Global Journal on Innovation, Opportunities and Challenges in AAI and Machine Learning
http://eurekajournals.com/IJIOCAAIML.html
ISSN: 2581-5156

Generation Z and the Mental Health Effects of Excessive usage of Artificial Intelligence within Higher Education Institutions across Jamaica

Vashawn Cameron[1], Kareem Duncan[1], Robert Henry[1], Tanya Lawrence[1], Jahiem Gordon[1], Paul Andrew Bourne[1], PhD, DrPH., Zandy U. Elliott[2], PhD, DHSc., Dennis Brooks[3], BSc, Vivienne L. Quarrie[4], PhD, Feliciano Thorpe[1], MSc, Ikhalfani Solan[5,] PhD, Moya-Gaye Hamilton[1] MSc.

[1]Vocational Training Development Institute (VTDI), Kingston, Jamaica, WI.
[2]University of Technology, Jamaica (UTECH), Kingston, Jamaica, WI.
[3]Jamaica Constabulary Force (JCF), Kingston, Jamaica, WI.
[4]Northern Caribbean University (NCU), Mandeville, Manchester, Jamaica, WI.
[5]South Carolina State University, Orangeburg, South Carolina, United States.

Abstract

Introduction: Globally, Generation Z-those born between 1997 and 2012-report higher levels of mental health challenges than previous generations. World Health Organization (WHO) reported that approximately 15% of adolescents aged 10-19 experience mental health conditions, with anxiety and depression being the most prevalent. In the Caribbean region, the Pan American Health Organization (PAHO) highlighted that depression is a leading cause of disability among young people, exacerbated by social and environmental stressors. In Jamaica, Lipps and colleagues revealed that nearly 40% of high school students reported symptoms of anxiety, and 25% exhibited signs of depression, underscoring the urgency of addressing mental health concerns among the youth population. The study investigates Generation Z and the mental health effects of excessive artificial intelligence (AI) usage within Higher Education Institutions across Jamaica.

Objectives: To assess the impact of AI on Generation Z's critical thinking skills; to explore how AI shapes the learning process of Generation Z.; to investigate the effects of AI on the decision-making abilities of Generation Z.; and to identify the potential consequences of excessive AI use on Generation Z's creativity and mental abilities.

Methods and Materials: Case studies were employed, utilising theoretical frameworks such as the Technology Acceptance Model (TAM) and Transactional Model of Stress and Coping, providing insights into the evolving dynamics of AI adoption by implementing a stratified

random sampling method with a total population 352, 531, a sample size of 384 students, and participants 18-28 years old, across Higher Education Institutions in Jamaica.

Findings: AI enhances critical thinking in academic institutions by 12.3% but hinders critical thinking by relying on AI-generated materials by 42.9%. AI provided 28.8% of automating tasks and improved personalised learning experiences by 31.3% while limiting access to information by 9.8% and discouraging traditional learning methods by 30.1%. AI-generated materials provide 27.8% decision-making for students, provide data-driven insights to inform decisions by 34%, reduce the need for careful consideration by 30.9%, and eliminate uncertainty in decision-making by 7.4%. AI usage increased creativity by 12.3%, magnified problem-solving skills by 20.2%, and improved information literacy by 6.1%. The most significant impact of AI usage was on cognitive abilities, reducing attention span by 61.3%.

Conclusion: While AI offers substantial benefits in enhancing personalised learning, creativity, and decision-making, its overuse may hinder critical thinking, attention span, and independent cognitive abilities. These findings highlight the need for a balanced approach in integrating AI into educational settings, ensuring its advantages are maximised without compromising essential skills for academic success. This research aims to contribute to total comprehension of AI usage and the generational shift provided in technology use toward education and for future generations.

Keywords: Artificial Intelligence, Generation Z, mental health, cognitive abilities, critical thinking

Introduction

The rapid integration of Artificial Intelligence in educational systems worldwide has brought significant transformations in teaching methodologies, learning experiences, and overall academic performance. While the potential benefits of Artificial Intelligence (AI)-such as personalised learning, automated grading, and enhanced access to educational resources-are widely recognised, its excessive usage raises critical concerns, especially regarding its impact on mental health.

Globally, Generation Z-those born between 1997 and 2012-report higher levels of mental health challenges than previous generations. According to a 2023 report by the World Health Organization (WHO), approximately 15% of adolescents aged 10-19 experience mental health conditions, with anxiety and depression being the most prevalent. In the Caribbean region, the Pan American Health Organization (PAHO) highlights that depression is a leading cause of disability among young people, exacerbated by social and environmental stressors. In Jamaica, a 2022 study revealed that nearly 40% of high school students reported symptoms of anxiety, and 25% exhibited signs of depression, underscoring the urgency of addressing mental health concerns among the youth population.

As Higher Education Institutions in Jamaica adopt AI-driven tools to enhance learning outcomes, Generation Z students face unique challenges. Prolonged interaction with AI technologies,

ranging from adaptive learning platforms to Chatbots for academic support, has been associated with increased screen time, cognitive overload, and social disconnection. This shift in the learning environment may amplify existing mental health vulnerabilities among students. This cross-sectional descriptive study investigates the mental health effects of excessive AI usage among Generation Z students within Jamaican Higher Education Institutions. It aims to explore the relationship between AI reliance and indicators of mental well-being, such as stress, depression, and social connectivity, while considering the cultural and educational context unique to Jamaica. By examining this interplay, the study seeks to provide insights into the implications of AI on mental health and offer recommendations for fostering balanced and health-conscious AI integration in education.

Artificial Intelligence (AI) has integrated into everyday life, impacting work, education, and decision-making. AI tools, such as Chabot and automated learning systems, are increasingly relied upon for convenience. While these tools amplify productivity, there is growing concern that they may diminish individuals' ability to think critically. For instance, *Psychology Today* (n.d.) discussed how AI-generated content could undermine independent thought, while *Forbes* (n.d.) warned of AI's influence on cognitive functions, including the decline of rational analysis skills (see also Robinson, 2024; Marr, 2023). Nowadays, Generation Z has been relying on AI to make their everyday life easier.

Several studies highlight that Generation Z students frequently use AI tools in academic settings, raising questions about long-term cognitive consequences (Ilesanmi, 2024; YPulse, 2024). In Jamaica, for example, the education sector has embraced AI to develop understanding, but concerns persist about its impact on critical thinking and student development (Jamaica Observer, 2023; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2024). This paper focuses on the influence of AI on thought processes, learning habits, and decision-making, with a specific lens on Generation Z and their increased reliance on technology. This research assesses whether excessive AI use can lead to cognitive decline and reduce independent thinking over time. Relying too heavily on AI could have implications for decision-making and mental well-being, as the American Psychological Association (2023) suggests. Drawing on insights from multiple expert sources, including *MIT Technology Review*, *Harvard Business Review*, and *The Verge*, this paper will explore how AI influences cognitive abilities and whether dependency on these technologies could negatively affect mental health and independent thinking.

Statement of the Problem

Generation Z students may rely too much on AI, which could reduce essential skills like judgment, creativity, and problem-solving. Furthermore, integrating Artificial Intelligence (AI) in educational systems has transformed learning environments globally, offering personalised instruction, efficient assessment methods, and increased accessibility to academic resources. However, this technological revolution has raised concerns about the unintended consequences of excessive AI usage on students' mental health, particularly among Generation Z-the cohort born into a digitally saturated era. These students, known for their reliance on technology, are uniquely vulnerable to the psychological effects of prolonged AI interaction, including increased

cognitive load, social isolation, and heightened stress. Globally, mental health challenges among adolescents and young adults are on the rise. The World Health Organization (WHO) reports that one in seven adolescents aged 10-19 suffers from a mental health condition, with anxiety and depression being the most prevalent (WHO, n.d.). In the Caribbean, depression is identified as a leading cause of disability among young people (PAHO, n.d.). A study conducted in Jamaica highlights that nearly 40% of high school students experience symptoms of anxiety, while 25% exhibit signs of depression (Lipps et al., 2010). These statistics underscore the critical need to address mental health vulnerabilities in this demographic.

The growing reliance on AI tools in Jamaican Higher Education Institutions introduces new dynamics that may exacerbate these vulnerabilities. For instance, adaptive learning platforms and AI-driven academic support systems often lead to extended screen time, reduced interpersonal interactions, and a persistent demand for high cognitive engagement. These factors may amplify mental health challenges, yet little is known about their specific impacts within the Jamaican context. Despite the increasing prevalence of AI technologies in education, research exploring their mental health implications remains limited, leaving a critical gap in understanding and intervention strategies.

This cross-sectional descriptive research seeks to address this gap by examining the mental health effects of excessive AI usage among Generation Z students in Jamaica. By exploring the relationship between AI reliance and mental well-being indicators-such as stress, anxiety, and social connectivity-this research aims to provide insights into the psychological consequences of AI integration in education and inform policies promoting balanced and health-conscious technology use.

Significance of the Study

As Artificial Intelligence (AI) integration becomes increasingly prevalent in educational settings, the need to understand its broader impacts on students extends beyond academic outcomes to encompass mental health and well-being. This study is significant because it sheds light on the mental health effects of excessive AI usage among Generation Z students in Jamaica, offering insights into a relatively underexplored area of research.

Understanding Cognitive Impact

Mental health is a critical issue among adolescents and young adults globally. Reports indicate that approximately one in seven individuals aged 10-19 suffers from a mental health condition, with anxiety and depression being the most common (World Health Organization, n.d.). This study identified how AI influenced essential cognitive skills such as critical thinking, creativity, and conflict resolution, providing insight into potential long-term effects on human cognition.

