study revealed that the agreement on the overreliance on ChatGPT impacts their ability to evaluate the credibility of sources is high. These results raise considerations on academic integrity and reflect ongoing debates in the literature regarding the ethical use of AI in education (Wu et al., 2023). It also mirrors the ethical considerations raised by Day (2023), who cautioned against the uncritical acceptance of AI-generated content and emphasized the importance of verifying the accuracy and authenticity of such materials. The ethical implications of using AI technologies like ChatGPT in education encompass data privacy and bias concerns. Data privacy issues arise from collecting, storing, and processing personal information, where there is a risk of unauthorized access or misuse (Wu et al., 2023). Bias in AI algorithms, on the other hand, can lead to unfair or discriminatory educational outcomes, reflecting the data on which these systems are trained (Zhai, 2022). Addressing these ethical problems necessitates strong data protection measures as well as continual attempts to detect and reduce bias in AI systems, resulting in fair and safe learning environments.

In addition, students' opinions about how the use of ChatGPT influenced their motivation to engage in independent research or critical analysis is high. Although it is unclear whether it affected their motivation positively or negatively, Kasneci et al. (2023) assumed that using ChatGPT might result in simplifying the process of getting information,

which has an adverse effect on students' motivation to conduct independent research and get at their conclusions or solutions. Kooli (2023) says that giving students new and sophisticated issues to address can boost their interest and motivation in a course.

In conclusion, while ChatGPT offers significant advantages for academic engagement and learning, balancing its benefits against the challenges it presents is crucial. It is crucial to develop strategies that encourage responsible use of ChatGPT while harnessing its potential to personalize learning and enhance student engagement. A multifaceted approach is necessary to address data privacy concerns and bias in AI algorithms. Integrating workshops on critical digital literacy can equip students to identify and evaluate potential biases in AI-generated content and encourage transparency and ethical considerations when interacting with AI tools. Furthermore, educators can explore pedagogical approaches that leverage ChatGPT's capabilities while promoting independent thinking and research skills. This might involve using ChatGPT as a springboard for further research or critical analysis tasks. Future research should also focus on establishing ethical guidelines for AI use in academia for every HEI, enhancing critical digital literacy, and examining the impact of AI tools like ChatGPT on students' motivation for independent learning.

By acknowledging ChatGPT's benefits and drawbacks, educators and students can work together to use this technology responsibly and create a more effective and ethical learning environment.

The Impact of ChatGPT on Critical Thinking Skills: A Cause for Concern with the Potential for Improvement?

Critical thinking, the foundation of intellectual growth and a pivotal skill in academic and professional contexts (Facione, 2011), is increasingly becoming the center of educational discourse, especially with rapidly evolving AI. As educators and students

navigate the growing landscape of AI tools like ChatGPT, understanding their implications for critical thinking skills has never been more important. The study reveals a correlation between high ChatGPT usage and lower critical thinking scores among students, raising critical questions about the impact of AI tools on education. These results contribute to the ongoing debate about the impact of AI tools on learning and cognitive development in educational settings.

The study's results demonstrate a clear link between the frequency of ChatGPT use and critical thinking performance. Students who reported using ChatGPT more than 11 times a week displayed the lowest pre-test critical thinking scores. Conversely, students who abstained from using ChatGPT achieved the highest average scores. This pattern underscores a potential cause-and-effect relationship, where frequent reliance on ChatGPT might weaken critical thinking abilities. Several mechanisms might explain this correlation. ChatGPT's ability to provide quick and accessible answers might discourage users from engaging in the deeper cognitive processes typically involved in critical thinking, such as analysis, evaluation, and synthesis of information (Facione, 2011). For example, students accustomed to receiving summaries from ChatGPT might struggle with the more nuanced task of critically reading primary sources (Kooli, 2023). Furthermore, the convenience of ChatGPT could lead students to bypass traditional, more demanding academic tasks, such as conducting independent research and formulating their own conclusions (Kasneci et al., 2023). This aligns with Putra et al.'s (2023) argument that overreliance on AI tools might impede the development of independent cognitive skills. Also, by making knowledge acquisition easier, ChatGPT may inadvertently increase feelings of laziness and discourage students from conducting research and formulating conclusions or solutions' (Kasneci et al., 2023). Limitations of the model itself raise additional concerns. ChatGPT's dependence on pre-existing data and algorithms can lead to the generation of partially original ideas and

potentially biased information (Putra et al., 2023). According to Kooli (2023), this might have a negative effect on critical thinking since it prevents the development of creative thinking abilities and the capacity to make informed judgments based on reputable sources.

However, this is not the whole picture. The research findings regarding the effectiveness of training on the use of ChatGPT effectively add another layer of discussion. The marked improvement in critical thinking test scores demonstrated by the experimental group after the intervention suggests that equipping students with skills to evaluate and critically use ChatGPT may improve students' critical thinking skills. The ways of using ChatGPT emphasize the importance of how this tool can be integrated into educational contexts.

This aligns with perspectives like those of Cotton et al. (2023), who suggested that LLMs can act as “thinking partners,” prompting users to formulate questions, evaluate different perspectives, and refine their arguments. Similarly, Wu et al. (2022) argue that LLMs can be valuable tools for brainstorming and idea generation, encouraging users to think creatively and critically analyze the outputs generated by the model. These authors highlight the potential of ChatGPT to create a more interactive learning environment by promoting a deeper understanding of topics and fostering critical, creative, and reflective thinking, significantly enhancing learning outcomes by providing personalized feedback (Sok & Heng, 2023). This means that with proper guidance and strategic use, ChatGPT can be a powerful tool that supports the development of students’ critical thinking skills.

Moreover, the idea that educators can use ChatGPT as a tool for conducting critical analysis, particularly in tasks that encourage comparison and contrast of information from the model with traditional sources, resonates with the recommendations of Haque (2022). They emphasize the critical balance between technological integration and the development of foundational academic skills, advocating for using technology to complement rather than

replace traditional learning methods. The discussion also references Essel et al. (2024), who highlight the role of AI in enhancing active learning and engagement, suggesting that technology, when used effectively, can support a shift towards more student-centered educational approaches that prioritize learner autonomy and active participation, promoting a deeper understanding of topics through interactive learning experiences. However, the potential downsides, such as the impact on self-discipline and independent thinking of students highlighted by Essel et al. (2024) and the influence of student attitudes towards technology on its adoption and use in educational settings (Abdaljaleel et al., 2024), provide a more comprehensive view of the challenges associated with integrating ChatGPT into learning environments.

Furthermore, the results highlight the need for faculty involvement in properly guiding students in using AI tools. The study conducted by Guo and Lee (2023) provides a compelling insight into this dynamic, showcasing significant improvements in students' confidence and critical thinking abilities when ChatGPT is thoughtfully incorporated into instructional practices. This finding not only underscores the potential of ChatGPT as a valuable educational resource but also highlights the indispensable role of faculty in guiding its effective use. As suggested by Kirschner et al. (2006), the effectiveness of educational technology is significantly influenced by how it is deployed within the learning environment. The call for faculty involvement in guiding the correct use of ChatGPT highlights the necessity for an informed approach to incorporating AI in learning environments. This guidance extends beyond mere technological integration to foster self-regulatory strategies and ethical considerations among students (Hyytinen et al., 2024), advocating for a balanced, informed approach to the educational use of ChatGPT. Guo and Lee (2023) suggested implementing a three-staged, ChatGPT-based activity designed to enhance students' critical thinking skills within educational settings. The activity begins with an Introduction and

Exploration stage, where students familiarize themselves with ChatGPT and its functionalities. This is followed by the Application and Analysis stage, where students engage in a research assignment using ChatGPT to explore and analyze a topic related to their course. The final stage, Reflection and Synthesis, involves students refining their work based on peer feedback and reflecting on their learning experience, focusing on integrating AI into their knowledge-acquisition process. This structured approach emphasizes the importance of faculty guidance throughout, encouraging ethical engagement and critical analysis of AI-generated content. However, the journey has its challenges. Guo and Lee's (2023) study sheds light on several limitations and potential pitfalls, such as the risk of encountering misinformation and the overarching need for comprehensive educator training to enhance the quality of ChatGPT interactions. Educators play a crucial role in navigating these complexities, ensuring that students not only benefit from the advantages offered by ChatGPT but also remain aware of its limitations and potential pitfalls.

There are other exciting examples of integrating AI into the educational environment that represent a new approach to improving teaching and learning. One of them is the inclusion of ChatGPT as a student in a course in the College of Education and Human Development at the University of Nevada. This innovative strategy aims to deepen future educators' understanding of the potential impact of AI on teaching methods through gamification in the classroom environment (Hanlon, 2024). This online second language acquisition course uses an innovative pedagogical approach with a competitive element. Students compete against ChatGPT to outperform it on weekly assignments designed to assess their proficiency in the target language. The next innovative educational experiment was at Ferris State University, which announced its plan to enroll two chatbot “students” in its classes, too. The initiative seeks to understand how AI can contribute to learning processes and educational outcomes, marking a significant step towards incorporating

technological advancements in HE (Young, 2024). They want to use AI as a simulant of different students, for example, those who struggle with a specific topic, and get feedback from AI on what a teacher can do to solve the problem, as students often do not do it. Even if these innovative methods have not yet been fully studied, and it is not clear how they will affect students, these are good examples of how ChatGPT can be integrated into the classroom.

While the findings highlight an association between high ChatGPT use and lower critical thinking scores, they cannot definitively establish causation. Factors such as the student's prior critical thinking skills, specific uses of ChatGPT or other AI tools, and other external variables were not fully controlled, which could influence the outcomes. Does frequent ChatGPT use lead to a decline in critical thinking skills, or are students with weaker critical thinking skills more likely to turn to ChatGPT as a shortcut? Because of these questions, further research using a longitudinal design or experimental interventions would help clarify the causality and mechanisms underlying these observations.

These findings underscore the importance of a balanced approach to incorporating AI technologies like ChatGPT in educational contexts. Educators and curriculum designers might consider strategies for integrating ChatGPT as a supplement to traditional learning methods, focusing on activities that encourage critical engagement with content and the development of critical thinking skills rather than replace traditional learning and critical thinking exercises. Developing strategies that focus on critical engagement with content and fostering critical thinking skills are crucial (Kasneci et al., 2023). Additionally, fostering student awareness of potential biases and limitations within ChatGPT can mitigate negative impacts. It is crucial for further research to look into the best ways to use ChatGPT, including teaching methods that bring out its advantages. Further studies might also examine the long-term impacts of guided ChatGPT use on critical thinking and other cognitive skills across

diverse educational settings. By carefully combining AI tools with traditional education, we can improve learning while ensuring critical thinking skills continue developing.

Unveiling the Complexities of ChatGPT Use, Critical Thinking, and Students GPA

The study also delves into demographic factors, such as class levels and GPA, revealing complex interactions between these variables and critical thinking scores. The positive correlation between higher critical thinking skills and higher GPA, alongside the impact of ChatGPT usage frequency on these outcomes, underscores the multifaceted nature of academic performance. These insights contribute to an emerging body of research examining the implications of AI tools on student learning outcomes and highlight the need for educational strategies that effectively integrate these technologies while promoting critical thinking and academic integrity.

While the initial findings reveal a negative correlation between high ChatGPT usage frequency and critical thinking scores and improving critical thinking skills with effective use of ChatGPT, the research delves more deeply, exploring how demographic factors like class level and GPA interact with these variables. This unveils a multifaceted picture of academic performance, where critical thinking skills and technology intertwine with pre-existing academic abilities and student backgrounds.

Findings revealed a complex interplay between students' critical thinking test scores, ChatGPT use, and GPAs. As a result, students with stronger critical thinking skills achieved higher GPAs, supporting the well-established value of critical thinking in academic success (Scott & Markert, 1994). Several studies have found a positive correlation between critical thinking abilities and GPA. First, studies have found a strong link between college-level critical thinking scores and GPA (Facione, 2011). This suggests that students with more vital critical thinking skills tend to achieve higher GPAs. Facione (2011) writes, "It has also been shown that critical thinking skills can be learned, which suggests that one's GPA might

improve as one learns. Further supporting this hypothesis is the significant correlation between critical thinking and reading comprehension. Improvements in the other parallel improvements in the one" (Facione, 2011, p. 23). This emphasizes the importance of integrating critical thinking skill development throughout curricula. Interestingly, students with higher GPAs and higher critical thinking test results used ChatGPT less frequently (1-3 times per week).

However, as discussed before, the relationship between ChatGPT usage and pre-critical thinking test scores was negatively correlated. On the other hand, students who used ChatGPT very frequently (more than 11 times per week) had lower GPAs and lower critical thinking test results. This aligns with concerns about overreliance on AI hindering critical thinking development (Kasneci et al., 2023). When students become accustomed to having answers readily generated, they might neglect the crucial processes of independent analysis and critical evaluation. This highlights the need for educational strategies that enable students to think critically about the information they encounter, even when using tools like ChatGPT. As Day (2023) and Hyytinen et al. (2024) highlight, a one-size-fits-all strategy for integrating AI tools is insufficient. A more nuanced strategy is needed to consider the interplay between technology use, critical thinking skills, and student background characteristics. It is crucial to stress that students must combine critical thinking skills with using ChatGPT effectively for deeper learning. They need to understand the information presented, evaluate its credibility, and use it as a springboard for their own analysis, not simply accept it as the final answer.

Furthermore, the study supports the notion that critical thinking skills develop over time (Prat-Sala & van Duuren, 2022). Analysis revealed significant differences in critical thinking scores across different class levels, with students in higher class levels demonstrating better critical thinking skills. This suggests that pre-existing critical thinking

abilities may mediate the relationship between ChatGPT usage and critical thinking development. Students with a stronger foundation in critical thinking skills, often developed through prior coursework, might be better equipped to navigate the potential pitfalls of frequent ChatGPT use. Furthermore, the observed development of critical thinking skills across different class levels suggests that such training can be beneficial at various stages of a student's academic journey, supporting the notion of a developmental trajectory in critical thinking abilities that can be augmented through targeted educational interventions (Huber & Kuncel, 2016):

- Lower Class Levels: Interventions in these years should focus on building foundational critical thinking skills like analysis, evaluation, and argument identification. Techniques like concept mapping, structured debates, and analyzing complex sources can be employed to equip students with this essential toolkit.
- Higher Class Levels: At this stage, the focus can shift towards applying critical thinking to complex problems and independent research projects. ChatGPT could be used strategically to assist with tasks like literature reviews or data analysis, freeing students' cognitive resources for higher-level critical thinking activities. However, it is crucial to emphasize the responsible and critical use of the tool, ensuring students understand its limitations and do not simply rely on its outputs without proper evaluation.