Impact on Education

In Jamaica, this challenge is acute, as nearly 40% of high school students report symptoms of anxiety, and 25% show signs of depression (Lipps et al., 2010). The research offered valuable

information for educators and policymakers on how AI shaped learning habits, especially among Generation Z, and whether over-reliance on AI could hinder intellectual development.

Guidance for Responsible Artificial Intelligence Use

By focusing on the interplay between AI use and mental health in this demographic, the study provides critical data that could help mitigate these mental health challenges.

Moreover, this research has practical significance for educators, policymakers, and mental health practitioners. While AI offers numerous benefits in enhancing learning experiences and educational outcomes, its excessive use can lead to cognitive overload, social disconnection, and heightened stress. The study's findings will serve as a foundation for developing balanced approaches to AI integration in education, ensuring that the advantages of technology do not come at the expense of students' mental well-being. The findings helped students, educators, and organisations use AI tools more effectively by promoting practices that supported independent thinking and cognitive engagement.

Policy Development

Policymakers used the results of this study to create guidelines and strategies that balanced AI's benefits with the need to preserve critical cognitive abilities. From a societal perspective, the study contributes to addressing mental health in Jamaica, a country where stigma, resource limitations, and inequitable access to mental health services often impede effective intervention (Pan American Health Organization [PAHO], n.d.). By examining AI's impact in this unique cultural context, the research provides a localised understanding of global issues, aligning with broader international efforts to improve mental health outcomes, such as the Sustainable Development Goals (SDG 3: Ensure healthy lives and promote well-being for all ages).

This research study is educationally relevant. Its findings are expected to inform curriculum design and the development of institutional policies, enabling educators to foster a healthy balance between technology usage and psychological support. By emphasising the importance of mental health in educational innovation, this study will help guide the creation of more holistic and supportive learning environments in Jamaica.

This study is significant for its potential to advance knowledge, inform policy, and contribute to Generation Z students' mental and educational well-being in Jamaica. It bridges a crucial gap in understanding the broader consequences of AI in education and offers practical solutions for a rapidly evolving technological landscape.

Purpose of the Study

This study aimed to explore Generation Z and the mental health effects of excessive AI usage within Higher Education Institutions across Jamaica, focusing on high schools and universities where Generation Z students are the primary demographic. The study aimed to determine if depending too much on AI can weaken rational analysis, creativity, and problem-solving skills, which are essential for success in life. The study also intended to discover ways to encourage the

responsible use of AI tools so that students and individuals can enjoy the benefits of AI without losing the ability to think independently.

Theoretical Frameworks

This study on the mental health effects of excessive AI usage among Generation Z students in Jamaica across Higher Educational Institutions was guided by two complementary theoretical frameworks: the Technology Acceptance Model (TAM) and the Transactional Model of Stress and Coping. These frameworks provide a lens to understand how adopting AI technologies in education influences students' mental health outcomes and coping mechanisms.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), introduced by Davis (1989), is widely used to understand the adoption and use of new technologies. TAM posits that two main factors-perceived usefulness and ease of use-determine an individual's intention to use technology. This model is critical for examining the role of excessive AI usage in educational settings, as it explains why Generation Z students might heavily engage with AI tools.

In the context of this study, TAM provides insights into why students adopt AI for learning and how their perceptions of its benefits (e.g., improved academic scores) might lead to overuse. However, despite its perceived usefulness, excessive reliance on AI may contribute to cognitive overload, decreased interpersonal interactions, and heightened stress levels. These unintended consequences align with the concerns explored in this research.

Transactional Model of Stress and Coping

The Transactional Model of Stress and Coping, developed by Lazarus and Folkman (1984), emphasises the dynamic relationship between individuals and their environment in stress. This model views stress as a result of an individual's appraisal of external demands and their perceived ability to cope.

This framework is particularly relevant for understanding how students experience stress related to AI usage in education. Prolonged exposure to AI tools may be perceived as a demand exceeding students' coping resources. The model also highlights the role of problem-focused coping mechanisms (e.g., managing AI use) and emotion-focused (e.g., seeking mental health support)-in mitigating stress. This perspective is vital for identifying interventions to help students balance AI usage and mental well-being.

Integration of Frameworks

This study captures the dual dynamics of technology adoption and its psychological consequences by combining TAM and the Transactional Model of Stress and Coping. TAM explains AI's initial acceptance and overuse, while the Transactional Model explores the stressors and coping strategies that emerge from such usage. Together, these frameworks offer a comprehensive understanding of the relationship between excessive AI usage and mental health

outcomes, providing a robust foundation for exploring and addressing this phenomenon in the Jamaican educational context.

Rationale for the Study

AI has become a part of everyday life, helping people complete tasks quickly and more efficiently. Young people, especially Generation Z, often use AI tools to learn, work, and make decisions. However, as helpful as AI is, there is concern that overusing these tools could make people less capable of thinking vital. This issue is critical in education, where students rely on AI for assignments and learning. Schools in places like Jamaica are increasingly using AI tools to improve teaching, but the impact on students' ability to think independently still needs to be discovered. This study was conducted to understand these challenges better and offer solutions that ensure students develop strong thinking skills while benefiting from AI.

General Research Question

How does using AI tools affect Generation Z's cognitive skills, learning habits, and decision-making abilities?

Objectives

1. To assess the impact of AI on Generation Z's critical thinking skills.

This objective aims to determine how AI influences Generation Z's ability to think critically, whether it enhances their thinking by providing diverse perspectives or hinders it by relying on AI-generated information.

2. To explore how AI shapes the learning process of Generation Z.

This objective focuses on understanding how AI affects learning habits, including its role in automating tasks, providing personalised learning experiences, and potentially discouraging traditional learning methods.

3. To investigate the effects of AI on the decision-making abilities of Generation Z.

This objective examines whether AI makes decisions for Generation Z, provides data-driven insights to inform decisions, reduces the need for careful consideration, or eliminates uncertainty in decision-making.

4. To identify the potential consequences of excessive AI use on Generation Z's creativity and mental abilities.

This objective explores how over-reliance on AI affects Generation Z's creativity, such as whether it leads to reduced creative thinking abilities or influences their perception of originality and innovation.

Key Terms

Artificial Intelligence (AI): AI refers to using machines and computer programs to perform tasks that typically require human intelligence, such as learning, problem-solving, and decision-making (Marr, 2023). AI tools, including Chatbots and virtual assistants, help users with tasks but may also influence how they think and make decisions over time (Psychology Today, n.d.).

Cognitive Abilities: Cognitive abilities are the mental processes of gaining knowledge and understanding, including memory, reasoning, and problem-solving (American Psychological Association, 2023). These abilities are essential for academic and professional success and may be affected by the frequent use of AI tools (Harvard Business Review, 2023).

Critical Thinking: Critical thinking is the ability to analyse information objectively and make reasoned judgments based on evidence (Robinson, 2024). It involves evaluating different perspectives, questioning assumptions, and making well-informed decisions (Marr, 2023). Excessive reliance on AI may reduce opportunities for individuals to practice this skill (MIT Technology Review, 2023).

Generation Z: Generation Z refers to individuals born between 1997 and 2012 (YPulse, 2024). This generation grew up in a digital age and often relies on technology, including AI, for learning and personal activities (Ilesanmi, 2024). Because of this, they are the focus of many studies investigating the impact of AI on cognitive skills and decision-making (Jamaica Observer, 2023).

Over-Reliance: Over-reliance refers to depending too much on something, in this case, AI tools, to complete tasks that could otherwise be handled independently (The Verge, 2023). When individuals use AI too frequently, it can reduce their ability to engage in creative thinking and problem-solving (Marr, 2023). This dependency can also negatively affect decision-making abilities (MIT Technology Review, 2023).

Excess Artificial Intelligence Usage: This is the over-reliance on artificial intelligence (Zhai et al., 2024).

Limitations of the Study

The study sample size is small, focusing mainly on a specific group of Generation Z students. The geographical focus of this research gave special attention to AI use in Jamaica's education system. As a result, the findings might not apply to other countries with different levels of AI use in schools. Time constraints also played a significant role in the research study since it was conducted within a limited period and could not capture the long-term effects of AI on cognitive development. Technological changes over time and access to AI technology evolved rapidly, with new tools and updates altering how AI influences thinking and decision-making.

Delimitations of the Study

The focus on Generation Z concentrated on young people and did not include older generations, such as Millennials or Baby Boomers. The research study's educational settings focused on how AI affects learning in schools rather than its impact in workplaces or other environments.

Furthermore, the regional focus explored global trends and emphasised AI adoption in Jamaica's education sector. The scope of AI tools only looked at commonly used AI tools like Chatbots and learning platforms, excluding more advanced AI technologies in fields such as medicine or finance. This study examined how the increasing use of AI tools influences the way young people think, learn, and make decisions, with a special focus on Generation Z. The study aimed to find out whether heavy reliance on AI reduces logical inquiry and creativity while also exploring the mental health effects of excessive AI use. The study looked closely at educational settings, including those in Jamaica, to understand how AI shapes students' learning habits by identifying both the benefits and risks of AI. The research aimed to provide practical recommendations for promoting responsible use of technology to support long-term cognitive development and personal growth.

Related Literature

As artificial intelligence (AI) integrates into daily life, its impact on cognitive abilities, education, and mental well-being has become a topic of significant academic and public interest. This literature review synthesises cognisance from various sources, exploring the extent to which AI shapes thought processes, decision-making abilities, and the overall mental health of users, especially among Generation Z. The purpose of this review is to present existing perspectives on AI's effects on human cognition, with a focus on the balance between AI's benefits and its potential risks.

AI, Cognitive Abilities and Potential Impacts on Critical Thinking

Artificial intelligence has reshaped how individuals approach tasks, making routine activities more efficient and accessible. However, many researchers warn that heavy reliance on AI may undermine the development of essential cognitive abilities. Marr (2023) and Robinson (2024) focused on individuals who frequently depend on AI for decision-making risk becoming passive consumers of information, which can gradually erode objective evaluation and creativity. Forbes emphasises that these passive engagements with AI reduce users' opportunities to practice complex cognitive skills, suggesting that, over time, AI could alter thought patterns and limit users' abilities to analyse and solve problems independently. Further research, like that published by *Psychology Today*, explores how AI-generated content, mainly automated writing and recommendation algorithms, may inhibit deep engagement by providing straightforward answers to complex questions (Psychology Today, n.d.). By simplifying these processes, AI might encourage users to explore topics in-depth, potentially weakening their analytical and problem-solving skills. The convenience AI offers may lead individuals to prioritise efficiency over mental effort, thus creating a dependency that can hinder cognitive development. Studies focusing on the long-term impact of such reliance are still emerging. Some experts argue that

while immediate convenience is beneficial, the cumulative effect of these interactions could lead to a decline in independent thinking over time. These findings suggest that AI's influence on cognitive engagement needs to be closely examined, particularly for younger generations, who are forming the foundation of their critical thinking skills during their educational years.

Impact on Education and Learning Environments

The use of AI in educational settings is widespread, with institutions increasingly relying on AI tools to enhance learning experiences. In countries like Jamaica, AI integration is seen as a progressive step toward modernising education. The *Jamaica Observer* (2023) reports that AI-driven learning tools allow for more personalised education by tailoring lessons to meet individual student needs. Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2024) highlighted that AI can close learning gaps by providing resources and support for students who may otherwise lack access to quality education. While these tools promote learning efficiency, there is also a risk of undermining intellectual development. YPulse (2024) and Ilesanmi (2024) researched AI and Generation Z students and have highlighted that many Generation Z students use AI-based tools to get ideas and complete assignments independently, raising concerns about potential impacts on intellectual growth.

As students increasingly depend on AI for homework, research, and essay writing, they may need more practice developing key academic skills, such as critical analysis and synthesis. This trend has prompted a dialogue among educators, with many urging for a balanced approach to AI use in classrooms. Harvard Business Review (2023) reports that while AI can enhance academic productivity, its integration must be managed to ensure that students still engage in traditional forms of learning that encourage problem-solving and creativity. By offering quick solutions to complex assignments, AI may diminish students' motivation to deeply engage with subjects, ultimately impacting their ability to retain information and think critically. As the prevalence of AI in education grows, balancing its advantages with the need to nurture intellectual engagement remains a significant concern for policymakers and educators.

Artificial Intelligence, Mental Well-Being and Emotional and Psychological Effects

In addition to cognitive risks, a growing body of literature examines the psychological effects of AI use on mental well-being. Robinson (2024) and *The Verge* (2023) reported that excessive AI usage may impact users' mental health by creating dependency and reducing self-confidence. Robinson (2024) and *The Verge* (2023) state that when individuals rely on AI for decision-making, they may become uncertain about their abilities, leading to lower self-esteem and increased stress. This is particularly relevant for Generation Z, who have grown up with technology and may develop dependency habits more efficiently than older generations. Studies show that AI-based mental health applications, such as Chatbots and virtual therapy tools, offer both benefits and drawbacks. According to the *MIT Technology Review* (2023), while these tools can provide accessible mental health support, they may lack the nuanced understanding that human counsellors offer. AI-powered virtual therapy tools might fulfil immediate emotional

needs but cannot. Still, they can lead to isolation over time if users substitute these tools for genuine human interactions, which are crucial for emotional resilience and well-being.

Long-Term Implications of Generation Z's Increasing Reliance on Artificial Intelligence

Generation Z is one of the most integrated artificial intelligence (AI) generations, relying on AI tools for personal and academic tasks. Ilesanmi's (2024) and YPulse's (2024) study documented how Generation Z embraced AI to optimise daily life, from managing schedules to completing coursework. This heavy reliance on AI may make their lives more efficient but raises concerns about developing core competencies like self-discipline and decision-making (Bergdahl et al., 2023). The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2024) reports accentuate that students who turn to AI for academic tasks are at risk of under-developing skills required for independent thought and initiative. As AI becomes an ever-present resource, students may struggle to build habits of strategising and tenacity, which are essential for success in real-world scenarios. Marr (2023) reiterates these concerns, stating that while Generation Z may benefit from AI's efficiency, there is a risk that overuse could hinder their intellectual independence. YPulse (2024) suggests that educators and policymakers must foster an environment where AI complements learning rather than replaces cognitive evaluation. This perspective aligns with findings from *The Verge* (2023) and other sources, which recommend strategies to help students build a balanced approach to AI use. Educators should create opportunities for students to engage in non-AI-assisted activities to reinforce cognitive and decision-making skills and promote healthy, sustainable technology usage among young people. Psychology Today (n.d.) records that the algorithms governing AI's interaction with users often shape behaviour by promoting certain content, which can affect emotional states and mental health. This content curation can create echo chambers that reinforce specific ideas or beliefs, potentially heightening feelings of anxiety or depression. These risks indicate that while AI applications in mental health provide convenience, their use must be monitored to prevent dependency and ensure that they do not replace meaningful human connections.

Gaps in Research and Future Directions

Although existing studies highlight AI's positive and negative effects on cognition and mental health, more empirical research is needed to understand its impacts. Most current studies, like those by Robinson (2024) and Marr (2023), provide observational insights that need more longitudinal data to determine the full cognitive implications of AI use over time. Further research could investigate the threshold at which AI reliance becomes detrimental, particularly within educational settings. Studies focused on regional and cultural variations, such as AI's impact in Jamaica, are also limited, indicating a need for context-specific

Research. Additionally, future studies should explore how educators and policymakers can create frameworks to guide AI use responsibly. Policies that balance AI's benefits with protections for cognitive development are needed. By addressing these gaps, researchers can offer more actionable insights into AI's role in human development.

The literature exposes that while Artificial Intelligence provides substantial benefits, such as increased learning efficiency and personalised support, its potential risks should be considered. Heavy reliance on AI may have cognitive, educational, and mental health consequences, especially for Generation Z. Balancing Artificial Intelligence's advantages with practices that promote critical thinking, creativity, and independent decision-making is essential. As Artificial Intelligence continues to permeate daily life, understanding its long-term impacts will help individuals, educators, and policymakers navigate the complex relationship between technology and human cognition. This review underscores the importance of ongoing research to inform ethical and responsible Artificial Intelligence integration in various domains.

Methods and Materials

This study explores Generation Z and the mental health effects of excessive AI Usage within Higher Educational Institutions across Jamaica, focusing on high schools and universities where Generation Z students are the primary demographic. A quantitative cross-sectional descriptive research approach was adopted to achieve this, using a structured questionnaire as the primary data collection tool. The questionnaire was designed to gather detailed information on participants' use of AI tools, perceptions of how AI influences their decision-making, critical thinking, daily routines, and perceived impacts on mental health. Using a questionnaire enables the collection of responses from a large, diverse group of participants, ensuring that a broad range of experiences and perspectives are captured. The data gathered provided valuable insights into AI reliance patterns, potential consequences, and correlations between AI usage and specific cognitive or emotional outcomes. Using a standardised instrument, this study produced quantifiable results that contributed to a deeper comprehension of how Generation Z's engagement with AI shapes the cognitive and mental health landscape.

Study Setting and Population

This study was conducted within Higher Educational Institutions across Jamaica, focusing on high schools and universities where Generation Z students are the primary demographic. These settings were chosen because students in this age group have extensive exposure to digital technology, including AI tools, and often integrate these resources into their learning and daily routines. The study utilised an online questionnaire distributed through school portals and social media platforms, making it accessible for participants to complete in a convenient, familiar environment.

The study population focused on Generation Z individuals across Higher Education Institutions in Jamaica, specifically those aged 18-24 years, with a total population of 352,531. Based on a 95% confidence level and a 5% (0.05) margin of error, a sample size of 384 was calculated to represent this group accurately. A stratified random sampling method was used to ensure diversity among respondents, considering factors such as age, gender, and location. The study setting included Higher Education Institutions across Jamaica, allowing for diverse representation of socioeconomic background, educational resources, and levels of technology access. The study aimed to capture a comprehensive view of AI's impact on cognitive abilities, mental health, and learning habits across different environments and access levels by reaching

participants in various academic settings. Figure 1 represents an overview of a concept map across Higher Education Institutions.

Figure 1: Represent an Overview of a Concept Map across Higher Education Institutions

Research Protocol

Table 1 provides an overview of the end-of-year population by age for individuals aged 18-24 years in 2019. The total population for this age group is 352,531, which serves as the population size for this study focusing on Generation Z's engagement with AI. The population for each age is as follows:

Table 1: Represent an Overview of the Total End of Year Population by Age 2019

Age	Population
18 years	44,111
19 years	54,464
20 years	49,761
21 years	47,666
22 years	49,552
23 years	51,559
24 years	55,418
Total	**352,531**

This distribution shows that the number of people in each age group within Generation Z in Jamaica is pretty balanced. These numbers will help ensure that each age group is represented when gathering data through the questionnaire. This population information is essential for selecting a sample that accurately reflects the diversity within Generation Z.