Acknowledging this multifaceted relationship can move us beyond a simplistic view of ChatGPT's impact. The research suggests that critical thinking skills remain a cornerstone of academic success, regardless of class level. While low to moderate ChatGPT usage might offer some learning benefits when used thoughtfully, frequent use can be detrimental. The key lies in fostering a learning environment that cultivates critical thinking alongside responsible technology use. However, acknowledging that the observed correlation between

class level and critical thinking scores does not necessarily imply causation is essential. Higher class levels might coincide with increased opportunities to develop critical thinking skills through coursework. Further research is needed to explore the causal mechanisms at play.

Finally, the study did not find a statistically significant association between gender and critical thinking skills, which aligns with some previous research (Afsahi & Afghari, 2017). However, it is essential to acknowledge that gender stereotypes might influence participation in specific courses or activities that could indirectly impact critical thinking development. Future research with more extensive and diverse samples could explore this potential influence in greater depth.

This study sheds light on the intricate connection between ChatGPT usage, critical thinking skills, and student success. By emphasizing the importance of critical thinking, encouraging responsible technology use, and implementing tailored interventions throughout the academic journey, we can provide students with the tools they need to succeed in the era of AI. This will ensure they succeed academically and develop the critical thinking skills necessary for lifelong learning and navigating an increasingly complex world.

Summary

The discussion chapter critically examines the complex relationship between the use of ChatGPT and the development of student's critical thinking skills. It highlights ChatGPT's role in improving learning through personalized learning while warning against potential drawbacks such as over-dependency and issues related to academic integrity and digital literacy. Findings suggest a correlation between frequent ChatGPT use and decreased critical thinking abilities, calling for a balanced approach to its use in education that includes faculty supervision and encourages critical engagement with content. Moreover, it examines the interaction between ChatGPT use, critical thinking, and student demographics, advocating

for a comprehensive strategy that promotes critical thinking and its responsible use. Moreover, the chapter calls for careful integration of ChatGPT into academia, seeking to balance its benefits with ethical considerations and support for critical thinking and academic integrity.

Chapter 6.

Conclusion

Introduction

This chapter summarizes the studies undertaken on the impact of ChatGPT on students' critical thinking skills in HEI. It highlights the core findings of the study, shedding light on how students engage with ChatGPT and its implications for their critical analysis abilities. In addition, the chapter offers recommendations for future research, focusing on enhancing teaching methodologies to leverage ChatGPT positively and suggestions for improving academic practices to mitigate any adverse effects. These recommendations address the issues identified in the study, contributing to the ongoing discussion about effectively integrating artificial intelligence tools like ChatGPT in educational settings.

Revisiting Purpose and Objectives

The major goal of this study was to investigate the correlation between the use of ChatGPT, a popular AI tool, and its influence on students' critical thinking abilities. In light of the increasing integration of AI technologies into the educational environment, this study examined the potential advantages and problems of ChatGPT in improving critical thinking among university students. Specifically, the study focused on quantifying students' engagement with ChatGPT, assessing their level of critical thinking, and identifying any significant correlations between ChatGPT use and critical thinking skills. Participants representing various academic disciplines at one Kazakhstani university offered deep insights into using ChatGPT for academic tasks. This commitment was driven by the broader goal of promoting the effective integration of AI tools into education, ensuring that they strengthen, not undermine, the critical analytical skills vital to academic and professional success.

Main Conclusions

The study investigated the impact of ChatGPT on critical thinking skills among undergraduate students in one university in Kazakhstan, revealing how AI tools shape educational practices. Participants with a balanced gender distribution and varied GPAs frequently used ChatGPT for various academic tasks, indicating its integral role in their academic lives. While some students appreciated ChatGPT for seeking assistance with academic tasks and generating ideas, concerns were raised about plagiarism, over-reliance on the tool, and its effect on the motivation for independent research. This problem underscores the importance of explicit norms and ethical standards for the use of AI tools in educational settings in order to maintain academic integrity.

The research found that critical thinking levels were consistent across participants, but those using ChatGPT more often had lower critical thinking test scores. This suggests that the frequency and manner of ChatGPT usage could influence critical thinking skills. The study also showed that targeted interventions could improve critical thinking skills, highlighting the potential benefits of guided, responsible, and effective ChatGPT use to harness its benefits for critical thinking enhancement. Furthermore, it was noted that students with higher class levels and GPAs tended to have better critical thinking skills.

In conclusion, the research highlights students' high engagement with ChatGPT and its nuanced impact on their academic and cognitive development. The findings highlight the importance of taking a balanced and analytical approach when adopting AI technologies such as ChatGPT into educational settings. The study suggests that while ChatGPT offers substantial support for academic activities, its role in fostering critical thinking skills is contingent on how it is used, emphasizing the importance of responsible and informed usage to maximize its benefits and mitigate potential drawbacks. This

nuanced perspective on the intersection of technology and education contributes to the ongoing dialogue on enhancing learning outcomes in the digital era.

Implications and Recommendations

The outcomes of this study hold significant implications for educational technology, pedagogy, and policy. Firstly, the active use of ChatGPT among students underscores the need for HEI to recognize and integrate AI tools that enhance, rather than detract from, critical thinking and learning. ChatGPT's potential to serve as a personalized learning aid demonstrates its value in supporting students' academic growth. However, the observed correlation between frequent ChatGPT usage and decreased critical thinking skills highlights the risk of over-reliance on AI for academic tasks.

This study also illustrates the importance of critical digital literacy. It suggests that students must be educated on the operational use of AI tools like ChatGPT and their limitations, ethical considerations, and the importance of cross-checking AI-generated information with credible sources. Furthermore, the positive impact of training on effective ChatGPT use on students' critical thinking skills suggests that with appropriate guidance, AI tools can complement traditional educational methods and support the development of crucial academic skills.

This study's exploration of student use of ChatGPT in HEI offers valuable guidance for navigating the complexities of AI integration within learning environments. Specific recommendations are targeted towards key stakeholder groups to ensure a balanced and responsible approach.

HEI administrators and curriculum developers should collaborate to recognize the potential of AI tools as complementary to traditional teaching methods. Thoughtful integration into the curriculum can leverage AI to enrich student learning experiences without sacrificing critical thinking and independent learning. Curriculum developers play

a vital role in fostering critical digital literacy by designing educational programs that equip students to critically evaluate information, understand the ethical implications of AI use, and navigate the challenges of digital information sources. This includes discerning the credibility of AI-generated content and understanding the broader impact of AI on data privacy and academic integrity.

To empower educators to effectively integrate AI tools, policymakers can support faculty and educators by allocating resources for training programs. Developed collaboratively by educational institutions and researchers, these programs should enhance educators' understanding of AI capabilities and limitations. The training should equip educators to integrate AI tools effectively into their pedagogical strategies and guide students in responsible use. This will enable educators to facilitate a learning environment that encourages critical engagement with content, fostering a culture of academic integrity and ethical use of technology. Finally, policymakers can further support a successful AI integration by establishing clear and comprehensive ethical guidelines for AI use in HEIs. These guidelines should address concerns about plagiarism, cheating, and data privacy. Additionally, policymakers should consider allocating resources for equitable access to AI tools and training programs for all students.

By collaborating and focusing on these stakeholder-specific recommendations, the educational community may maximize the potential of AI technologies to improve learning experiences while safeguarding critical thinking skills and ethical considerations in the digital learning environment. This collaborative approach will ensure that students are not only academically successful but also prepared to engage with the digital world ethically and critically.

Limitations

The study presents several limitations that are important to acknowledge for a comprehensive understanding of its scope and implications. First, the sample size and demographic concentration of undergraduate students from only one university in Kazakhstan restrict the findings' generalizability across other educational contexts and cultural backgrounds. The results may not reflect students' experiences in different educational settings or regions. Secondly, the study's design captures information at one point, which restricts the understanding of the long-term impact of ChatGPT on critical thinking abilities. Essentially, without observing changes over time, it is challenging to determine if ChatGPT directly impacts students' critical thinking development.

Moreover, the reliance on quantitative measures and self-reported data introduces potential biases. Participants might respond in ways they perceive as favorable, which may not accurately reflect their authentic engagement with ChatGPT or its impact on their critical thinking abilities. This reliance on self-reporting can affect the validity of the data collected.

Additionally, the study measures critical thinking skills through tests, which may not fully capture all the dimensions of this complex cognitive process. The specific test and survey items may limit the understanding of critical thinking to certain aspects, neglecting other crucial components of this skill set. Furthermore, the fast-paced evolution of AI technologies like ChatGPT means the tool is constantly being updated. As a result, the study's findings may not remain relevant as new versions of ChatGPT are released, which could offer different features or affect users differently. These limitations underline the importance of exercising caution when interpreting the study's findings and proposing topics for future investigation.

Future Research Directions

Several recommendations for future research directions are proposed to overcome the limitations found in the study on the impact of ChatGPT usage on students' critical thinking skills. Expanding the diversity of the participant pool emerges as a critical first step. By including a more comprehensive array of participants from various educational institutions, disciplines, and cultural backgrounds, future studies can increase the generalizability of the findings and provide a broader perspective on how ChatGPT is used and its effects across different student populations.

Secondly, adopting longitudinal research designs is essential for capturing the evolving impact of ChatGPT on critical thinking skills over time. Such an approach would allow researchers to observe not only the immediate effects of ChatGPT usage but also how these effects develop or change as students continue to engage with the AI throughout their education and help to determine whether the observed relationships are consistent and identify any emerging patterns or trends.

Thirdly, incorporating a mixed-methods approach could address the limitations associated with self-reported data. By combining quantitative measures, such as standardized tests, with qualitative methods, such as interviews or focus groups, researchers can acquire a better understanding of students' experiences and perceptions. This approach would also allow for the exploration of how students incorporate ChatGPT into their learning processes and the specific ways in which it influences their critical thinking.

Furthermore, to more accurately measure critical thinking, future research should explore alternative assessment methods that capture the complexity of this skill. Developing or using assessment tools that can more comprehensively evaluate the various dimensions of critical thinking beyond what standardized tests may capture is necessary.

This could involve creating new instruments or adapting existing ones to better align with the specific cognitive processes influenced by AI tool usage. Also, extending the scope of research to explore the impact of ChatGPT on a broader range of educational outcomes, including creativity, problem-solving abilities, and emotional intelligence, can further elucidate the multifaceted role of AI in education. This broader perspective is crucial for designing educational interventions that support holistic student development.

Finally, given the rapid evolution of AI technologies, future research must continuously update the tools and platforms under investigation. Studies should consider the latest versions of ChatGPT or other emerging AI tools to ensure the findings remain relevant and reflect current technological capabilities.

By implementing these recommendations, future research can overcome some of the current study's limitations and contribute valuable knowledge to the ongoing dialogue about integrating AI technologies in education. This would strengthen the evidence base and inform pedagogical practices and policy decisions regarding using AI tools like ChatGPT in learning environments.

Reflections on the Research Experience

After thoroughly researching the impact of ChatGPT on students' critical thinking skills, this journey not only enriched my academic experience but also profoundly changed my perspective on the role of AI in education. As a student introduced to AI tools halfway through the educational journey, I navigated the complexities of this study with enthusiasm, from data collection to analysis, embracing challenges as opportunities for personal and methodological growth. This study emphasized the significance of a balanced and critical strategy regarding AI integration, emphasizing the creation of a learning environment that develops critical thinking while also promoting responsible usage of AI technology in Kazakhstan.

The study aim has been reached, and the research questions have been answered. My personal engagement with ChatGPT and its widespread use among my peers made this exploration particularly relevant and exciting. I concluded that AI should not be seen as a problem or a disease to overcome but as a catalyst for positive transformation within education, offering new avenues for growth and enhancement in learning processes.

By highlighting how AI can improve learning outcomes without undermining the development of essential cognitive skills, I hope to inspire educators to incorporate AI tools strategically into teaching approaches. This initiative aims to embrace technological innovation while also improving the educational experience with a view to preparing students for an environment in which AI is integrated into life and learning. Reflecting on this research, I imagine a future in which the incorporation of AI in education, informed by studies, promotes a more engaging, effective, and inclusive learning environment. This study path has also sparked a strong belief in AI's transformational power in education—a revolution in which I am excited to participate. As we look towards this promising horizon, it is clear that AI, when approached with critical insight and ethical consideration, holds the key to unlocking unprecedented potential in the educational field.

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Appendices

Appendix A – Declaration of the Use of Generative AI

Thesis Title: Investigating the Impact of ChatGPT Use on Students' Critical Thinking Skills

Appendix A – Declaration of the Use of Generative AI

I hereby declare that I have read and understood NUGSE's policy concerning appropriate use of AI and composed this work independently (please check one):

☑ with the use of artificial intelligence tools, or
☐ without the use of artificial intelligence tools.

(If you have used AI tools as defined in the GSE policy document, please complete the rest of this form.)

During the preparation of this thesis/examination, I used ChatGPT to structure and organize the written text, translate the abstracts into other languages, and used Grammarly to proofread.

I also declare that I

☑ am aware of the capabilities and limitations of AI tool(s),
☑ have verified that the content generated by AI systems and adopted by me is factually correct,
☑ am aware that as the author of this thesis I bear full responsibility for the statements and assertions made in it,
☑ have submitted complete and accurate information about my use of AI tools in this work, and
☑ acknowledge that there may be disciplinary consequences if I have not followed NUGSE's guidelines regarding AI appropriate use.