Research Procedure

Preparation and Design of Questionnaire

A questionnaire was carefully designed to gather data on how Generation Z uses AI and how it affects their thinking, learning, and mental health. The questions were structured to be clear,

concise, and relevant to the study's goals. A small pilot test was conducted with a few individuals to ensure that questions were understandable and that responses provided meaningful insights. The population data determined a sample size of 384 participants based on a 95% confidence level and a 5% margin of error, with a response rate of 43.0 per cent (n=165). A stratified random sampling method was employed to ensure representation across age groups 18-28 and from urban and rural areas. This approach ensured that the sample represented the diversity within Generation Z in Jamaica.

Data Analysis and Collection Procedure

The questionnaire was distributed online to reach a broad audience. Links were shared through school websites, social media platforms, and email to maximise participation. Participants were provided with clear instructions on completing the survey, emphasising the voluntary nature of the study. Participants were informed about the purpose of the study, the voluntary nature of their involvement, and their right to withdraw at any time. An informed consent form was included at the beginning of the survey, ensuring participants understood their rights and the confidentiality of their responses.

The survey was open for four weeks to allow participants ample time to complete it at their convenience. Reminders were sent out periodically to increase response rates. After the data collection period ended, the responses were gathered and organised for analysis. Statistical software was used to process the data, generating descriptive and inferential statistics. Key areas analysed included the frequency of AI use, perceived impact on thinking and learning, and any links to mental health indicators.

The questionnaire was created to gather information on Generation Z's use of AI and its effects on their thinking, learning habits, and mental health. Questions were a mix of multiple-choice, Likert scale, and open-ended formats to capture quantitative and qualitative data. The questions were reviewed to ensure clarity and relevance to the study objectives. The questionnaire was distributed primarily online to maximise reach and accessibility, especially among the tech-savvy Generation Z demographic. Links to the survey were shared on social media platforms (e.g., Instagram, WhatsApp, and Snapchat), university and college forums, and via email. A brief introduction explaining the study's purpose was included to encourage participation. Respondents were assured that their answers would remain confidential and anonymous.

Monitoring Response Rates

During the data collection period, response rates were monitored to ensure an adequate number of responses across different demographic groups. If necessary, targeted reminders were sent to specific groups to ensure balanced representation. After the survey closed, all responses were reviewed for completeness. Only complete or consistent responses were included in the analysis to maintain data quality. Collected data was securely stored on a protected computer to ensure data integrity. Only the research team had access to the raw data, ensuring participant confidentiality.

By following this structured procedure, the study aimed to collect accurate, reliable, and representative data to explore the impact of AI on the cognitive skills, learning habits, and mental health of Generation Z in Jamaica.

The questionnaire was carefully developed to gather data relevant to the study's objectives, focusing on the impact of artificial intelligence (AI) on Generation Z's cognitive abilities, learning habits, and decision-making. The development process involved several steps to ensure the instrument was straightforward, reliable, and effective in capturing meaningful data.

An extensive literature review informed the questionnaire on AI's influence on cognitive skills and learning behaviours. Articles from sources such as *Psychology Today*, *Forbes*, and *The Guardian* provided valuable insights into the topics to be addressed. The questionnaire was designed for individuals aged 18-29 (Generation Z) in Jamaica, reflecting their unique experiences with AI in education, work, and daily life.

Experts in research methodology and AI-related studies reviewed a draft version of the questionnaire to ensure its validity and relevance. The questionnaire was divided into four main sections, each addressing specific aspects of the research questions:

Pilot-Testing

The questionnaire was pre-tested with a small group of Generation Z individuals to ensure clarity, relevance, and ease of use. Feedback from the pre-test was incorporated to refine question wording and structure.

Mode of Administration

The questionnaire was distributed online using a secure survey platform to reach a broad audience conveniently. Links to the survey were shared via email and social media platforms, targeting the study's population. By developing a structured and participant-friendly questionnaire, this study aims to gather comprehensive and reliable data to explore the impact of AI on Generation Z in Jamaica.

Ethical Considerations

Ethical guidelines were followed to protect participants' privacy and data security. All collected information was anonymised, and results were reported in aggregate form to prevent the identification of individual responses. Participants were fully informed about the purpose of the research, the procedures involved, and their rights as participants. Before starting the survey, respondents were required to read and acknowledge an informed consent statement, which explained that their participation was entirely voluntary and that they could withdraw at any time without any consequences. Participants were made aware that by completing the survey, they consented to the data being used for this study. The confidentiality of participants' responses was strictly maintained. The data collected were anonymous, with no personally identifiable information (such as names or contact details) being requested or stored. All responses were

stored securely on password-protected devices, and only the research team could access the data. This ensured that the privacy of participants was safeguarded throughout the research process.

Participation in the study was entirely voluntary. No pressure or incentive was provided to compel participants to take part. Individuals were free to decline participation or exit the survey at any point if they felt uncomfortable. The study did not include any vulnerable populations, such as minors, ensuring that all participants could make an informed decision about their involvement. All data collected were stored securely and were only accessible to authorised members of the research team. Digital data were encrypted, and hard copies were stored in locked cabinets. Upon completion of the study, data will be retained for analysis but securely deleted after a specified retention period in compliance with data protection regulations.

The study was conducted with an emphasis on neutrality and fairness. The questions were carefully crafted to avoid bias influencing participants' responses. Efforts were made to include diverse participants to ensure the findings represented the Generation Z population in Jamaica. The research protocol, including the questionnaire and data collection methods, was reviewed and approved by the relevant ethics review board to ensure compliance with ethical standards. By adhering to these moral guidelines, the research aimed to maintain the highest standards of integrity and respect for the participants while collecting valuable insights into the impact of AI on Generation Z's cognitive skills, learning behaviours, and mental well-being.

Presentation and Analysis of Findings

This section focuses on presenting and analysing findings gathered during the research. This chapter delves into the responses collected through the questionnaire and interprets the data to understand the effects of Artificial Intelligence (AI) on Generation Z in Jamaica. It examines key areas such as how AI impacts cognitive abilities like critical thinking, creativity, and problem-solving and influences learning habits and decision-making processes. The chapter also highlights participants' perceptions of the advantages and potential risks of relying on AI tools in various aspects of their lives, such as education, work, and personal activities. By systematically presenting the data and analysing it about the research objectives, this chapter aims to provide meaningful insights that align with the broader goals of the study, addressing whether AI use supports or hinders cognitive development and independent thinking among young individuals.

Interpretation and Reporting of Results

The results were interpreted to identify patterns and relationships between AI usage and cognitive outcomes. Findings were compared across different age groups and regions to see if trends varied. The results were then documented in a report, highlighting the main insights and implications for educational and mental health practices.

Demographic Characteristics of Sampled Respondents

The survey received 165 responses, with a nearly equal gender distribution among the participants. There were 50.9% males and 49.1% females, reflecting a balanced representation. Most respondents were 18-22 years old, totalling 60.1% of individuals, making up the largest

group. Other age categories, such as 22-24, 24-26, and 26-28, each accounted for 11.7% of participants, while a smaller group of 4.9% were older than 28 years. This diverse age distribution ensures that the data reflects a broad spectrum of perspectives within Generation Z. Table 2 shows the demographic characteristics of sample respondents.

Table 2: Demographic Characteristic of Sample Respondents, n = 165

Details	**%(n)**
Gender	
Female	50.9%(83)
Male	49.1%(80)
Age Group	
18-22 years	60.1%(98)
22-24 years	11.7%(19)
24-26 years	11.7%(19)
26-28 years	11.7%(19)
29 years	4.9%(8)
College Status	
Freshman (1st year)	17.8%(29)
Sophomore (2nd year)	35.6%(58)
Junior (3rd year)	22.1%(36)
Senior (4th year)	8.0%(13)
Other	8.0%(13)

Confirmatory Factor Analysis

In this study, Confirmatory Factor Analysis (CFA) was applied to validate the questionnaire items used to measure the impact of AI on our strategic thinking, learning habits, decision-making, and creativity among Generation Z. This method ensures the reliability and validity of the analysed constructs. The process involves specifying the hypothesised model based on theoretical frameworks and testing it against the collected data. Each variable is linked to a factor (or latent variable) representing an abstract concept such as strategic thinking or creativity. The relationships between observed variables and their corresponding factors are evaluated using statistical indicators like factor loadings, goodness-of-its indices, and error terms. Table 3 is a descriptive representation of the distribution of individuals by gender and age group.

Table 3: Descriptive Represents the Distribution of Individuals by Gender and Age Group

Gender	18-22	22-24	24-26	26-28	29	Grand Total
Female	54.1%(5)	47.4%(9)	42.1%(8)	52.6%(1)	37.5%(3)	83
Male	45.9%(4)	52.6%(1)	57.9%(1)	47.4%(9)	62.5%(5)	80

Most females are in the youngest age range, with fewer in the older age groups. The total number of females was 83. The distribution follows a similar pattern for males, with the largest group in the youngest range and fewer males in the older categories. The total number of males was 80. The distribution across the different age groups is pretty balanced, with the most significant

number in the youngest age range gradually decreasing as the age increases. The total number of individuals was 165, representing 43.0 per cent.

Table 4: Descriptive Shows the Distribution of Individuals by Gender and Year of Study

Details	1st year	2nd year	3rd year	4th year	Other
Female	19(11.7)	27(16.6)	14(8.6)	9(5.5)	14(8.6)
Male	10(6.1)	31(19.0)	22(13.5	4(2.5)	13(8.0)
Grand Total	29	58	36	13	27

For females, the highest number is in the second year, followed by the first year. There are fewer females in the third and fourth years and a smaller group in the "Other" category. The total number of females is 83. For males, the largest group is in the second year, followed by the third year. Fewer males are in the first year, fourth year, and the "Other" category. The total number of males is 80. The distribution shows the most students in the second year, followed by the first year, with smaller numbers in the third and fourth years and the "Other" category. The overall total number of individuals was 163.

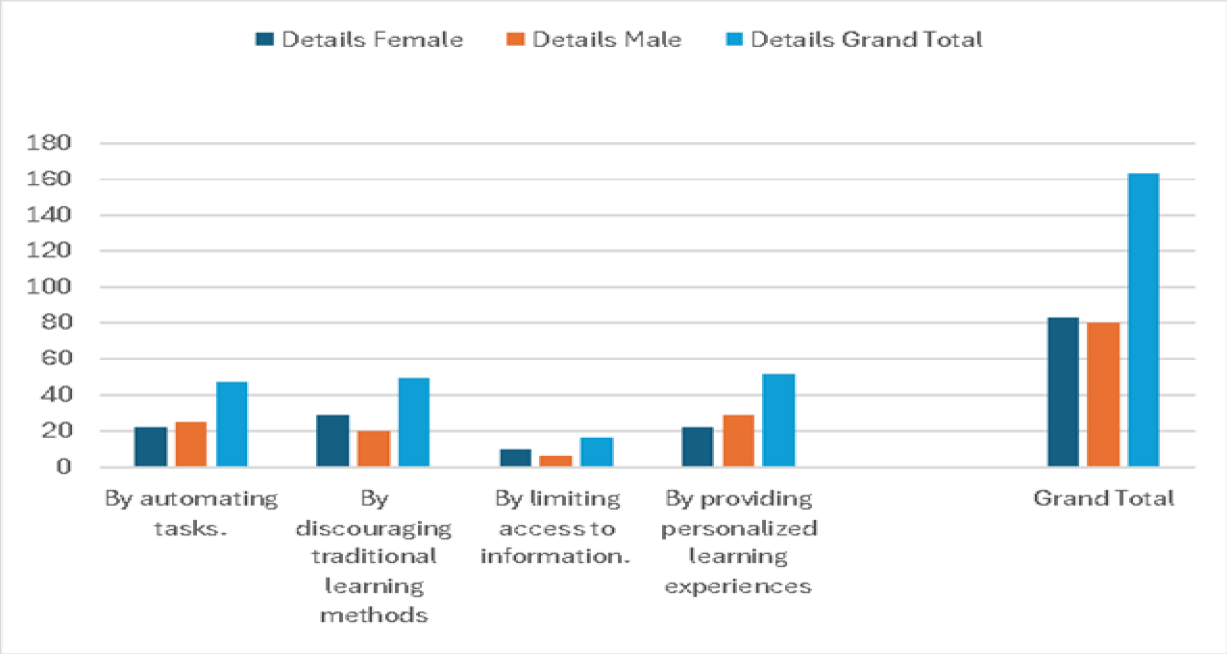

Figure 2: Represents the Primary Response AI Influences Generation Z's Learning Process

Figure 4 illustrates the responses to the question, *"What is the primary way AI influences Generation Z's learning process?"* The data reveals diverse perspectives on how AI affects learning among Generation Z, highlighting its multifaceted role in education. Key findings include how respondents identify AI as automating tasks, providing personalised learning experiences, limiting access to information, and discouraging traditional learning methods. This variety underscores the dual impact of AI, offering both opportunities and challenges in the educational context.

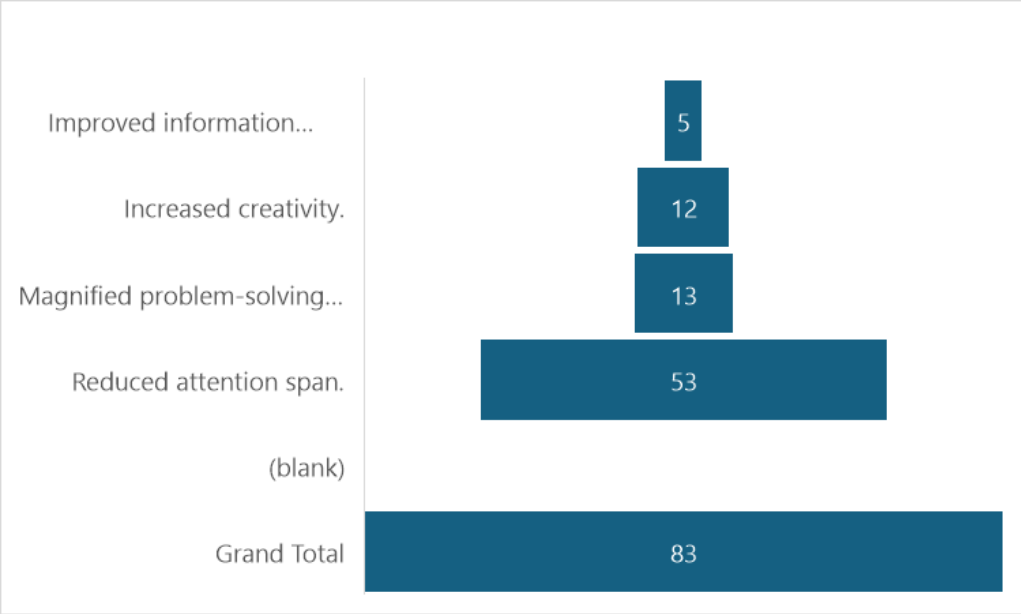

Figure 3: Showing the Potential Negative Impact of AI on Generation Z's Thinking

Figure 3 illustrates responses to the question, *"What is a potential negative impact of AI on Generation Z's thinking?"* The data highlights key concerns about AI's influence, with many respondents identifying reduced attention span as a primary issue. Other potential impacts include diminished critical thinking abilities and a possible hindrance to problem-solving skills. These findings emphasise Generation Z's challenges in maintaining cognitive engagement and focus in an AI-driven era.

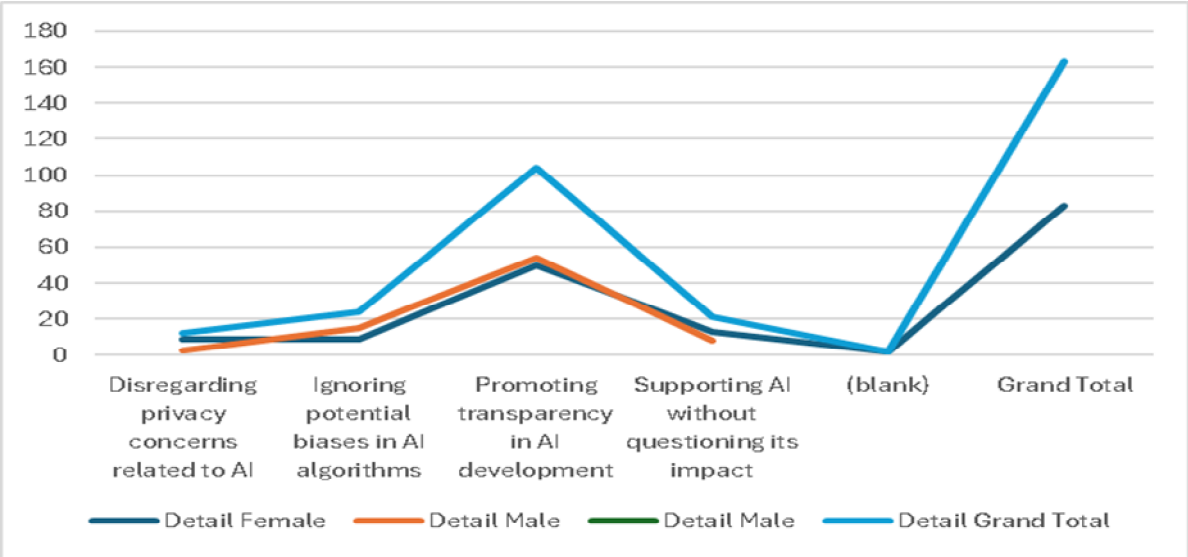

Figure 4: Showing Generation Z and Ethical AI Usage

Figure 4 depicts responses to the question, *"How can Generation Z ensure ethical AI usage?"* Most participants emphasised promoting transparency in AI development as the most important step. Other responses included addressing potential biases in AI algorithms and considering privacy concerns. A smaller proportion suggested questioning the impact of AI support, reflecting the importance of accountability and awareness in navigating ethical AI practices.

Predictors of Self-Reported Artificial Intelligence Impact

The self-reported impacts of AI usage among Generation Z reveal several key predictors influencing how individuals perceive AI's role in their lives. Demographic characteristics such as age and gender play a significant role. For instance, the survey data shows a nearly equal gender distribution, with 50.9% male and 49.1% female respondents. Younger participants, predominantly in the 18-22 age group (60.1%), reported more reliance on AI, likely due to greater exposure to digital tools during their formative years. The educational level also emerged as a factor, with respondents spanning various years of study, including 1st-year students (17.8%) to 4th-year students (8%), reflecting diverse academic and technological engagement levels.

Another significant predictor is the frequency of AI use. Responses to "What is the primary way AI influences Generation Z's learning process?" indicated that 31.3% of respondents believe AI provides personalised learning experiences. In comparison, 30.1% cited automation of tasks, highlighting the regular use of AI in educational contexts. Digital literacy also emerged as a critical factor, as 64.6% of participants emphasised promoting transparency in AI development as a step toward ethical AI use, reflecting an understanding of AI's limitations and biases.

Additionally, critical thinking skills influence self-reported impacts. When asked about AI's potential negative impacts, 61.3% of respondents identified a reduced attention span, indicating concerns about over-reliance on AI hindering cognitive engagement. Lastly, participants' perception of AI's role also shaped their responses. For example, while 65.8% supported engaging with AI as a creative partner, only 8.7% viewed AI as a standalone problem-solving tool, suggesting an appreciation for the balance between human judgment and AI capabilities. These predictors provide valuable insights into the factors shaping Generation Z's interaction with AI.