Name: Aiolana Kani
Signature:
Date: 22.04.2024

Appendix B: INFORMED CONSENT FORM

TOPIC: Investigating the Impact of ChatGPT on the Students' Critical Thinking Skills

DESCRIPTION: Dear student, you are kindly invited to participate in **a research study** examining the relationship between the use of artificial intelligence (AI) tools, specifically ChatGPT, and students' critical thinking skills. You will be asked to take **a survey** about your experience with using ChatGPT, **take a critical thinking test** twice before and after the training, and **participate in a training session** on the topic of Effective Use of ChatGPT. The results will be used to complete a thesis to find the relationship between ChatGPT use and students' critical thinking skills. If you want to contribute to this study and agree to participate, you can complete the survey after properly reading this consent form. I would greatly appreciate your participation.

TIME INVOLVEMENT: Your participation will take approximately 2.5 hours over a month: 10-15 minutes to take a survey, 50 minutes to take a critical thinking test, and 2-3 hours in total in a month to participate in training sessions.

RISKS: The risks associated with this study are minimal, primarily centering on the invasion of privacy and keeping confidentiality. All information will be collected non-anonymously to contact you throughout the study. To minimize these risks, all the data collected through the data collection process will be kept confidential and will not be disclosed to any third parties. Additionally, participants in the critical thinking tests might experience discomfort or stress. They will be informed of their right to opt out of participation at any point if they find it uncomfortable to continue. Significantly, no punishments or rewards will be associated with completing the critical thinking. Moreover, introducing new technology, such as ChatGPT, may bring unforeseen consequences like dependency. However, effective usage guidelines for ChatGPT will be provided during training to address and mitigate any potential issues. Your decision whether or not to participate in this study will not affect your grades in school.

BENEFITS: The benefit which may reasonably be expected to result from this study is learning how to use ChatGPT responsibly in the educational context. Participants will be given the opportunity to participate in the study, with the potential to improve the use of ChatGPT in educational settings.

PARTICIPANT'S RIGHTS: If you have read this form and have decided to participate in this project, please understand your **participation is voluntary,** and you have the **right to withdraw your consent or discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled**. **The alternative is not to participate.** You have the right to refuse to answer particular questions. The results of this research study may be presented at scientific or professional meetings or published in scientific journals.

CONTACT INFORMATION:
Questions: If you have any questions, concerns, or complaints about this research, its procedures, risks, and benefits, contact Aidana Kani, +77767233383, aidana.kani@nu.edu.kz or Master's Thesis Supervisor for this student work (Dr. Ahmet Aypay, ahmet.aypay@nu.edu.kz).
Independent Contact: If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the NUGSE Research Committee at gse_researchcommittee@nu.edu.kz.
Please sign this consent form if you agree to participate in this study.

- I have carefully read the information provided;
- I have been given full information regarding the purpose and procedures of the study;
- I understand how the data collected will be used, and that any confidential information will be seen only by the researchers and will not be revealed to anyone else;
- I understand that I am free to withdraw from the study at any time without giving a reason;
- With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

Signature: _____ Date: _____

ЗЕРТТЕУ ЖҰМЫСЫ КЕЛІСІМІНІҢ АҚПАРАТТЫҚ ФОРМАСЫ

ТАҚЫРЫП: Студенттердің сыни ойлау дағдыларына ChatGPT әсерін зерттеу

СИПАТТАМА: Сіз жасанды интеллект (AI) құралдарын, атап айтқанда ChatGPT қолданысы мен студенттердің сыни ойлау дағдыларының арасындағы байланысты зерттеуге бағытталған **зерттеу жұмысына** қатысуға шақырылып отырсыз. Сізге **сауалнамадан өту**, тренинге дейін және кейін **сыни тұрғыдан ойлану тестін тапсыру**, сондай-ақ «ChatGPT-ті тиімді пайдалану» **тренингіне қатысу** ұсынылады. Нәтижелер ChatGPT қолданысы мен студенттердің сыни ойлау дағдылары арасындағы байланысты табу үшін жазылып жатқан диссертация үшін пайдаланылады.

ӨТКІЗІЛЕТІН УАҚЫТЫ: Сіздің қатысуыңыз шамамен 1 айдың ішінде шамамен 2.5 сағатты алады: сауалнаманы өтуге 10-15 минут, сыни тұрғыдан ойлау тестін тапсыруға 50 минут және тренингке қатысуға айына барлығы 2-3 сағат.

ЗЕРТТЕУ ЖҰМЫСЫНА ҚАТЫСУДЫҢ ҚАУІПТЕРІ: Зерттеу жұмысына қатысудың қауіптері аз, бірақ құпиялылық пен жеке өмірге қол сұғумен байланысты. Зерттеу барысында сізбен байланысу үшін жеке ақпараттар сұралады. Бұл қауіпті азайту үшін құпиялылық қатаң сақталады. Сонымен қатар, сыни ойлау тестілеріне қатысушылар ыңғайсыздықты немесе стрессті сезінуі мүмкін. Олар жалғастыруды ыңғайсыз сезінсе, кез келген уақытта қатысудан бас тарту құқығы туралы хабарланады. Сыни тұрғыдан ойлану тестін өткені үшін жазалау немесе марапаттау жоқ. Сонымен қатар, ChatGPT сияқты жаңа технологияны енгізу тәуелділік сияқты күтпеген салдарға әкелуі мүмкін. Дегенмен, бұл мәселені шешу үшін ChatGPT тиімді пайдалану әдісі бойынша нұсқаулар беріледі. Зерттеу жұмысына қатысуға келісім беруіңіз немесе бас тартуыңыз сіздің мектептегі бағаларыңызға еш әсерін тигізбейді.

ЗЕРТТЕУ ЖҰМЫСЫНА ҚАТЫСУДЫҢ АРТЫҚШЫЛЫҚТАРЫ: Зерттеу жұмысына қатысуыңыздың келесідей артықшылықтары болуы мүмкін: зерттеуге қатысқаныңыз үшін тәттілер беріледі. Қатысушылар сонымен қатар ChatGPT-ті білім беру контекстінде жауапкершілікпен пайдалануды үйренеді. Қатысушыларға ChatGPT-ті оқу орындарында пайдалануды жақсарту мүмкіндігі бар зерттеуге қатысу мүмкіндігі беріледі.

ҚАТЫСУШЫ ҚҰҚЫҚТАРЫ: Егер Сіз берілген формамен танысып, зерттеу жұмысына қатысуға шешім қабылдасаңыз, Сіздің қатысуыңыз **ерікті** түрде екенін хабарлаймыз. Сонымен қатар, **қалаған уақытта айыппұл төлемей және сіздің әлеуметтік жеңілдіктеріңізге еш кесірін тигізбей зерттеу жұмысына қатысу туралы келісіміңізді кері қайтаруға немесе тоқтатуға құқығыңыз бар. Зерттеу жұмысына мүлдем қатыспауыңызға да толық құқығыңыз бар.** Сондай-ақ, қандай да бір сұрақтарға жауап бермеуіңізге де әбден болады. Бұл зерттеу жұмысының нәтижелері академиялық немесе кәсіби мақсаттарда баспаға ұсынылуы немесе шығарылуы мүмкін.

БАЙЛАНЫС АҚПАРАТЫ:
Сұрақтарыңыз: Егер жүргізіліп отырған зерттеу жұмысының процесі,қаупі мен артықшылықтары туралы сұрағыңыз немесе шағымыңыз болса, келесі байланыс құралдары арқылы зерттеушімен, Айдана Қани, +77767233383, aidana.kani@nu.edu.kz, немесе зерттеушінің магистрлық тезисі бойынша жетекшісімен хабарласуыңызға болады**:** Dr. Ahmet Aypay, ahmet.aypay@nu.edu.kz.
Дербес байланыс ақпараттары: Егер берілген зерттеу жұмысының жүргізілуімен қанағаттанбасаңыз немесе сұрақтарыңыз бен шағымдарыңыз болса, Назарбаев Университеті Жоғары Білім беру мектебінің Зерттеу Комитетімен көрсетілген байланыс құралдары арқылы хабарласуыңызға болады: электрондық поштамен gse_researchcommittee@nu.edu.kz.

Зерттеу жұмысына қатысуға келісіміңізді берсеңіз, берілген формаға қол қоюыңызды сұраймыз.

- Мен берілген формамен мұқият таныстым;
- Маған зерттеу жұмысының мақсаты мен оның процедурасы жайында толық ақпарат берілді;
- Жинақталған ақпарат пен құпия мәліметтерге тек зерттеушінің өзіне қолжетімді және мәлім болатынын толық түсінемін;
- Мен кез келген уақытта ешқандай түсініктемесіз зерттеу жұмысына қатысудан бас тартуыма болатынын түсінемін;
- Мен жоғарыда аталып өткен ақпаратты саналы түрде қабылдап, осы зерттеу жұмысына қатысуға өз келісімімді беремін.

Қолы: _____ Күні: _____

ФОРМА ИНФОРМАЦИОННОГО СОГЛАСИЯ

ТЕМА: Исследование влияния ChatGPT на навыки критического мышления учащихся

ОПИСАНИЕ: Вы приглашены принять участие **в исследовании** посвященном изучению взаимосвязи между использованием инструментов искусственного интеллекта (ИИ), в частности ChatGPT, и навыками критического мышления учащихся. Вам будет **предложено пройти опрос о своем опыте использования ChatGPT, дважды пройти тест** на критическое мышление до и после тренинга, а также **принять участие в тренинге** на тему «Эффективное использование ChatGPT». Результаты будут использованы для написания диссертации, чтобы найти взаимосвязь между использованием ChatGPT и навыками критического мышления студентов.
ВРЕМЯ УЧАСТИЯ: Ваше участие потребует около 2,5 часа в течение месяца: 10-15 минут на прохождение опроса, 50 минут на прохождение теста на критическое мышление и 2-3 часа в общей сложности в месяц на участие в тренингах.

РИСКИ: Риски, связанные с этим исследованием, минимальны и в первую очередь связаны с вторжением в частную жизнь и сохранением конфиденциальности. Вся информация будет собираться неанонимно, чтобы связаться с вами на протяжении всего исследования. Чтобы свести к минимуму эти риски, все данные, собранные в процессе сбора данных, будут храниться в тайне и не будут переданы третьим лицам. Кроме того, участники тестов на критическое мышление могут испытывать дискомфорт или стресс. Они будут проинформированы об их праве отказаться от участия в любой момент, если им будет неудобно продолжать. Примечательно, что за завершение критического мышления не полагается никаких наказаний или поощрений. Более того, внедрение новой технологии, такой как ChatGPT, может привести к непредвиденным последствиям, таким как зависимость. Однако во время обучения будут предоставлены эффективные рекомендации по использованию ChatGPT для устранения и устранения любых потенциальных проблем. Ваше решение о согласии либо отказе в участии никаким образом не повлияет на ваши оценки в школе.
ПРЕИМУЩЕСТВА: В качестве ожидаемых преимуществ в результате исследования можно рассматривать получение сладостей для участия в исследовании. Также участники научатся ответственно использовать ChatGPT в образовательном контексте. Участникам будет предоставлена возможность принять участие в исследовании, которое потенциально может улучшить использование ChatGPT в образовательных учреждениях.

ПРАВА УЧАСТНИКОВ: Если Вы прочитали данную форму и решили принять участие в данном исследовании, Вы должны понимать, что Ваше участие является **добровольным** и что у Вас есть право **отозвать свое согласие или прекратить участие в любое время без штрафных санкций и без потери социального пакета, который Вам предоставляли.** В качестве альтернативы можно не участвовать в исследовании. Также Вы имеете право не отвечать на какие-либо вопросы. Результаты данного исследования могут быть представлены или опубликованы в научных или профессиональных целях.

КОНТАКТНАЯ ИНФОРМАЦИЯ:
Вопросы: Если у Вас есть вопросы, замечания или жалобы по поводу данного исследования, процедуры его проведения, рисков и преимуществ, Вы можете связаться с Айданой Кани, 8 776 723 33 83, aidana.kani@nu.edu.kz или руководителем магистерской диссертации исследователя: Dr. Ahmet Aypay, ahmet.aypay@nu.edu.kz.
Независимые контакты: Если Вы не удовлетворены проведением данного исследования, если у Вас возникли какие-либо проблемы, жалобы или вопросы, Вы можете связаться с Комитетом Исследований Высшей Школы Образования Назарбаев Университета, отправив письмо на электронный адрес gse_researchcommittee@nu.edu.kz.
Пожалуйста, подпишите данную форму, если Вы согласны участвовать в исследовании.

- Я внимательно изучил представленную информацию;
- Мне предоставили полную информацию о целях и процедуре исследования;
- Я понимаю, как будут использованы собранные данные, и что доступ к любой конфиденциальной информации будет иметь только исследователь;
- Я понимаю, что вправе в любой момент отказаться от участия в данном исследовании без объяснения причин;
- С полным осознанием всего вышеизложенного я согласен принять участие в исследовании по собственной воле.

Подпись: _____ Дата: _____

Appendix C: “Investigating the Impact of ChatGPT on the Students’ Critical Thinking Skills ” Survey

Welcome to the research study!

We are interested in understanding the relationship between the use of ChatGPT, and students' critical thinking skills. First and foremost, I would like to express my gratitude for your participation in this questionnaire. Your involvement is highly valued.

The purpose of this quantitative study is to examine the relationship between the use of artificial intelligence (AI) tools, specifically ChatGPT, and students’ critical thinking skills within the context of one higher educational institution.

Please start the questionnaire if you agree to participate in the experimental part of the research, where you will be asked to take a critical thinking test twice (before and after training) to measure your critical thinking level. Also, you will be asked to participate in short online training sessions on the topic of the effective use of ChatGPT. You will be asked to write your contact number, as the researcher need to contact you throughout the study.

Even if you do not want to participate in the experimental part of the study, please take the survey. You don't have to write your contact emails if you don't want to.

The results will be used to complete a thesis to find the relationship between ChatGPT use and students' critical thinking skills. If you want to contribute to this study and agree to participate, you can complete the survey after properly reading this consent form. I would greatly appreciate your participation.

Your participation will take approximately 2.5 hours over three weeks: 10 minutes to take a survey, 30 minutes to take a critical thinking test, and 1 hour in total in a month to participate in training sessions.

Your participation in this research is voluntary. You have the right to withdraw at any point during the study.