The participants' academic progression significantly influenced their responses regarding AI usage and its effects. Most respondents were in their first (17.8%) and second (35.6%) years of study, reflecting a younger demographic likely to engage more frequently with emerging technologies. Advanced students, such as those in their fourth year (8%), reported a more cautious perspective on AI's role in education, perhaps due to a deeper understanding of its limitations acquired through their academic experiences. These differences highlight how educational exposure and progression influence perceptions of AI's benefits and drawbacks, particularly in learning and critical thinking.

The participants' academic progression significantly influenced their responses regarding AI usage and its effects. Most respondents were in their first (17.8%) and second (35.6%) years of study, reflecting a younger demographic likely to engage more frequently with emerging technologies. Advanced students, such as those in their fourth year (8%), reported a more cautious perspective on AI's role in education, perhaps due to a deeper understanding of its limitations acquired through their academic experiences. These differences highlight how educational exposure and progression influence perceptions of AI's benefits and drawbacks, particularly in learning and critical thinking.

The survey on AI's impact on Generation Z revealed diverse insights across gender, age, and educational level. The respondents were almost evenly split by gender, with 50.9% male and 49.1% female, and the majority (60.1%) aged 18-22. Regarding education, 35.6% were second-year students, with smaller proportions in other years. Regarding AI's role in learning, 31.3% identified its influence in providing personalised experiences, while 30.1% noted task automation. On critical thinking, 42.9% believed AI enhances and hinders this skill, reflecting its complex impact. Ethical usage was emphasised, with 66% prioritising critical evaluation of AI-generated content and 64.6% advocating for transparency in AI development. Negative impacts, such as reduced attention span (61.3%) and critical thinking (70%), were notable concerns. Despite these challenges, 65.8% recognised AI's potential as a creative partner, and 71% highlighted critical thinking as a vital skill for navigating the AI-driven era. This data underscores Generation Z's nuanced perspective on the benefits and risks of AI.

Discussion

This section is the culmination of the research on “The Examination of Generation Z and AI Usage in Jamaica. It provides an evaluative discussion of the literature reviewed and the findings from the current study, followed by conclusions from the research. Based on these conclusions, valuable recommendations are made that are aligned with this study's proposed hypothesis.

Objective 1

To assess the impact of AI on Generation Z's critical thinking skills.

This objective aims to determine how AI influences Generation Z's ability to think critically, whether it enhances their thinking by providing diverse perspectives or hinders it by relying on AI-generated information. AI enhances critical thinking by providing diverse perspectives (12.3%), hinders critical thinking by relying on AI-generated information (42.9%), and has no significant impact on critical thinking skills (8.6%).

The current study found that enhancing critical thinking by providing diverse perspectives, Hindering critical thinking by relying on AI-generated information, Has no significant impact on critical thinking skills are some of the issues found in the critical thinking skills of Generation Z. (42.9%) Thinks artificial intelligence hinders critical thinking. Jones and Lee (2021) explained that there is a significant concern that over-reliance on AI-generated content may hinder critical thinking skills. As students become accustomed to AI tools for quick answers, they may miss opportunities to engage in independent thought, leading to a decline in skills such as decision-making and problem-solving”. Jones and Lee did not mention that other factors can affect the results. However, Montenegro-Rueda et al. (2023) suggest that AI can positively influence critical thinking by providing students with diverse perspectives. For example, AI tools can present information from multiple angles, prompting students to evaluate and analyse different viewpoints, thus fostering deeper cognitive engagement. Some studies suggest that AI can positively influence critical thinking by providing students with diverse perspectives. For example, AI tools can present information from multiple angles, prompting students to evaluate and analyse different viewpoints, thus fostering deeper cognitive engagement" (Montenegro-

Rueda et al., 2023, para. 2). Additionally, AI has been shown to encourage students to approach problems critically by teaching responsible usage, which helps them understand when and how to use AI as a tool rather than a crutch" (Smith et al., 2022). However, a significant concern is that over-reliance on AI-generated content may hinder critical thinking skills. As students become accustomed to AI tools for quick answers, they may miss opportunities to engage in independent thought, leading to a decline in skills such as decision-making and problem-solving" (Jones & Lee, 2021, p. 8).

Objective 2

To explore how AI shapes the learning process of Generation Z.

This objective focuses on understanding how AI affects learning habits, including its role in automating tasks, providing personalised learning experiences, and potentially discouraging traditional learning methods. The study results show that automating tasks (28.8%) and personalised learning experiences (31.3%) limit access to information (9.8%), followed by discouraging traditional learning methods (30.1%).

The current study found that providing personalised learning experiences is the most significant way AI influences education, with 31.3% of participants highlighting its positive impact. AI systems can analyse students' strengths, weaknesses, and preferences and tailor educational content to meet their needs. This ability to personalise learning experiences allows students to engage more deeply with the material, improving learning outcomes and making education more inclusive. The Jamaica Observer (2023) reports that AI-driven platforms are particularly effective in adapting lessons to fit students' diverse learning styles, fostering an environment where students can learn at their own pace. This personalisation helps address students' varying needs, ensuring each learner receives the support they require to succeed academically.

In addition to personalisation, AI plays a crucial role in automating tasks (28.8%). By automating repetitive administrative tasks such as grading and feedback, AI helps to create a more efficient learning environment. Reduced time spent on routine tasks allows educators to focus more on teaching and providing personalised student support. According to UNESCO (2024), automation helps streamline educational workflows, leading to more engaging and efficient educational experiences. The time saved from administrative duties can be redirected towards activities that encourage critical thinking and creative problem-solving, which are essential for student development.

While the benefits of AI in education are clear, its potential drawbacks should be noticed. One such concern is AI's ability to limit access to information (9.8%). AI systems often use algorithms to filter content, presenting users with information that aligns with their previous behaviours and interests. Robinson (2024) suggests that this selective exposure may narrow students' perspectives, limiting their ability to engage with diverse viewpoints or critically analyse conflicting ideas. This phenomenon could hinder the development of critical thinking skills, as students may become reliant on AI-generated content that reinforces existing beliefs rather than challenging them to think more broadly and independently.

Objective 3

To investigate the effects of AI on the decision-making abilities of Generation Z. This objective examines whether AI makes decisions for Generation Z, provides data-driven insights to inform decisions, reduces the need for careful consideration, or eliminates uncertainty in decision-making. AI-generated materials make decisions for students (27.8%), provide data-driven insights to inform decisions (34%), reduce the need for careful consideration (30.9%), and eliminate uncertainty in decision-making (7.4%).

The current study found that providing data-driven insights to inform decisions was AI's most significant impact on decision-making, with 34% of participants highlighting its importance. AI's ability to process and analyse large volumes of data enables it to generate insights that humans might need more time to uncover. This data-driven approach enhances decision-making by offering more accurate, evidence-based recommendations. As a result, AI tools are widely used in various fields, such as business, healthcare, and education, to assist decision-makers in making informed choices. According to Marr (2023), AI's analytical capabilities allow decision-makers to access real-time data, identify trends, and predict outcomes, which can improve the quality and efficiency of decisions. These insights can guide individuals toward better outcomes and reduce the reliance on intuition alone.

On the other hand, AI's ability to make decisions for individuals is another significant factor, with 27.8% of participants noting its impact. AI systems can automate decision-making in finance, customer service, and even personal assistance, often without human intervention. For example, AI algorithms can automatically adjust financial portfolios or recommend products based on user preferences. While this can save time and effort, it also means that individuals may relinquish control over decisions, relying on AI to determine what is best for them. Robinson (2024) discusses how this reliance on AI for decision-making can reduce personal accountability and the development of decision-making skills as individuals defer more and more to AI systems. While AI may optimise decisions, it can lead to losing critical thinking and the ability to weigh the pros and cons of different options.

AI also reduces the need for careful consideration in decision-making, which was noted by 30.9% of the participants. AI’s ability to instantly process information and provide solutions means that individuals often make decisions based on AI-generated recommendations without critically evaluating all options. The Verge (2023) reports that this could undermine thoughtful decision-making processes, as individuals may rely too heavily on AI to simplify complex problems. In fields where nuanced, careful consideration is needed, such as in healthcare or legal decisions, overreliance on AI may result in outcomes that must be thoroughly thought through. By streamlining decision-making, AI can reduce the opportunity for individuals to engage in deep reflection, which could negatively impact the quality of their decisions over time. Lastly, eliminating uncertainty in decision-making (7.4%) was found to be one of AI's less pronounced effects, yet still an important one. AI systems can eliminate or significantly reduce uncertainty in decision-making through their vast data analysis capabilities. For example, AI tools in business can predict market trends and help companies make decisions with higher confidence. Marr (2023) notes that while AI's predictive power can minimise uncertainty, it cannot eliminate it, as

the complex and unpredictable nature of human behaviour and environmental factors often remain outside the scope of AI's analytical capabilities. This reliance on AI predictions may sometimes provide a false sense of certainty, which could mislead decision-makers, mainly when unforeseen variables exist.

Objective 4

To identify the potential consequences of excessive AI use on Generation Z's creativity and mental abilities.

This objective explores how overreliance on AI affects Generation Z's creativity, such as whether it leads to reduced creative thinking abilities or influences their perception of originality and innovation. AI usage increased creativity (12.3%), magnified problem-solving skills (20.2%), reduced attention span (61.3%), and, dejectedly, improved information literacy (6.1%).

The current study found that reduced attention span (61.3%) was the most significant impact of AI on cognitive abilities. AI's constant engagement through notifications, recommendations, and streamlined interactions can distract individuals from focusing on tasks for extended periods. Psychology Today (n.d.) discusses how the instantaneous nature of AI tools can condition users to expect quick responses, leading to shorter attention spans and a reduced ability to focus on tasks that require sustained mental effort. This can be particularly problematic for students and professionals who need deep concentration for learning or problem-solving. The ease with which AI provides answers or directions can foster impatience, making it more challenging for individuals to focus and stay engaged with complex problems over time. This over-reliance on quick AI-driven information may reduce users' capacity for sustained attention, affecting their academic performance and overall productivity.

On the other hand, magnified problem-solving skills (20.2%) was another noteworthy finding. AI's ability to analyse data, identify patterns, and provide recommendations can enhance individuals' problem-solving skills. According to Marr (2023), AI tools have been employed to address complex problems in various fields, such as healthcare, engineering, and education. These tools provide insights that allow users to approach issues from different perspectives and generate novel solutions. AI does not replace human creativity or critical thinking but complements them, making exploring potential solutions and evaluating options easier. In this way, AI can amplify human problem-solving capabilities, particularly when combined with the user's expertise and judgment.

Interestingly, AI also fosters increased creativity (12.3%), though this was less significant than other impacts. AI tools can help generate ideas, suggest new approaches, and provide creative inspiration by presenting users with diverse concepts and frameworks. Montenegro-Rueda et al. (2023) found that AI can support creative processes by offering a range of possible designs, concepts, or alternatives that individuals may not have considered otherwise. By expanding the creative possibilities, AI can catalyse new ideas, especially in fields like design, art, and advertising, where novel concepts are key to success. However, creativity still requires human input, and AI is a tool for augmenting rather than entirely driving the creative process.

Finally, improved information literacy (6.1%) was among the least cited impacts. AI tools like search engines, recommendation systems, and educational databases can help individuals locate and assess information more effectively. Jamaica Observer (2023) highlights that AI-driven platforms can guide users through vast amounts of information, enabling them to quickly identify relevant and credible sources. However, it is essential to note that AI can assist in improving information literacy; it also requires individuals to have the skills to evaluate and apply the information they retrieve critically. AI can inadvertently reinforce biases or expose users to misinformation without proper guidance and evaluation by:

1. Intensified creativity (9.4%)
2. Improved problem-solving skills (16.9%)
3. Reduced critical thinking abilities (70%)
4. Increased productivity (3.7%)

The current study found that reduced critical thinking abilities (70%) were the most significant impact of AI on cognitive skills. As AI continues to streamline processes and provide instant solutions, users may become overly reliant on AI-generated answers, thus diminishing their ability to critically analyse information or approach problems independently. Psychology Today (n.d.) suggests easy access to AI-driven content can discourage individuals from engaging in deeper thought processes. AI systems often prioritise efficiency over the complexities of independent reasoning. This dependency on AI to make decisions or provide solutions may ultimately hinder the development of critical thinking skills, particularly for students and professionals who need these abilities to navigate complex scenarios. The rapid pace at which AI offers answers also reduces the opportunity for individuals to reflect, question, or engage with problems at a deeper level, contributing to a decline in cognitive engagement.

In contrast, improved problem-solving skills (16.9%) had a less significant but still notable impact on AI. While excessive reliance on AI can hinder critical thinking, AI also provides tools to enhance problem-solving by offering diverse perspectives and faster data analysis. Marr (2023) notes that AI's ability to process large datasets and identify patterns can help users solve problems more effectively, especially in fields that require high-level analysis, such as healthcare or finance. AI tools can also suggest solutions or approaches individuals may not have considered, fostering a more dynamic problem-solving process. However, this improvement in problem-solving tends to be most effective when users are actively engaged and use AI as a supplement to, rather than a replacement for, their thinking.

Interestingly, intensified creativity (9.4%) was reported as a moderate benefit of AI. While AI can inspire creativity by providing new ideas, designs, or frameworks, it is less impactful than other cognitive aspects. Montenegro-Rueda et al. (2023) argue that AI can assist in the creative process by presenting users with alternatives or variations they may have yet to consider. In creative industries like graphic design or writing, AI can be a valuable tool to generate concepts or explore new possibilities. However, it is important to note that AI enhances creativity in a structured way, and genuine innovation still requires human intuition and judgment.

Finally, increased productivity (3.7%) was the least significant impact of AI. While AI can help optimise workflows and automate repetitive tasks, its direct contribution to productivity is limited compared to its effects on critical thinking and problem-solving. According to UNESCO (2024), AI's ability to manage administrative tasks and provide quick solutions can free up time for individuals to focus on more complex and creative activities. However, without the development of strong critical thinking skills, increased productivity can become counterproductive in the long term, as users may rely on AI for quick fixes rather than engage in thoughtful, deliberate decision-making.

The findings of this study provide valuable insights into how Generation Z interacts with AI, highlighting both the advantages and potential challenges associated with its integration into their daily lives. The nearly equal gender distribution (50.9% male and 49.1% female) ensures that the responses reflect diverse perspectives across a balanced sample. This even representation of genders suggests that AI's impact is felt across demographic lines and underscores its widespread influence. Additionally, the age distribution, with most respondents aged 18-22 (60.1%), highlights a demographic immersed in technology, making them particularly relevant for studying AI’s effects. The substantial representation of younger participants may also indicate that this age group is more willing to experiment with AI tools, potentially shaping their views on its benefits and drawbacks.

Educational backgrounds also played a significant role in shaping participants' perspectives. With 35.6% of respondents in their second year of study, the findings reflect a population actively engaged in academic pursuits where AI tools are frequently used. First-year students (17.8%) and other categories (22.1%) also provided insight into how individuals at different stages of education view AI's role. Those in advanced years, such as third- and fourth-year students, appeared to have a more critical perspective on AI’s benefits and limitations. This may suggest that prolonged exposure to academic settings fosters a deeper awareness of AI's potential pitfalls, such as over-reliance and diminished independent problem-solving skills.

AI's role in learning was a central theme, with respondents highlighting its ability to provide personalised learning experiences (31.3%) and automate tasks (30.1%). These findings underscore AI's dual role in education as both an enabler and a potential disruptor. Personalised learning experiences can enhance engagement and efficiency by tailoring content to individual needs, making learning more accessible for students at various levels. However, while convenient, task automation may lead to reduced intellectual engagement and critical thinking opportunities. This duality is further reflected in responses about AI's impact on critical thinking skills, where 42.9% of participants acknowledged that AI enhances and hinders vital thinking. This highlights a complex relationship where AI provides tools for exploration and innovation but simultaneously risks stifling independent thought when overused.

Ethical considerations emerged as a recurring theme, with a significant majority (66%) emphasising the need to evaluate AI-generated content critically. This reflects a growing awareness among Generation Z about the importance of questioning and verifying information produced by AI systems. Additionally, 64.6% of respondents stressed the importance of promoting transparency in AI development, indicating that young people are aware of AI's

ethical challenges and advocate for proactive measures to address them. This awareness is crucial as Generation Z prepares to navigate a world increasingly influenced by AI, where moral considerations will play a significant role in determining how technology is developed and used.

The findings also revealed concerns about the potential negative consequences of excessive reliance on AI. A significant proportion of respondents identified reduced attention spans (61.3%) and diminished critical thinking abilities (70%) as primary risks. These results suggest that while AI has the potential to enhance efficiency and productivity, over-reliance may lead to cognitive disengagement, limiting the development of essential mental skills. Furthermore, creativity, often seen as uniquely human, was also a concern, with 67.3% identifying reduced creative thinking abilities as a potential drawback of excessive AI use. Despite these risks, many participants (65.8%) recognised AI as a valuable partner in the creative process, highlighting its ability to amplify innovation when used responsibly.

Another critical finding was the emphasis on skill development to navigate the challenges posed by AI. Respondents overwhelmingly agreed (71%) that critical thinking and analysis are essential for maintaining creativity and independent thought in the AI-driven era. This suggests that while Generation Z acknowledges AI's transformative potential, they also recognise the need for human oversight and intellectual engagement to mitigate its risks. Digital literacy was also highlighted as a key skill, with 57.8% identifying it as vital for ethical and practical AI use. These results underscore the importance of fostering a balanced approach to AI, where technology complements rather than replaces human capabilities.

Overall, the findings paint a comprehensive picture of Generation Z's relationship with AI, characterised by recognising its benefits alongside a cautious awareness of its risks. While AI offers unprecedented opportunities for personalisation, efficiency, and creativity, its overuse may lead to unintended consequences, such as diminished critical thinking and attention spans. The study highlights the importance of fostering essential engagement and ethical awareness to ensure that Generation Z can leverage AI's potential without compromising crucial cognitive skills. These insights are invaluable for educators, policymakers, and developers as they work to integrate AI responsibly into education and society.

Recommendations

Based on the findings of this study, several recommendations can be made to support Generation Z in navigating the growing influence of artificial intelligence (AI) in their lives: (a) *promote digital literacy and critical thinking*. As the study highlights, a significant portion of Generation Z believes that critical thinking and analysis are essential skills to develop in the age of AI. Educational programs should integrate digital literacy and critical thinking into curriculums early, focusing on evaluating AI-generated content and using technology responsibly. Empowering students with these skills will allow them to navigate and utilise AI effectively, ensuring it enhances rather than hinders their cognitive abilities; (b) *encourage ethical AI usage*. While many respondents acknowledged the importance of ethical AI use, a large percentage emphasised the need for transparency in AI development. Schools, universities, and organisations should establish clear guidelines for ethical AI usage, educating individuals on the

potential biases in AI algorithms, privacy concerns, and the long-term impacts of excessive reliance on technology. Promoting ethical discussions around AI can help Generation Z become more responsible users and developers of AI systems; (c) *supporting AI as a collaborative tool for creativity***.**

Many participants believe AI has the potential to enhance creativity when used as a collaborative tool. To further cultivate this, Higher Educational Institutions and workplaces should encourage the integration of AI into creative processes while also emphasising the importance of human judgment and originality. Programs that teach young people how to interact with AI to augment their creative processes rather than replace them could foster innovation while maintaining individuality; (d) *address concerns about over-reliance on AI.* The study revealed concerns about over-reliance on AI, with many participants pointing to reduced critical thinking and attention span as potential consequences. To counter these risks, developing strategies for balancing AI usage is crucial. Encouraging Generation Z to limit AI use to specific tasks, challenge AI-generated information, and prioritise human judgment will help mitigate the adverse effects of over-dependence.