The Principal Investigator of this study can be contacted at Aidana Kani, aidana.kani@gmail.com, 87767233383.

By clicking the button below, you acknowledge:

You have carefully read the information provided.

You are 18 years of age.

You are aware that you may choose to terminate your participation at any time for any reason.

You understand how the data collected will be used, and that any confidential information will be seen only by the researchers and will not be revealed to anyone else.

○ I consent, begin the study

○ I do not consent, I do not wish to participate

Survey Questions

1. Your Gender:
   o Male o Female o Other
2. Class Level:
   - o Undergraduate 1 year
   - o Undergraduate 2 year
   - o Undergraduate 3 year
   - o Undergraduate 4 year
3. School:

- o School of Medicine
- o School of Mining and Geosciences
- o School of Sciences and Humanities
- o School of Engineering and Digital Sciences

4. Age:
- o 18-20
- o 21-23
- o 24-26
- o 27-30
- o >30

5. GPA:
   o 1.67-2.00 o 2.01-2.32 o 2.33-2.67 o 2.68-2.99 o 3.00-3.33 o 3.34-3.66 o 3.67-4.00
6. Do you participate in extracurricular activities?
   o Yes o No
7. If yes, how many extracurricular activities do you attend weekly?
   o 1-3 times per week o 4-6 times per week o 7-10 times per week o more than 11 times per week
8. Do you use ChatGPT in general?
   o Yes o No
9. If yes, on average, how many times do you use ChatGPT weekly?
   o 1-3 times per week o 4-6 times per week o 7-10 times per week o more than 11 times per week
10. Mostly for what purposes do you use ChatGPT?

- o Research Assistance
- o Homework help
- o Generating ideas
- o Writing assistance
- o Learning new topics
- o Programming help
- o Language translation
- o Do not use
- o Other (please, specify) .....

11. How often do you use AI-powered tools like ChatGPT for academic or learning purposes?
    o Never o Rarely o Daily o Weekly o Monthly
12. On a scale of 1 to 5, how confident are you in your critical thinking abilities?

- o 1 (Not confident at all)
- o 2 (Slightly confident)
- o 3 (Moderately confident)
- o 4 (Very confident)
- o 5 (Extremely confident)

13. To what extent do you believe that using ChatGPT enhances your learning experience?
    o 1 (Not at all) o 2 (Slightly) o 3 (Moderately) o 4 (Significantly) o 5 (Extremely)
14. Have you noticed any changes in your approach to problem-solving since using ChatGPT?
    o Yes o No
15. If yes, would you please complete the following sentence?: As I keep using the ChatGPT, I started noticing
    ……
    ……

Please indicate to what extent you agree or disagree (from strongly agree (5) to strongly disagree (1) with the following statements:

16. I often cross-reference the information provided by ChatGPT with other sources.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
17. I think using ChatGPT has affected my motivation to engage in independent research or critical analysis.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
18. I use ChatGPT in my classes.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
19. My professors explain to me how to use ChatGPT correctly.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
20. I think the faculty should be involved in explaining how to use ChatGPT correctly.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree

21. I think using ChatGPT for academic purposes is plagiarism.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
22. I think over-reliance on ChatGPT impacts my ability to evaluate the credibility of sources.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
23. I experienced cases where ChatGPT provided inaccurate or biased information.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
24. I know how to use ChatGPT responsibly.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
25. I use ChatGPT responsibly in a manner that aligns with ethical guidelines and academic integrity.
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
26. My interaction with ChatGPT influenced my ability to form my own opinions on complex topics?
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree
27. I think that excessive use of ChatGPT might hinder my long-term critical thinking skills?
    o Strongly agree o Agree o Neutral o Disagree o Strongly disagree

«Студенттердің сыни ойлау дағдыларына ChatGPT әсерін зерттеу»

сауалнамасы

Зерттеу жұмысына қош келдіңіздер!

Біз ChatGPT қолдану мен студенттердің сыни тұрғыдан ойлау қабілеттері арасындағы байланысты түсінуге мүдделіміз. Ең алдымен, осы сауалнамаға қатысқандарыңыз үшін алғысымды білдіргім келеді. Сіздің қатысуыңыз жоғары бағаланады.

Бұл сандық зерттеудің мақсаты-жасанды интеллект (AI) құралдарын, атап айтқанда ChatGPT құралдарын пайдалану мен студенттердің сыни тұрғыдан ойлау қабілеттері арасындағы байланысты бір жоғары оқу орнының контекстінде зерттеу.

Егер сіз зерттеудің эксперименттік бөліміне қатысуға келіссеңіз, сауалнаманы бастаңыз, онда сізден сыни тұрғыдан ойлау деңгейіңізді өлшеу үшін екі рет (жаттығуға дейін және одан кейін) сыни тұрғыдан ойлау тестін тапсыру сұралады. Сондай-ақ, Сізден ChatGPT-ті тиімді пайдалану тақырыбында қысқа онлайн-тренингтерге қатысу сұралады. Сізден байланыс нөміріңізді жазу сұралады, өйткені зерттеуші зерттеу барысында сізбен байланысуы керек.

Зерттеудің эксперименттік бөлігіне қатысқыңыз келмесе де, сауалнаманы тапсырыңыз. Егер сіз қаламасаңыз, байланыс электрондық пошталарын жазудың қажеті жоқ.

Нәтижелер chatgpt қолдану мен студенттердің сыни тұрғыдан ойлау қабілеттері арасындағы байланысты анықтау үшін дипломдық жұмысты аяқтау үшін пайдаланылады. Егер сіз осы зерттеуге өз үлесіңізді қосқыңыз келсе және қатысуға келіссеңіз, сауалнаманы осы келісім формасын дұрыс оқығаннан кейін аяқтай аласыз. Мен сіздің қатысқаныңызға өте ризамын.

Сіздің қатысуыңыз үш апта ішінде шамамен 2,5 сағатты алады: сауалнама жүргізу үшін 10 минут, сыни тұрғыдан ойлау тестін тапсыру үшін 30 минут және жаттығуларға қатысу үшін бір айда барлығы 1 сағат.

Сіздің осы зерттеуге қатысуыңыз ерікті. Сіз оқу кезінде кез келген уақытта бас тартуға құқығыңыз бар.

Осы зерттеудің Негізгі Зерттеушісімен Aidana Kani мекен-жайы бойынша байланысуға болады, aidana.kani@gmail.com, 87767233383.

Төмендегі түймені басу арқылы сіз мойындайсыз:
Сіз берілген ақпаратты мұқият оқып шықтыңыз.
Сіз 18 жастасыз.
Сіз кез келген себеппен кез келген уақытта қатысуыңызды тоқтатуды таңдай алатыныңызды білесіз.
Сіз жиналған деректердің қалай пайдаланылатынын және кез келген құпия ақпаратты тек зерттеушілер ғана көретінін және басқа ешкімге ашылмайтынын түсінесіз.

○ Мен келісемін, зерттеуді бастаймын

○ Мен келіспеймін, қатысқым келмейді

Сауалнама сұрақтары

1. Сіздің жынысыңыз қандай:
о Ер о Әйел о Басқа
2. Сынып деңгейі:
- Бакалавр 1 жыл
- Бакалавр 2 жыл
- Бакалавр 3 жыл
- Бакалавр 4 жыл

3. Мектеп:
- Тау-кен ісі және жер туралы ғылымдар мектебі

o Жаратылыстану, әлеуметтік және гуманитарлық ғылымдар мектебі
o Медицина мектебі
o Инженерия және цифрлық ғылымдар мектебі
4. Жасыңыз:
o 18-20
o 21-23
o 24-26
o 27-30
o >30
5. Орта балл (GPA):
o 1.67-2.00 o 2.01-2.32 o 2.33-2.67 o 2.68-2.99 o 3.00-3.33 o 3.34-3.66 o 3.67-4.00
6. Сіз сыныптан тыс шараларға қатысасыз ба?
o Иә o Жоқ
7. Иә деп жауап берген болсаңыз, аптасына қанша сабақтан тыс іс-шараларға қатысасыз?
o Аптасына 1–3 рет o Аптасына 4–6 рет o Аптасына 7–10 рет o Аптасына 11 реттен көп
8. Сіз ChatGPT пайдаланасыз ба?
o Иә o Жоқ
9. Иә деп жауап берген болсаңыз, ChatGPT-ті аптасына орта есеппен қанша рет пайдаланасыз?
o Аптасына 1–3 рет o Аптасына 4–6 рет o Аптасына 7–10 рет o Аптасына 11 реттен көп
10. ChatGPT-ті негізінен қандай мақсаттарда пайдаланасыз?
o Зерттеу көмегі
o Үй тапсырмасын орындауға көмектесу
o Идея генерациясы
o Эссе жазуға көмек
o Жаңа тақырыптарды меңгерту
o Бағдарламалау (программирование)
o Тілдік аударма
o Мен қолданбаймын
o Басқа (көрсетіңіз).....
11. Сіз академиялық немесе оқу мақсаттарында ChatGPT сияқты AI-мен жұмыс істейтін құралдарды қаншалықты жиі пайдаланасыз?
o Ешқашан o Сирек o Күнделікті o Апта сайын o Ай сайын
12. 1-ден 5-ке дейінгі шкала бойынша, сіз өзіңіздің сыни ойлау қабілеттеріңізге қаншалықты сенімдісіз?
o 1 (мүлдем сенімді емес)
o 2 (аздап сенімді)
o 3 (орташа сенімді)
o 4 (өте сенімді)
o 5 (өте сенімді)
13. ChatGPT пайдалану сіздің оқу тәжірибеңізді қаншалықты жақсартады деп ойлайсыз?
o 1 (мүлдем) o 2 (аз) o 3 (орташа) o 4 (көп) o 5 (өте)
14. ChatGPT пайдаланғаннан кейін мәселелерге көзқарасыңызда қандай да бір өзгерістер байқадыңыз ба?
o Иә o Жоқ
15. Иә деп жауап берген болсаңыз, келесі сөйлемді аяқтаңыз: Менің ChatGPT пайдалануды жалғастыра отырып байқағаным
……
……
Төмендегі мәлімдемелермен қаншалықты келісесіз немесе келіспейтініңізді («толық келіспеймін» дегеннен «толықтай келіспеймін» дегенге дейін) көрсетіңіз:
16. Мен ChatGPT ұсынған ақпаратты басқа ақпарат көздерімен жиі тексеремін.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
17. Менің ойымша, ChatGPT пайдалану менің тәуелсіз зерттеуге немесе сынға қатысуға мотивацияға әсер етті.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
18. Мен сабақтарымда ChatGPT қолданамын.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
19. Менің профессорларым маған ChatGPT қалай дұрыс пайдалану керектігін түсіндіреді.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін

20. Менің ойымша, профессорлар ChatGPT-ті қалай дұрыс пайдалану керектігін түсіндіруге қатысуы керек.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
21. ChatGPT-ті академиялық мақсаттарда пайдалану плагиат деп санаймын.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
22. Менің ойымша, ChatGPT-ке шамадан тыс тәуелділік дереккөздердің сенімділігін бағалау қабілетіме әсер етеді.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
23. Мен ChatGPT дұрыс емес ақпарат берген жағдайларды кездестірдім.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
24. Мен ChatGPT-ті жауапкершілікпен пайдалануды білемін.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
25. Мен ChatGPT-ті этикалық принциптерге және академиялық адалдыққа сәйкес жауапкершілікпен пайдаланамын.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
26. ChatGPT-пен қарым-қатынасым күрделі тақырыптар бойынша өз пікірімді қалыптастыру қабілетіме әсер етті.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін
27. Менің ойымша, ChatGPT-ті шамадан тыс пайдалану менің ұзақ мерзімді сыни ойлау дағдыларыма кедергі келтіруі мүмкін.
o Толықтай келісемін o Келісемін o Бейтарап o Келіспеймін o Толықтай келіспеймін

Опрос «Исследование влияния ChatGPT на навыки критического мышления учащихся»

Добро пожаловать в исследовательскую работу!

Мы заинтересованы в понимании взаимосвязи между использованием ChatGPT и навыками критического мышления студентов. Прежде всего, я хотел бы выразить свою благодарность за ваше участие в этом опросе. Мы высоко ценим ваше участие.

Целью данного количественного исследования является изучение взаимосвязи между использованием инструментов искусственного интеллекта (ИИ), в частности ChatGPT, и навыками критического мышления студентов в контексте одного высшего учебного заведения.

Пожалуйста, заполните анкету, если вы согласны участвовать в экспериментальной части исследования, где вам будет предложено дважды (до и после обучения) пройти тест на критическое мышление, чтобы измерить свой уровень критического мышления. Также вам будет предложено принять участие в коротких онлайн-тренингах на тему эффективного использования ChatGPT. Вас попросят указать свой контактный номер, так как исследователь должен будет связаться с вами на протяжении всего исследования.

Даже если вы не хотите участвовать в экспериментальной части исследования, пожалуйста, примите участие в опросе. Вам не обязательно отправлять свои контактные электронные письма, если вы этого не хотите.

Результаты будут использованы для написания дипломной работы, чтобы найти взаимосвязь между использованием ChatGPT и навыками критического мышления студентов. Если вы хотите внести свой вклад в это исследование и согласны участвовать, вы можете заполнить анкету после того, как внимательно прочтете эту форму согласия. Я был бы очень признателен вам за участие.

Ваше участие займет примерно 2,5 часа в течение трех недель: 10 минут - на заполнение анкеты, 30 минут - на прохождение теста на критическое мышление и в общей сложности 1 час в течение месяца - на участие в тренингах.

Ваше участие в этом исследовании является добровольным. Вы имеете право отказаться от участия в любой момент во время обучения.

С главным исследователем этого исследования можно связаться по адресу: Айдана Кани, aidana.kani@gmail.com , 87767233383.
Нажав на кнопку ниже, вы подтверждаете:

Вы внимательно ознакомились с предоставленной информацией.
Вам исполнилось 18 лет.
Вы осознаете, что можете прекратить свое участие в программе в любое время по любой причине.
Вы понимаете, как будут использоваться собранные данные, и что любая конфиденциальная информация будет доступна только исследователям и не будет раскрыта никому другому.

○ Я даю согласие, начинайте исследование

○ Я не даю согласия, я не желаю участвовать

Вопросы опроса

1. Ваш пол:
o Мужчина o Женщина o Другое
2. Уровень класса:
o Предуниверситетская подготовка (Foundation)
o Бакалавриат 1 год
o Бакалавриат 2 год
o Бакалавриат 3 год

o Бакалавриат 4 год
3. Школа
o Школа горного дела и наук о Земле
o Школа естественных, социальных и гуманитарных наук
o Школа медицины
o Школа инженерии и цифровых наук
4. Возраст:
o 18-20
o 21-23
o 24-26
o 27-30
o >30
5. Средний балл (GPA):
o 1.67-2.00 o 2.01-2.32 o 2.33-2.67 o 2.68-2.99 o 3.00-3.33 o 3.34-3.66 o 3.67-4.00
6. Участвуете ли вы во внеклассных мероприятиях?
o Да o Нет
7. Если да, сколько внеклассных мероприятий вы посещаете еженедельно?
o 1–3 раза в неделю o 4–6 раз в неделю o 7–10 раз в неделю o более 11 раз в неделю
8. Используете ли вы ChatGPT?
o Да o Нет
9. Если да, то сколько раз в среднем вы используете ChatGPT в неделю?
o 1–3 раза в неделю o 4–6 раз в неделю o 7–10 раз в неделю o более 11 раз в неделю
10. В основном для каких целей вы используете ChatGPT?
o Помощь в исследованиях
o Помощь в выполнении домашнего задания
o Генерация идей
o Помощь в написании эссе
o Изучение новых тем
o Помощь по программированию
o Языковой перевод
o Не использую
o Другое (пожалуйста, уточните).....
11. Как часто вы используете инструменты на базе искусственного интеллекта, такие как ChatGPT, в академических или учебных целях?
o Никогда o Редко o Ежедневно o Еженедельно o Ежемесячно
12. По шкале от 1 до 5 насколько вы уверены в своих способностях критического мышления?
o 1 (Совершенно не уверен)
o 2 (Слегка уверенно)
o 3 (Умеренно уверенно)
o 4 (Очень уверенно)
o 5 (Крайне уверен)
13. Насколько вы считаете, что использование ChatGPT улучшает ваш опыт обучения?
o 1 (совсем нет) o 2 (незначительно) o 3 (умеренно) o 4 (значительно) o 5 (чрезвычайно)
14. Заметили ли вы какие-либо изменения в своем подходе к решению проблем после использования ChatGPT?
o Да o Нет
15. Если да, не могли бы вы закончить следующее предложение?: Продолжая использовать ChatGPT, я начал замечать
……
……

Пожалуйста, укажите, в какой степени Вы согласны или не согласны (от «полностью согласен» до «полностью не согласен») со следующими утверждениями:
16. Я часто проверяю информацию, предоставленную ChatGPT, с другими источниками.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
17. Я думаю, что использование ChatGPT повлияло на мою мотивацию к участию в независимых исследованиях или критическом анализе.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
18. Я использую ChatGPT для своих занятиях.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен

19. Мои профессора объясняют мне, как правильно использовать ChatGPT.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
20. Я думаю, что преподаватели должны участвовать в объяснении того, как правильно использовать ChatGPT.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
21. Я считаю, что использование ChatGPT в академических целях является плагиатом.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
22. Я думаю, что чрезмерная зависимость от ChatGPT влияет на мою способность оценивать достоверность источников.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
23. Я сталкивался со случаями, когда ChatGPT предоставлял неточную или предвзятую информацию.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
24. Я знаю, как ответственно использовать ChatGPT.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
25. Я использую ChatGPT ответственно, в соответствии с этическими принципами и академической честностью.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
26. Мое взаимодействие с ChatGPT повлияло на мою способность формировать собственное мнение по сложным темам.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен
27. Я думаю, что чрезмерное использование ChatGPT может помешать моим долгосрочным навыкам критического мышления.
o Полностью согласен o Согласен o Нейтрально o Не согласен o Категорически не согласен

Appendix D: Intervention Screenshots: Training Website: How to Use ChatGPT Effectively

Figure 6

Screenshot of The Main Page of the Training Website: Using ChatGPT Effectively

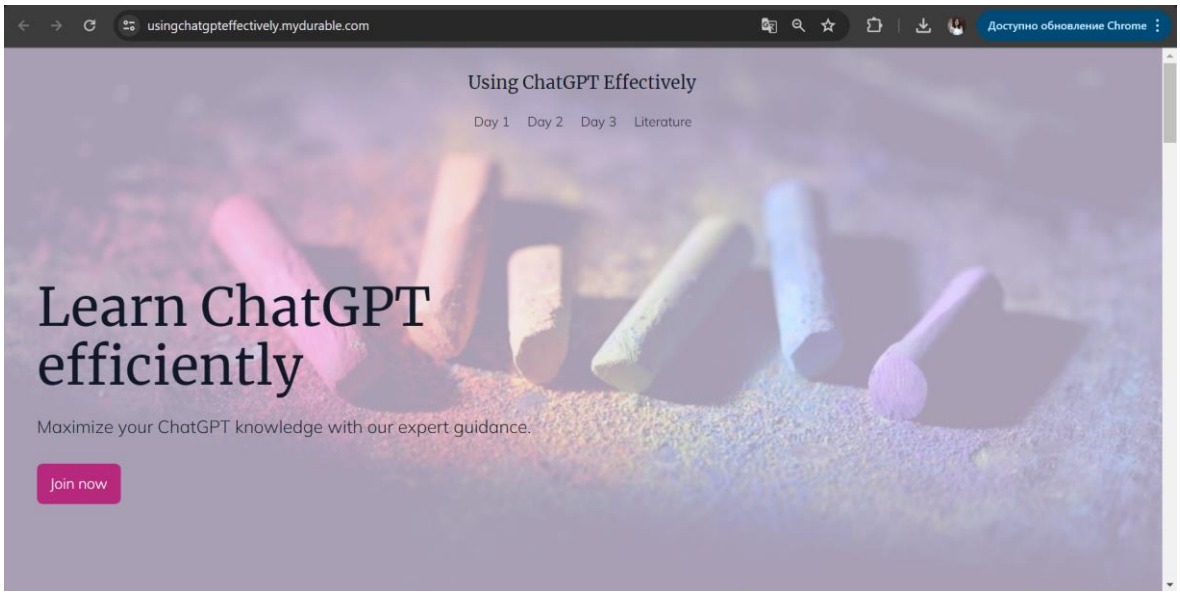


Figure 7

Screenshot of the Next Page of the Training Website: Using ChatGPT Effectively

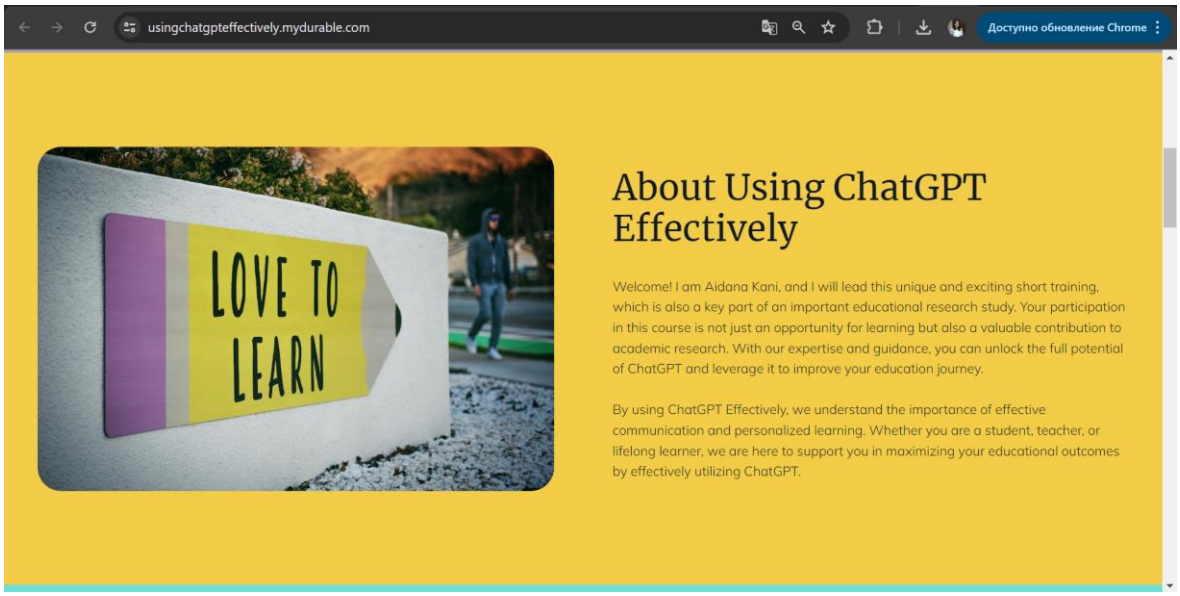
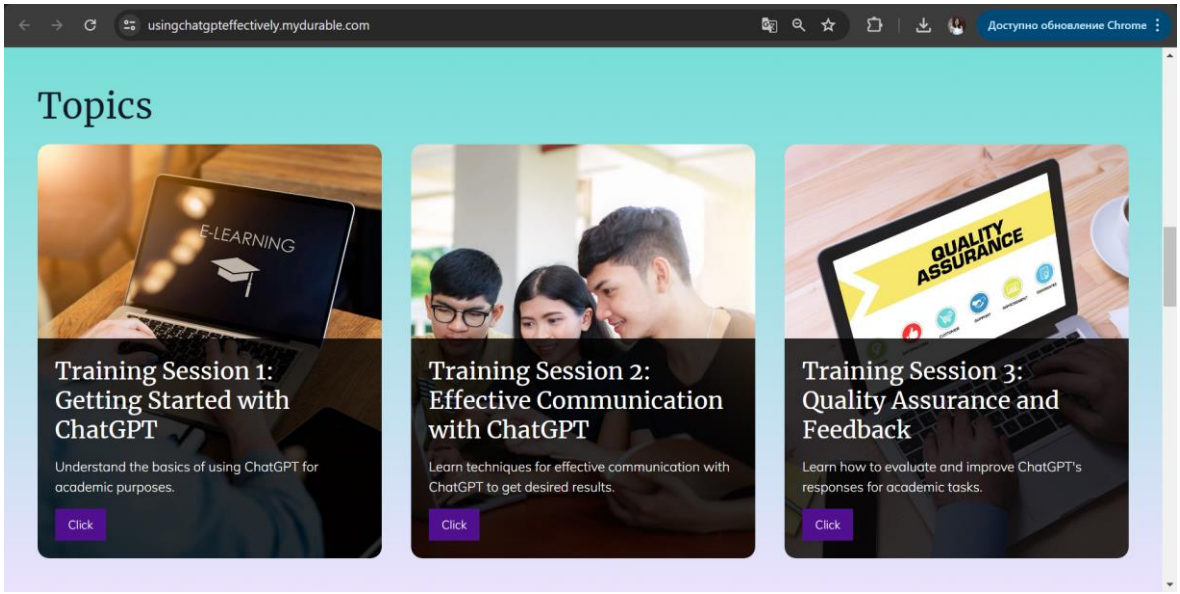


Figure 8

Screenshot of the Topics In the Training Website: Using ChatGPT Effectively



Appendix E: The Cornell Class-Reasoning Test Form X (CCT-X) Questions

Welcome to the "The Cornell Class-Reasoning Test, Form X ," which is a key part of an educational research study.

Your email:

General directions:

This is a test to see how well you do a particular kind of thinking. We call it "class reasoning". You will see that you already do some of this kind of thinking.
The sample questions make clear what is expected. DO NOT GUESS WILDLY. If you think you have the answer, but are not sure, mark that answer. But if you have no idea, then skip the question.
There are 3 sample questions, then 48 others. You should work as quickly as you can, but do not rush.
This is not a speed test. Once you do the samples, you will be able to move right along.
You have 50 minutes to finish the test.

Answering the questions:

In answering each question, use only what you are told in that question. In order to do this, you should imagine that your mind is blank, because some of the things you are told are obviously false. Even so, you should suppose that they are true--for that question only.
You will be given one or more sentences with which to think. You will then be given another sentence, about which you must decide, using only what you were told.
There are three possible answers. This is what they mean:
A. YES - It must be true.
B. NO - It can't be true.
C. MAYBE - It may be true or it may not be true.You weren't told enough to be certain whether it is "YES" or "NO".
Each question has only one correct answer.
Remember: If you have no idea what the answer is, skip the question and go on to the next. Do not guess wildly, but if you think you know, then answer the question.
Sample questions: Read the first question and see how it is marked.
1. Suppose you know that Bill is next to Sam. Then would this be true? Sam is next to Bill.
A. YES
B. NO
C. MAYBE
The correct answer is A, "YES". If Bill is next to Sam, then Sam must be next to Bill. It must be true, so a circle is drawn around "YES".
Here is another sample. This time you circle the answer (will not be marked).
Suppose you know that: The sparrow is over the hawk. Then would this be true? The hawk is over the sparrow.
o YES o NO o MAYBE
You should have circled B. "NO". If the sparrow is over the hawk, then the hawk can't be over the sparrow. It can't be true.
Circle the answer to this next sample. Be careful:
Suppose you know that Jane is standing near Betsy. Then would this be true? Betsy is standing near Jane (will not be marked).
o YES o NO o MAYBE
The correct answer is C, "MAYBE". Even is Jane is standing near Betsy, Betsy may be sitting. Betsy might be standing near Jane, but she might be sitting near Jane, or something else. You were not told enough to be certain about it, so "MAYBE" is the answer.

Let's start!

Now that you have done the practice questions you probably understand what is expected.

1. Suppose you know that
All the cars in the garage are Mr. Smith's.
All Mr. Smith's cars are Fords.
Then would this be true?
All of the cars in the garage are Fords.
o YES o NO o MAYBE

2. Suppose you know that
All John's pencils are blue.
Then would this be true?
At least some of John's pencils are not blue.
o YES o NO o MAYBE

3. Suppose you know that
All the books about sailing are Bill's.
All the green books are Bill's.
Then would this be true?
At least some of the green books are about sailing.
o YES o NO o MAYBE

4. Suppose you know that
None of Jane's dolls have hats.
Then would this be true?
None of the dolls that have hats are Jane's.
o YES o NO o MAYBE

5. Suppose you know that
All the red books are John's
Then would this be true?
All John's books are red.
o YES o NO o MAYBE

Suppose you know that
6. All of Mary's books are about horses.
None of the books on the shelf are about horses.
Then would this be true?
At least some of Mary's books are on the shelf.
o YES o NO o MAYBE

7. Suppose you know that
At least some of the children in the Martin family take out books from the library.
All people who take out books from the library have library cards.

Then would this be true?
At least some of the children in the Martin family have library cards.
o YES o NO o MAYBE
8. Suppose you know that
All X's are Y's.
No Z's are Y's.
Then would this be true?
At least some X's are Z's.
o YES o NO o MAYBE
9. Suppose you know that
At least some of Fred's pencils are green.
Then would this be true?
None of Fred's pencils are green.
o YES o NO o MAYBE
10. Suppose you know that
At least some of Kate's pencils are blue.
All the pencils in the box are blue.
Then would this be true?
At least some of Kate's pencils are in the box.
o YES o NO o MAYBE
11. Suppose you know that
All Z's are Y's.
All Y's are X's.
Then would this be true?
All Z's are X's.
o YES o NO o MAYBE
12. Suppose you know that
All X's are Y's.
Then would this be true?
At least some X's are not Y's.
o YES o NO o MAYBE
13. Suppose you know that
All boys are painters.
All children are painters.
Then would this be true?
At least some children are boys.
o YES o NO o MAYBE
14. Suppose you know that
At least some of the books on the table are about stars.
None of Bob's books are about stars.
Then would this be true?
All of the books on the table are Bob's.
o YES o NO o MAYBE
15. Suppose you know that
No animals are dogs.
Then would this be true?
No dogs are animals.
o YES o NO o MAYBE
16. Suppose you know that
All X's are Y's.
Then would this be true?
All Y's are X's.
o YES o NO o MAYBE
17. Suppose you know that
All cats can fly.
All animals that can fly are black.
Then would this be true?
All cats are black.
o YES o NO o MAYBE
18. Suppose you know that
None of Bob's books are on the table, but there are books on the table.
Then would this be true?
At least some of the books on the table are not Bob's.
o YES o NO o MAYBE
19. Suppose you know that
All X's are Y's.
All Z's are Y's.
Then would this be true?
At least some Z's are X's.
o YES o NO o MAYBE
20. Suppose you know that
All pencils are heavy.
Nothing made of wood is heavy.
Then would this be true?
At least some pencils are made of wood.
o YES o NO o MAYBE
21. Suppose you know that
At least some of the green pencils are Dick's.
Then would this be true?
All Dick's pencils are green.
o YES o NO o MAYBE
22. Suppose you know that
No X's are Y's.
Then would this be true?
No Y's are X's.
o YES o NO o MAYBE
23. Suppose you know that
All dogs are brown.
Then would this be true?
At least some dogs are not brown.
o YES o NO o MAYBE
24. Suppose you know that
All brown animals have four legs.
Then would this be true?
All animals with four legs are brown.
o YES o NO o MAYBE
25. Suppose you know that
All of John's candy is in the box.
All of the candy that is not chocolate is also not in the box.
Then would this be true?
At least some of John's candy is not chocolate.
o YES o NO o MAYBE
26. Suppose you know that
All the papers in the box are torn.
None of John's papers are in the box.
Then would this be true?
None of John's papers are torn.
o YES o NO o MAYBE
Suppose you know that
27. All of the boys are singing.
Then would this be true?
All of the people who are not singing are also not boys.
o YES o NO o MAYBE
28. Suppose you know that
All the math homework is due today. None of John's homework is due today. All the homework for Mr. Miller's class is math homework.
Then would this be true?
None of John's homework is for Mr. Miller's class.
o YES o NO o MAYBE
29. Suppose you know that
All the pencils in the box are green.
All Sue's pencils are sharp.
All the green pencils are Sue's.
Then would this be true?
At least some of the pencils in the box are not sharp.
o YES o NO o MAYBE

30. Suppose you know that
None of my shirts are wool.
None of the shirts hanging up in the closet are wool.
Then would this be true?
At least some of my shirts are hanging up in the closet.
o YES o NO o MAYBE

31. Suppose you know that
All X's are Y's.
Then would this be true?
All things that are not Y's are also not X's.
o YES o NO o MAYBE

32. Suppose you know that
All four-legged animals can fly.
No horses can fly.
All fast runners are four-legged animals.
Then would this be true?
No horses are fast runners.
o YES o NO o MAYBE

33. Suppose you know that
All of the boys are running, but not everyone is running.
Then would this be true?
At least some of the people not running are not boys.
o YES o NO o MAYBE

34. Suppose you know that
All the books on the shelf belong to the library.
No science books belong to the library.
At least some of the books that Elmer likes are on the shelf.
Then would this be true?
At least some of the books that Elmer likes are not science books.
o YES o NO o MAYBE

35. Suppose you know that
At least some of Mr. Johnes' students ride the bus to school.
All students who live on Route 55 own dogs.
All students who ride the bus to school live on Route 55.
Then would this be true?
o YES o NO o MAYBE

36. Suppose you know that
All Y's are X's.
No Z's are Y's.
Then would this be true?
No Z's are X's.
o YES o NO o MAYBE

37. Suppose you know that
All teachers are college graduates.
All people who have gone to high school are men.
All college graduates have gone to high school.
Then would this be true?
At least some teachers are not men.
o YES o NO o MAYBE

38. Suppose you know that
All Z's are Y's.
No X's are Y's.
All T's are Z's.
Then would this be true?
No X's are T's.
o YES o NO o MAYBE

39. Suppose you know that
All birds have three eyes.
No ducks are birds.
Then would this be true?
No ducks have three eyes.
o YES o NO o MAYBE

40. Suppose you know that
No Z's are Y's.
No X's are Y's.
Then would this be true?
At least some Z's are X's.
o YES o NO o MAYBE

41. Suppose you know that
All Z's are Y's.
All Things that are not X's are also not Y's.
Then would this be true?
At least some Z's are not X's.
o YES o NO o MAYBE

42. Suppose you know that
At least some of Mrs. Brown's flowers are not roses.
At least some of the flowers in the flower show are not roses.
Then would this be true?
At least some of Mrs. Brown's flowers are in the flower show.
o YES o NO o MAYBE

43. Suppose you know that
All the people who live near the lake can swim.
None of the students in Mr. Smith's class live near the lake.
Then would this be true?
At least some of the students in Mr. Smith's class cannot swim.
o YES o NO o MAYBE

44. Suppose you know that
At least some of the boys in the class have bicycles.
All those who are not here also do not have bicycles.
Then would this be true?
No boys in the class are here.
o YES o NO o MAYBE

45. Suppose you know that
All dogs are red.
Then would this be true?
All animals that are not red are also not dogs.
o YES o NO o MAYBE

46. Suppose you know that
No ducks are birds.
Nothing with large feathers is a bird.
Then would this be true?
At least some ducks have large feathers.
o YES o NO o MAYBE

47. Suppose you know that
All alligators are smart animals.
All animals that cannot sing are also not smart.
Then would this be true?
At least some alligators cannot sing.
o YES o NO o MAYBE

48. Suppose you know that
All X's are Y's.
All Z's are T's.
All Y's are Z's.
Then would this be true?
At least some X's are not T's.
o YES o NO o MAYBE

Корнелл Сыныбындағы Пайымдау Тестінің Х Нысаны (ССТ-Х) Сұрақтары

Білім беру саласындағы зерттеудің негізгі бөлігі болып табылатын "Корнелл Сыныбындағы Пайымдау Сынағы, Х Нысаны" бағдарламасына қош келдіңіз.

Сіздің электрондық поштаңыз:

Жалпы бағыттар:

Бұл сіздің ойлаудың белгілі бір түрін қаншалықты жақсы орындағаныңызды тексеруге арналған тест. Біз оны "таптық пайымдау"деп атаймыз. Сіз қазірдің өзінде осындай ойлаудың қандай да бір түрін жасап жатқаныңызды көресіз. Сұрақтардың үлгісі не күтілетінін анық көрсетеді. Қате БОЛЖАМАҢЫЗ. Егер сізде жауап бар деп ойласаңыз, бірақ сенімді болмасаңыз, бұл жауапты белгіленіз. Бірақ егер сізде түсінік болмаса, сұрақты өткізіп жіберіңіз.
3 үлгі сұрақ, содан кейін тағы 48 сұрақ бар. Сіз мүмкіндігінше тез жұмыс істеуіңіз керек, бірақ асықпаңыз.
Бұл жылдамдықты тексеру емес. Үлгілерді жасағаннан кейін сіз бірден алға жылжи аласыз.
Тестті аяқтауға 50 минут уақытыңыз бар.

Сұрақтарға жауап беру:

Әрбір сұраққа жауап беру кезінде тек сол сұрақта айтылғандарды ғана пайдаланыңыз. Мұны істеу үшін сіз өзіңіздің ақыл-ойыңыздың бос екенін елестетуіңіз керек, өйткені сізге айтылған кейбір нәрселер анық жалған. Солай бола тұрса да, сіз олардың шындық екенін болжауыңыз керек.тек осы сұрақ үшін.
Сізге ойлануға болатын бір немесе бірнеше сөйлем беріледі. Содан кейін сізге тағы бір сөйлем беріледі, ол туралы сіз тек айтқаныңызды қолдана отырып шешім қабылдауыңыз керек.
Үш ықтимал жауап бар. Бұл олардың мағынасы:
А. ИӘ-бұл рас болуы керек.
В. ЖОҚ-бұл шындық болуы мүмкін емес.
С. МҮМКІН - бұл шындық болуы мүмкін немесе ол шындыққа сәйкес келмеуі мүмкін.Сізге "ИӘ" немесе "ЖОҚ"екеніне сенімді болу үшін жеткілікті түрде айтылмады.
Әр сұрақтың бір ғана дұрыс жауабы бар.
Есіңізде болсын: жауаптың не екенін білмесеңіз, сұрақты өткізіп жіберіп, келесіге өтіңіз. Жабайы болжамаңыз, бірақ егер сіз білемін деп ойласаңыз, сұраққа жауап беріңіз.
Сұрақтардың үлгісі: бірінші сұрақты Оқып, оның қалай белгіленгенін көріңіз.
1. Сіз Билл Сэмнің қасында екенін білесіз делік. Сонда бұл рас болар ма еді? Сэм Биллдің қасында.
o ИӘ o ЖОҚ o МҮМКІН
Дұрыс жауап - "ИӘ". Егер Билл Сэмнің қасында болса, Онда Сэм Биллдің қасында болуы керек. Бұл рас болуы керек, сондықтан "ИӘ"айналасында шеңбер сызылады.
Міне, тағы бір үлгі. Бұл жолы сіз жауапты дөңгелектейсіз (белгіленбейді).
Сіз мұны білесіз делік: торғай сұңқардың үстінде. Сонда бұл рас болар ма еді? Сұңқар торғайдың үстінде.
o ИӘ o ЖОҚ O МҮМКІН
Сіз в-ны айналып өтуіңіз керек еді."ЖОҚ". Егер торғай сұңқардың үстінде болса, онда сұңқар торғайдың үстінде бола алмайды. Бұл шындық болуы мүмкін емес.
Осы келесі үлгінің жауабын дөңгелектеңіз. Сақ болыңыз:
Сіз Джейн Бетсидің жанында тұрғанын білесіз делік. Сонда бұл рас болар ма еді? Бетси Джейннің жанында тұр (ол белгіленбейді).
o ИӘ o ЖОҚ O МҮМКІН
Дұрыс жауап-С,"МҮМКІН". Тіпті Джейн Бетсидің жанында тұрса да, Бетси отырған болуы мүмкін. Бетси Джейннің жанында тұруы мүмкін, бірақ Ол Джейннің жанында немесе басқа жерде отыруы мүмкін. Сізге бұл туралы сенімді болу үшін жеткілікті түрде айтылмады, сондықтан "МҮМКІН" - бұл жауап.

Бастайық!

Енді сіз практикалық сұрақтарды қойғаннан кейін, сіз не күтілетінін түсінетін шығарсыз.

1. Сіз мұны білесіз делік
Гараждағы көліктердің барлығы Смит Мырзаға тиесілі.
Смит Мырзаның барлық көліктері Форд.
Сонда бұл рас болар ма еді?
Гараждағы көліктердің барлығы Фордтар.
o ИӘ o ЖОҚ O МҮМКІН

2. Сіз мұны білесіз делік
Джонның барлық қарындаштары көк түсті.
Сонда бұл рас болар ма еді?
Джонның кем дегенде кейбір қарындаштары көк емес.
o ИӘ o ЖОҚ O МҮМКІН

3. Сіз мұны білесіз делік
Желкенді жүзу туралы кітаптардың барлығы Биллдікі.
Барлық жасыл кітаптар Биллге тиесілі.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір жасыл кітаптар желкенді жүзуге арналған.
o ИӘ o ЖОҚ O МҮМКІН

4. Сіз мұны білесіз делік
Джейннің қуыршақтарының ешқайсысында қалпақ жоқ.
Сонда бұл рас болар ма еді?
Шляпалары бар қуыршақтардың ешқайсысы Джейнге тиесілі емес.
o ИӘ o ЖОҚ O МҮМКІН

5. Сіз мұны білесіз делік
Барлық қызыл кітаптар Джондікі
Сонда бұл рас болар ма еді?
Джонның барлық кітаптары қызыл.
o ИӘ o ЖОҚ O МҮМКІН

Сіз мұны білесіз делік
6. Мәридің барлық кітаптары жылқылар туралы.
Сөреде тұрған кітаптардың ешқайсысында жылқы туралы айтылмаған.
Сонда бұл рас болар ма еді?
Мәридің кем дегенде кейбір кітаптары сөреде тұр.
o ИӘ o ЖОҚ O МҮМКІН
7. Сіз мұны білесіз делік
Мартин отбасының кем дегенде кейбір балалары кітапханадан кітаптар алып шығады.
Кітапханадан кітап шығаратын адамдардың барлығында кітапхана карталары бар.
Сонда бұл рас болар ма еді?
Мартин отбасындағы балалардың кем дегенде кейбірінде кітапхана карталары бар.
o ИӘ o ЖОҚ O МҮМКІН
8. Сіз мұны білесіз делік
Барлық Х-У-У.
Жоқ, Z-Y-Y.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір Х-Тер Z-ге тең.
o ИӘ o ЖОҚ O МҮМКІН
9. Сіз мұны білесіз делік
Фредтің кем дегенде кейбір қарындаштары жасыл түсті.
Сонда бұл рас болар ма еді?
Фредтің қарындаштарының ешқайсысы жасыл емес.
o ИӘ o ЖОҚ O МҮМКІН
10. Сіз мұны білесіз делік
Кейттің кем дегенде кейбір қарындаштары көк түсті.
Қораптағы барлық қарындаштар көк түсті.
Сонда бұл рас болар ма еді?
Кем дегенде, кейттің кейбір карындаштары қорапта.
o ИӘ o ЖОҚ O МҮМКІН
11. Сіз мұны білесіз делік
Барлық Z-Y-Ге тең.
У-Ның барлығы Х-қа тең.
Сонда бұл рас болар ма еді?
Барлық Z-Х-қа тең.
o ИӘ o ЖОҚ O МҮМКІН
12. Сіз мұны білесіз делік
Барлық Х-У-У.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір Х-Лер Y-лер емес.
o ИӘ o ЖОҚ O МҮМКІН
13. Сіз мұны білесіз делік
Барлық ұлдар суретші.
Барлық балалар суретші.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір балалар ер балалар.
o ИӘ o ЖОҚ O МҮМКІН
14. Сіз мұны білесіз делік
Үстелдегі кітаптардың кем дегенде бір бөлігі жұлдыздар туралы.
Бобтың бірде-бір кітабы жұлдыздар туралы емес.
Сонда бұл рас болар ма еді?
Үстелдегі кітаптардың барлығы Бобтың кітаптары.
o ИӘ o ЖОҚ O МҮМКІН
15. Сіз мұны білесіз делік
Ешбір жануар ит емес.
Сонда бұл рас болар ма еді?
Ешбір ит жануар емес.
o ИӘ o ЖОҚ O МҮМКІН
16. Сіз мұны білесіз делік
Барлық Х-У-У.
Сонда бұл рас болар ма еді?
У-Ның барлығы Х-қа тең.
o ИӘ o ЖОҚ O МҮМКІН
17. Сіз мұны білесіз делік
Барлық мысықтар ұша алады.
Ұша алатын жануарлардың барлығы қара түсті.
Сонда бұл рас болар ма еді?
Барлық мысықтар қара түсті.
o ИӘ o ЖОҚ O МҮМКІН
18. Сіз мұны білесіз делік
Бобтың бірде-бір кітабы үстелде жоқ, бірақ үстелде кітаптар бар.
Сонда бұл рас болар ма еді?
Үстелдегі кітаптардың кем дегенде бір бөлігі Бобқа тиесілі емес.
o ИӘ o ЖОҚ O МҮМКІН
19. Сіз мұны білесіз делік
Барлық Х-У-У.
Барлық Z-Y-Ге тең.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір Z-Х-қа тең.
o ИӘ o ЖОҚ O МҮМКІН
20. Сіз мұны білесіз делік
Барлық қарындаштар ауыр.
Ағаштан жасалған ептене ауыр емес.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір қарындаштар ағаштан жасалған.
o ИӘ o ЖОҚ O МҮМКІН
21. Сіз мұны білесіз делік
Кем дегенде, кейбір жасыл қарындаштар Дикке тиесілі.
Сонда бұл рас болар ма еді?
Диктің барлық қарындаштары жасыл түсті.
o ИӘ o ЖОҚ O МҮМКІН
22. Сіз мұны білесіз делік
Жоқ Х-У-У.
Сонда бұл рас болар ма еді?
Жоқ, У-Х.
o ИӘ o ЖОҚ O МҮМКІН
23. Сіз мұны білесіз делік
Барлық иттер қоңыр түсті.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір иттер қоңыр емес.
o ИӘ o ЖОҚ O МҮМКІН
24. Сіз мұны білесіз делік
Барлық қоңыр жануарлардың төрт аяғы бар.
Сонда бұл рас болар ма еді?
Төрт аяқты жануарлардың барлығы қоңыр түсті.
o ИӘ o ЖОҚ O МҮМКІН
25. Сіз мұны білесіз делік
Джонның барлық кәмпиттері қорапта.
Шоколад емес кәмпиттердің барлығы да қорапта жоқ.
Сонда бұл рас болар ма еді?
Джонның кәмпиттерінің кем дегенде бір бөлігі шоколад емес.
o ИӘ o ЖОҚ O МҮМКІН
26. Сіз мұны білесіз делік
Қораптағы барлық қағаздар жыртылған.
Джонның бірде-бір құжаты қорапта жоқ.
Сонда бұл рас болар ма еді?
Джонның бірде-бір құжаты жыртылмаған.
o ИӘ o ЖОҚ O МҮМКІН
Сіз мұны білесіз делік
27. Барлық балалар ән айтады.
Сонда бұл рас болар ма еді?
Ән айтпайтын адамдардың барлығы

сондай-ақ ұлдар емес.
o ИӘ o ЖОҚ O МҮМКІН
28. Сіз мұны білесіз делік
Математикадан барлық үй тапсырмаларын бүгін орындау керек. Бүгін Джонның үй тапсырмасының ешқайсысы орындалмауы керек. Миллер мырзаның сыныбына арналған барлық үй тапсырмалары-математикадан үй тапсырмасы.
Сонда бұл рас болар ма еді?
Джонның үй тапсырмаларының ешқайсысы Миллер мырзаның сыныбына арналмаған.
o ИӘ o ЖОҚ O МҮМКІН
29. Сіз мұны білесіз делік
Қораптағы барлық қарындаштар жасыл түсті.
Сьюдің барлық қарындаштары өткір.
Барлық жасыл қарындаштар Сьюге тиесілі.
Сонда бұл рас болар ма еді?
Қораптағы қарындаштардың кем дегенде бір бөлігі өткір емес.
o ИӘ o ЖОҚ O МҮМКІН
30. Сіз мұны білесіз делік
Менің көйлектерімнің ешқайсысы жүннен жасалған емес.
Шкафта ілулі тұрған көйлектердің ешқайсысы жүннен жасалған емес.
Сонда бұл рас болар ма еді?
Кем дегенде, менің көйлектерімнің бір бөлігі шкафта ілулі тұр.
o ИӘ o ЖОҚ O МҮМКІН
31. Сіз мұны білесіз делік
Барлық Х-У-У.
Сонда бұл рас болар ма еді?
У емес нәрселердің бәрі Де Х емес.
o ИӘ o ЖОҚ O МҮМКІН
32. Сіз мұны білесіз делік
Барлық төрт аяқты жануарлар ұша алады.
Ешбір жылқы ұша алмайды.
Барлық жылдам жүгірушілер-төрт аяқты жануарлар.
Сонда бұл рас болар ма еді?
Бірде-бір жылқы жылдам жүгіруші емес.
o ИӘ o ЖОҚ O МҮМКІН
33. Сіз мұны білесіз делік
Барлық ұлдар жүгіреді, бірақ бәрі бірдей жүгіре бермейді.
Сонда бұл рас болар ма еді?
Кем дегенде, сайлауға түспейтіндердің кейбірі ұлдар емес.
o ИӘ o ЖОҚ O МҮМКІН
34. Сіз мұны білесіз делік
Сөредегі барлық кітаптар кітапханаға тиесілі.
Кітапханаға бірде-бір ғылыми кітап тиесілі емес.
Элмерге ұнайтын кітаптардың кем дегенде бір бөлігі сөреде.
Сонда бұл рас болар ма еді?
Кем дегенде, Элмерге ұнайтын кітаптардың кейбірі ғылыми кітаптар емес.
o ИӘ o ЖОҚ O МҮМКІН
35. Сіз мұны білесіз делік
Джонс Мырзаның кем дегенде кейбір оқушылары мектепке автобуспен барады.
55-Маршрутта тұратын барлық студенттердің иттері бар.
Мектепке автобуспен баратын барлық оқушылар 55-Маршрутта тұрады.
Сонда бұл рас болар ма еді?
o ИӘ o ЖОҚ O МҮМКІН
36. Сіз мұны білесіз делік
У-Ның барлығы Х-қа тең.
Жоқ, Z-Y-Y.
Сонда бұл рас болар ма еді?
Жоқ, Z-Х-Ге тең.
o ИӘ o ЖОҚ O МҮМКІН
37. Сіз мұны білесіз делік
Барлық оқытушылар колледж түлектері.
Орта мектепке барғандардың барлығы ер адамдар.
Колледж түлектерінің барлығы орта мектепте оқыды.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір мұғалімдер ер адамдар емес.
o ИӘ o ЖОҚ O МҮМКІН
38. Сіз мұны білесіз делік
Барлық Z-Y-Ге тең.
Жоқ Х-У-У.
Барлық " Т " - "З".
Сонда бұл рас болар ма еді?
"Х" әрпі " Т " әрпі емес.
o ИӘ o ЖОҚ O МҮМКІН
39. Сіз мұны білесіз делік
Барлық құстардың үш көзі бар.
Үйректер құстар емес.
Сонда бұл рас болар ма еді?
Үйректердің үш көзі жоқ.
o ИӘ o ЖОҚ O МҮМКІН
40. Сіз мұны білесіз делік
Жоқ, Z-Y-Y.
Жоқ Х-У-У.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір Z-Х-қа тең.
o ИӘ o ЖОҚ O МҮМКІН
41. Сіз мұны білесіз делік
Барлық Z-Y-Ге тең.
Х емес Нәрселердің бәрі Де У Емес.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір Z-Лер Х-лер емес.
o ИӘ o ЖОҚ O МҮМКІН
42. Сіз мұны білесіз делік
Браун Ханымның кем дегенде кейбір гүлдері раушан емес.
Гүлдер көрмесіндегі гүлдердің кем дегенде бір бөлігі раушан гүлдері емес.
Сонда бұл рас болар ма еді?
Браун Ханымның кем дегенде кейбір гүлдері гүлдер көрмесінде.
o ИӘ o ЖОҚ O МҮМКІН
43. Сіз мұны білесіз делік
Көлдің жанында тұратындардың барлығы жүзе алады.
Смит мырзаның сыныбындағы оқушылардың ешқайсысы көлдің жанында тұрмайды.
Сонда бұл рас болар ма еді?
Смит мырзаның сыныбындағы кем дегенде кейбір оқушылар жүзе алмайды.
o ИӘ o ЖОҚ O МҮМКІН
44. Сіз мұны білесіз делік
Сыныптағы ұлдардың кем дегенде кейбірінің велосипедтері бар.
Мұнда жоқтардың барлығында да велосипед жоқ.
Сонда бұл рас болар ма еді?
Мұнда сыныпта ұлдар жоқ.
o ИӘ o ЖОҚ O МҮМКІН
45. Сіз мұны білесіз делік
Барлық иттер қызыл түсті.
Сонда бұл рас болар ма еді?
Қызыл емес жануарлардың барлығы да ит емес.
o ИӘ o ЖОҚ O МҮМКІН
46. Сіз мұны білесіз делік
Үйректер құстар емес.
Үлкен қауырсындары бар ештеңе құс емес.

Сонда бұл рас болар ма еді?
Кем дегенде, кейбір үйректердің қауырсындары үлкен.
o ИӘ o ЖОҚ O МҮМКІН
47. Сіз мұны білесіз делік
Барлық аллигаторлар-ақылды жануарлар.
Ән айта алмайтын жануарлардың бәрі де ақылды емес.
Сонда бұл рас болар ма еді?
Кем дегенде, кейбір аллигаторлар ән айта алмайды.
o ИӘ o ЖОҚ O МҮМКІН
48. Сіз мұны білесіз делік
Барлық X-У-У.
Барлық Z-Т.
Барлық Y-Z-Ге тең.
Сонда бұл рас болар ма еді?
Кем дегенде, Кейбір " X "Әріптері" Т " әрпіне жатпайды.
o ИӘ o ЖОҚ O МҮМКІН

Вопросы Корнелльского теста на логическое мышление, форма X (CCT-X)

Добро пожаловать на "Корнелльский тест на логическое мышление, форма X", который является ключевой частью образовательного исследования.

Ваш адрес электронной почты:

Общие указания:

Это тест, позволяющий определить, насколько хорошо вы мыслите определенным образом. Мы называем его "классовое мышление". Вы увидите, что вы уже умеете мыслить подобным образом.
Примерные вопросы разъясняют, чего от вас ожидают. НЕ ДЕЛАЙТЕ поспешных ВЫВОДОВ. Если вам кажется, что у вас есть ответ, но вы не уверены, отметьте этот ответ. Но если вы понятия не имеете, то пропустите вопрос.
Есть 3 примерных вопроса, затем 48 других. Вы должны работать как можно быстрее, но не торопитесь.
Это не тест на скорость. Как только вы выполните примеры, вы сможете двигаться дальше.
У вас есть 50 минут, чтобы закончить тест.

Ответы на вопросы:

При ответе на каждый вопрос используйте только то, что вам сказано в этом вопросе. Для этого вам следует представить, что в вашем сознании ничего нет, потому что некоторые вещи, которые вам говорят, заведомо ложны. Тем не менее, вы должны предположить, что они верны - только для этого вопроса.
Вам будет предложено подумать над одним или несколькими предложениями. Затем вам будет предложено другое предложение, по поводу которого вы должны принять решение, используя только то, что вам сказали.
Есть три возможных ответа. Вот что они означают:
О. ДА, это должно быть правдой.
В. НЕТ - Это не может быть правдой.
С. ВОЗМОЖНО - это может быть правдой, а может и не быть.Вам сказали недостаточно, чтобы быть уверенным, "ДА" это или "НЕТ".
На каждый вопрос есть только один правильный ответ.
Помнить: Если вы понятия не имеете, каков будет ответ, пропустите вопрос и переходите к следующему. Не пытайтесь угадать, но если вам кажется, что вы знаете, то ответьте на вопрос.
Примеры вопросов: Прочитайте первый вопрос и посмотрите, как он обозначен.
1. Предположим, вы знаете, что Билл находится рядом с Сэмом. Тогда это было бы правдой? Сэм находится рядом с Биллом.
o ДА o НЕТ o ВОЗМОЖНО
Правильный ответ - "ДА". Если Билл стоит рядом с Сэмом, то Сэм должен быть рядом с Биллом. Это должно быть правдой, поэтому вокруг "ДА" обведен кружок.
Вот еще один пример. На этот раз ответ обведен кружком (отмечен не будет).
Предположим, вы знаете, что: Воробей находится над ястребом. Тогда это было бы правдой? Ястреб находится над воробьем.
o ДА o НЕТ o ВОЗМОЖНО
Вам следовало обвести букву "Б" кружком. "НЕТ". Если воробей находится над ястребом, то ястреб не может находиться над воробьем. Это не может быть правдой.
Обведите ответ в следующем примере. Будьте осторожны:
Предположим, вы знаете, что Джейн стоит рядом с Бетси. Тогда было бы это правдой? Бетси стоит рядом с Джейн (не будет отмечена).
o ДА o НЕТ o ВОЗМОЖНО
Правильный ответ - С, "ВОЗМОЖНО". Даже если Джейн стоит рядом с Бетси, Бетси может сидеть. Бетси может стоять рядом с Джейн, но она может сидеть рядом с Джейн или как-то еще. Вам сказали недостаточно, чтобы быть в этом уверенным, поэтому ответ "ВОЗМОЖНО".

Давайте начнем!

Теперь, когда вы ответили на практические вопросы, вы, вероятно, понимаете, чего от вас ожидают.

1. Предположим, вы знаете, что
Все машины в гараже принадлежат мистеру Смиту.
Все машины мистера Смита - "Форды".
Значит, это правда?
Все машины в гараже - "Форды".
o ДА o НЕТ o ВОЗМОЖНО

2. Предположим, вы знаете, что
Все карандаши Джона синие.
Тогда было бы это правдой?
По крайней мере, некоторые из карандашей Джона не синие.
o ДА o НЕТ o ВОЗМОЖНО

3. Предположим, вы знаете, что
Все книги о парусном спорте написаны Биллом.
Все зеленые книги принадлежат Биллу.
Тогда это правда?
По крайней мере, некоторые из зеленых книг о парусном спорте.
o ДА o НЕТ o ВОЗМОЖНО

4. Предположим, вы знаете, что
Ни у одной из кукол Джейн нет шляп.
Тогда это правда?
Ни одна из кукол, у которых есть шляпки, не принадлежит Джейн.
o ДА o НЕТ o ВОЗМОЖНО

5. Предположим, вы знаете, что
Все красные книги принадлежат Джону

Тогда это правда?
Все книги Джона красные.
o ДА o НЕТ o ВОЗМОЖНО
Предположим, вы это знаете
6. Все книги Мэри о лошадях.
Ни одна из книг на полке не посвящена лошадям.
Тогда было бы это правдой?
По крайней мере, некоторые книги Мэри стоят на полке.
o ДА o НЕТ o ВОЗМОЖНО
7. Предположим, вы знаете, что
По крайней мере, некоторые дети в семье Мартин берут книги из библиотеки.
Все люди, которые берут книги из библиотеки, имеют читательские карточки.
Тогда было бы это правдой?
По крайней мере, у некоторых детей в семье Мартин есть библиотечные карточки.
o ДА o НЕТ o ВОЗМОЖНО
8. Предположим, вы знаете, что
Все буквы X - это буквы Y.
Ни одна буква Z не является буквой Y.
Тогда было бы это правдой?
По крайней мере, некоторые буквы X - это буквы Z.
o ДА o НЕТ o ВОЗМОЖНО
9. Предположим, вы знаете, что
По крайней мере, некоторые карандаши Фреда зеленые.
Тогда было бы это правдой?
Ни один из карандашей Фреда не зеленый.
o ДА o НЕТ o ВОЗМОЖНО
10. Предположим, вы знаете, что
По крайней мере, некоторые карандаши Кейт синие.
Все карандаши в коробке синие.
Тогда было бы это правдой?
По крайней мере, несколько карандашей Кейт лежат в коробке.
o ДА o НЕТ o ВОЗМОЖНО
11. Предположим, вы знаете, что
Все буквы Z - это буквы Y.
Все буквы Y - это буквы X.
Тогда это правда?
Все буквы Z - это буквы X.
o ДА o НЕТ o ВОЗМОЖНО
12. Предположим, вы знаете, что
Все X - это Y.
Тогда было бы это правдой?
По крайней мере, некоторые X - это не Y.
o ДА o НЕТ o ВОЗМОЖНО
13. Предположим, вы знаете, что
Все мальчики - художники.
Все дети - художники.
Тогда это правда?
По крайней мере, некоторые дети - мальчики.
o ДА o НЕТ o ВОЗМОЖНО
14. Предположим, вы знаете, что
По крайней мере, некоторые из книг на столе посвящены звездам.
Ни одна из книг Боба не посвящена звездам.
Тогда было бы это правдой?
Все книги на столе принадлежат Бобу.
o ДА o НЕТ o ВОЗМОЖНО
15. Предположим, вы знаете, что
Никакие животные не являются собаками.
Тогда это было бы правдой?
Никакие собаки не являются животными.
o ДА o НЕТ o ВОЗМОЖНО
16. Предположим, вы знаете, что
Все X - это Y.
Тогда это было бы правдой?
Все Y - это X.
o ДА o НЕТ o ВОЗМОЖНО
17. Предположим, вы знаете, что
Все кошки умеют летать.
Все животные, которые могут летать, черные.
Тогда было бы это правдой?
Все кошки черные.
o ДА o НЕТ o ВОЗМОЖНО
18. Предположим, вы знаете, что
На столе нет книг Боба, но на столе есть книги.
Тогда было бы это правдой?
По крайней мере, некоторые из книг на столе принадлежат не Бобу.
o ДА o НЕТ o ВОЗМОЖНО
19. Предположим, вы знаете, что
Все X - это Y.
Все Z - это Y.
Тогда было бы это правдой?
По крайней мере, некоторые Z - это X.
o ДА o НЕТ o ВОЗМОЖНО
20. Предположим, вы знаете, что
Все карандаши тяжелые.
Ничто из дерева не бывает тяжелым.
Так ли это на самом деле?
По крайней мере, некоторые карандаши сделаны из дерева.
o ДА o НЕТ o ВОЗМОЖНО
21. Предположим, вы знаете, что
По крайней мере, некоторые из зеленых карандашей принадлежат Дику.
Тогда это правда?
Все карандаши Дика зеленые.
o ДА o НЕТ o ВОЗМОЖНО
22. Предположим, вы знаете, что
Никакие "X" не являются "Y".
Тогда это было бы правдой?
Никакие "Y" не являются "X".
o ДА o НЕТ o ВОЗМОЖНО
23. Предположим, вы знаете, что
Все собаки коричневые.
Тогда это было бы правдой?
По крайней мере, некоторые собаки не коричневые.
o ДА o НЕТ o ВОЗМОЖНО
24. Предположим, вы знаете, что
У всех коричневых животных четыре ноги.
Тогда было бы это правдой?
Все четвероногие животные коричневые.
o ДА o НЕТ o ВОЗМОЖНО
25. Предположим, вы знаете, что
Все конфеты Джона в коробке.
Всех конфет, которые не являются шоколадными, тоже нет в коробке.
Тогда было бы это правдой?
По крайней мере, некоторые конфеты Джона не шоколадные.
o ДА o НЕТ o ВОЗМОЖНО
26. Предположим, вы знаете, что
Все бумажки в коробке порваны.
В коробке нет ни одной бумажки Джона.
Тогда было бы это правдой?
Ни одна из бумаг Джона не порвалась.
o ДА o НЕТ o ВОЗМОЖНО
Предположим, ты это знаешь
27. Все мальчики поют.

Тогда было бы это правдой?
Все люди, которые не поют, тоже не мальчики.
o ДА o НЕТ o ВОЗМОЖНО
28. Предположим, вы знаете, что
Все домашние задания по математике должны быть сделаны сегодня. Ни одно из домашних заданий Джона не должно быть сделано сегодня. Все домашние задания для класса мистера Миллера - это домашние задания по математике.
Тогда было бы это правдой?
Ни одно из домашних заданий Джона не предназначено для урока мистера Миллера.
o ДА o НЕТ o ВОЗМОЖНО
29. Предположим, вы знаете, что
Все карандаши в коробке зеленые.
Все карандаши Сью острые.
Все зеленые карандаши принадлежат Сью.
Тогда было бы это правдой?
По крайней мере, некоторые карандаши в коробке не заточены.
o ДА o НЕТ o ВОЗМОЖНО
30. Предположим, вы знаете, что
Ни одна из моих рубашек не шерстяная.
Ни одна из рубашек, висящих в шкафу, не шерстяная.
Тогда было бы это правдой?
По крайней мере, некоторые из моих рубашек висят в шкафу.
o ДА o НЕТ o ВОЗМОЖНО
31. Предположим, вы знаете, что
Все X - это Y.
Тогда было бы это правдой?
Все, что не относится к Y, также не является X.
o ДА o НЕТ o ВОЗМОЖНО
32. Предположим, вы знаете, что
Все четвероногие животные умеют летать.
Лошади летать не умеют.
Все быстро бегающие животные - четвероногие.
Тогда было бы это правдой?
Ни одна лошадь не может быть быстрой в беге.
o ДА o НЕТ o ВОЗМОЖНО
33. Предположим, вы знаете, что
Все мальчики бегают, но бегают не все.
Тогда было бы это правдой?
По крайней мере, некоторые из тех, кто не бегает, не мальчики.
o ДА o НЕТ o ВОЗМОЖНО
34. Предположим, вы знаете, что
Все книги на полке принадлежат библиотеке.
В библиотеке нет научных книг.
По крайней мере, некоторые из книг, которые нравятся Элмеру, есть на полке.
Тогда было бы это правдой?
По крайней мере, некоторые из книг, которые нравятся Элмеру, не являются научными.
o ДА o НЕТ o ВОЗМОЖНО
35. Предположим, вы знаете, что
По крайней мере, некоторые из учеников мистера Джонса ездят в школу на автобусе.
У всех учеников, которые живут на 55-м маршруте, есть собаки.
Все ученики, которые ездят в школу на автобусе, живут на 55-м маршруте.
Тогда было бы это правдой?
o ДА o НЕТ o ВОЗМОЖНО
36. Предположим, вы знаете, что
Все Y - это X.
Никакие Z не являются Y.
Тогда это было бы правдой?
Никакие Z не являются X.
o ДА o НЕТ o ВОЗМОЖНО
37. Предположим, вы знаете, что
Все учителя - выпускники колледжей.
Все люди, окончившие среднюю школу, - мужчины.
Все выпускники колледжей окончили среднюю школу.
Тогда было бы это правдой?
По крайней мере, некоторые учителя - не мужчины.
o ДА o НЕТ o ВОЗМОЖНО
38. Предположим, вы знаете, что
Все Z - это Y.
Никакие X - это Y.
Все T - это Z.
Тогда было бы это правдой?
Никакие X - это T.
o ДА o НЕТ o ВОЗМОЖНО
39. Предположим, вы знаете, что
У всех птиц по три глаза.
Утки не являются птицами.
Тогда было бы это правдой?
У уток не бывает трех глаз.
o ДА o НЕТ o ВОЗМОЖНО
40. Предположим, вы знаете, что
Никакие Z не являются символами Y.
Никакие X не являются символами Y.
Тогда было бы это правдой?
По крайней мере, некоторые Z являются символами X.
o ДА o НЕТ o ВОЗМОЖНО
41. Предположим, вы знаете, что
Все Z - это Y.
Все, что не является X, также не является Y.
Тогда было бы это правдой?
По крайней мере, некоторые Z - это не X.
o ДА o НЕТ o ВОЗМОЖНО
42. Предположим, вы знаете, что
По крайней мере, некоторые цветы миссис Браун - не розы.
По крайней мере, некоторые цветы на выставке цветов - не розы.
Значит, это правда?
По крайней мере, некоторые цветы миссис Браун представлены на выставке цветов.
o ДА o НЕТ o ВОЗМОЖНО
43. Предположим, вы знаете, что
Все люди, живущие рядом с озером, умеют плавать.
Никто из учеников класса мистера Смита не живет рядом с озером.
Тогда было бы это правдой?
По крайней мере, некоторые ученики в классе мистера Смита не умеют плавать.
o ДА o НЕТ o ВОЗМОЖНО
44. Предположим, вы это знаете.
По крайней мере, у некоторых мальчиков в классе есть велосипеды.
У всех, кого здесь нет, тоже нет велосипедов.
Тогда было бы это правдой?
В классе нет мальчиков.
o ДА o НЕТ o ВОЗМОЖНО
45. Предположим, вы знаете, что
Все собаки рыжие.
Тогда было бы это правдой?
Все животные, которые не рыжие, также не являются собаками.
o ДА o НЕТ o ВОЗМОЖНО

46. Предположим, вы знаете, что
Никакие утки не являются птицами.
Ничто с большими перьями не является птицей.
Тогда было бы это правдой?
По крайней мере, у некоторых уток большие перья.
o ДА o НЕТ o ВОЗМОЖНО
47. Предположим, вы знаете, что
Все аллигаторы - умные животные.
Все животные, которые не умеют петь, также не очень умны.
Тогда было бы это правдой?
По крайней мере, некоторые аллигаторы не умеют петь.
o ДА o НЕТ o ВОЗМОЖНО
48. Предположим, вы знаете, что
Все X - это Y.
Все Z - это T.
Все буквы Y - это буквы Z.
Тогда было бы это правдой?
По крайней мере, некоторые буквы X - это не буквы T.
o ДА o НЕТ o ВОЗМОЖНО