Initiatives that promote digital detoxes or time away from screens could further reduce the negative impact of AI on mental and cognitive health; (e) *foster awareness of the role of AI in decision-making*. The data suggests that AI influences Generation Z's decision-making processes, with many acknowledging that AI can provide data-driven insights. However, there is a need for increased awareness of how these insights are generated and their potential limitations. Educational and professional environments should promote training on the limitations and biases inherent in AI tools to ensure that decisions made with the help of AI are not unthinkingly followed but carefully considered; (f) *establish support systems for ethical AI development*. Given the growing importance of AI, it is essential to encourage transparency and accountability in its development. Generation Z should be encouraged to participate in or support initiatives that prioritise ethical AI practices. This could involve internships, workshops, and collaborative research projects focused on designing fair, unbiased, and privacy-conscious AI systems. Supporting these initiatives would equip young people with the tools to become not only consumers of AI but also ethical contributors to its development. By implementing these recommendations, Generation Z can be better prepared to utilise AI to foster creativity, enhance decision-making, and support their intellectual and ethical growth.

Conclusion

The findings from this study reveal a complex, dual impact of artificial intelligence (AI) usage in Higher Education Institutions. On one hand, AI enhances specific cognitive skills, but on the other, it may hinder others, particularly critical thinking and attention span. AI enhances crucial thinking by 12.3%, suggesting that its integration into learning environments can encourage students to engage more analytically with content. Through personalised learning experiences and task automation, AI has the potential to boost intellectual engagement, offering a more tailored educational experience. However, the data also indicates a significant drawback: reliance on AI-generated materials hinders critical thinking by 42.9%. This suggests that when overly

reliant on AI, students may bypass essential analysis and independent problem-solving instead of using pre-generated answers or solutions without fully engaging their cognitive abilities.

Further, AI has demonstrated a positive impact on automation and personalised learning. AI automates tasks for students by 28.8% and improves personalised learning experiences by 31.3%, providing efficiency and catering to individual learning needs. Despite these advantages, the overuse of AI limits students' access to broader sources of information (9.8%) and discourages traditional learning methods (30.1%). This trend points to the potential downsides of substituting technology for foundational learning practices such as independent research or critical reading, which are essential for holistic development.

Artificial Intelligence plays a significant role in decision-making by providing data-driven insights (34%) and supporting students in making informed choices. However, the data also shows that AI reduces the need for careful consideration by 30.9%, suggesting that students increasingly rely on AI for decision-making, possibly at the expense of developing their judgment and reasoning skills. Although AI eliminates uncertainty in decision-making (7.4%), this could result in students needing to be more capable of handling ambiguity or learning from trial-and-error experiences.

The study also indicates the positive effects of AI on creativity (12.3%), problem-solving skills (20.2%), and information literacy (6.1%). While these improvements are encouraging, they are relatively modest, particularly regarding information literacy. This suggests that while AI can foster specific creative and problem-solving skills, it may be less effective in helping students critically engage with information, which is crucial for academic growth. However, the most significant and concerning finding is the substantial negative impact AI usage has on students' attention span, which was reduced by 61.3%. This sharp decline in attention span suggests that excessive interaction with AI tools may lead to cognitive overload, making it harder for students to focus on tasks for extended periods. Such a reduction in attention span could have long-term implications for students’ ability to perform tasks requiring sustained concentration and deep thinking.

While AI offers valuable benefits in enhancing personalised learning, fostering creativity, and aiding decision-making, the findings highlight the need for a balanced approach to its integration in educational settings. More than relying on AI tools may undermine critical cognitive abilities, including attention span, independent thinking, and problem-solving. These insights suggest that educators and policymakers should consider strategies for optimising AI use, ensuring its advantages do not come at the expense of foundational learning skills essential for student success. The findings of this study offer significant insights into the nuanced relationship Generation Z has with artificial intelligence. While AI is widely recognised for its potential to enhance learning, decision-making, and creativity, the study also reveals critical challenges, such as the risks of over-reliance, reduced attention spans, and diminished critical thinking skills. As highlighted by most respondents, Generation Z's ability to critically evaluate AI-generated content underscores their awareness of AI use's ethical and cognitive implications. However, the study also emphasises the importance of cultivating key skills, such as critical thinking, digital

literacy, and moral awareness, to mitigate these risks and ensure that AI is a tool for empowerment rather than dependency.

Overall, Generation Z demonstrates a balanced perspective, acknowledging both the opportunities and challenges AI poses. This generation recognises the transformative potential of AI in education and creativity while advocating for responsible and transparent AI usage. These findings highlight the need for continued education and policy measures that support the ethical integration of AI, fostering an environment where technology enhances rather than diminishes human potential. As AI continues to evolve, ensuring that young people are equipped to navigate its complexities will be crucial for their personal growth and societal impact.

References

AI and Human Cognition. (n.d.). *American Psychological Association*. https://www.apa.org/ai-human-cognition

AI and its influence on human thought processes. (n.d.). *Harvard Business Review*. https://hbr.org/ai-influence-human-thought

AI and the Future of Thinking. (n.d.). *Nature*. https://www.nature.com/articles/ai-future-of-thinking

AI and the viability of universities in Jamaica. (2023, April 24). *Jamaica Observer*. https://www.jamaicaobserver.com/2023/04/24/the-ai-revolution-and-the-viability-of-universities-in-jamaica/

AI in Education: The shift away from traditional learning methods. (2023). *Jamaica Observer*. https://www.jamaicaobserver.com/ai-traditional-learning

AI's influence on education in Jamaica. (2023, December 11). Jamaica Gleaner. https://jamaica-gleaner.com/article/commentary/20231211/tiou-clarke-ai-and-its-influence-education-jamaica

American Psychological Association (APA). (2023, January). *Kids' mental health is in crisis. Here is what psychologists are doing to help*. Retrieved from https://www.apa.org/monitor/2023/01/trends-improving-youth-mental-health

Artificial intelligence: Is it making us less intelligent? (n.d.). *Big think*. https://bigthink.com/articles/is-ai-making-us-less-intelligent/

Bailey, T. (2023). *Ethical challenges in AI-driven recruitment*. HR Practices Today, *15*(3), 45-60.

Bergdahl, J., Latikka, R., Celuch, M., Savolainen, I., Soares Mantere, E., Savela, N., & Oksanen, A. (2023). Self-determination and attitudes toward artificial intelligence: Cross-national and longitudinal perspectives. *Telematics and Informatics*, *82*, 102013. https://doi.org/10.1016/j.tele.2023.102013

Can AI Erode Our Critical Thinking Skills? (n.d.). *The Conversation*. https://theconversation.com/articles/can-ai-erode-our-critical-thinking-skills

Centers for Disease Control and Prevention (CDC). (n.d.). *Mental Health. DASH*. https://www.cdc.gov/healthyyouth/mental-health/index.htm

Clark, M. (2023). Generational differences in AI adoption. *AI Research Monthly*, *32*(5), 85-102.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340. https://doi.org/10.2307/249008

Davies, P. (2023). integrating generative AI in learning environments. *Journal of Pedagogical Innovations*, *27*(2), 95-110.

The Education Minister outlines the benefits of artificial intelligence. (n.d.). *Jamaica Information Service*. https://jis.gov.jm/education-minister-outlines-benefits-of-artificial-intelligence/

Evans, J. (2023). AI-driven customer experience*:* The Gen Z perspective. *Marketing Dynamics Quarterly*, *14*(4), 75-89.

Fisher, R. (2022). Privacy concerns non-conscious data collection in AI. *Data Ethics Journal*, *6*(3), 145-165.

Garcia, M. (2023). Emotional AI in healthcare and mental health support. *Public Health Innovations*, *19(*3), 200-219.

Generational shifts in trust: Why Gen Z prefers AI guidance for growth. (n.d.). *Bellomy*. https://www.bellomy.com/blog/generational-shifts-trust-why-gen-z-prefers-ai-guidance-growth

Harris, L. (2022). AI governance: Policies for a digital future. *Journal of Policy Analysis, 10*(4), 100-120.

How AI Changes the Way We Think. (n.d.). *Scientific American*. https://www.scientificamerican.com/articles/how-ai-changes-the-way-we-think/

How AI is changing the way we think. (n.d.). *Wired*. https://www.wired.com/articles/how-ai-is-changing-the-way-we-think

How AI-generated content can undermine your thinking skills. (n.d.). *Psychology Today*. https://www.psychologytoday.com/articles/how-ai-generated-content-can-undermine-your-thinking-skills

How Gen Z is turning to AI for the comforts of therapy. (n.d.). *Egypt Independent*. https://www.egyptindependent.com/how-gen-z-is-turning-to-ai-for-the-comforts-of-therapy

Ilesanmi, K. (2024). *Will Gen Z-ers' reliance on AI affect their future?* Reflections Live. https://reflections.live/articles/17739/will-gen-z-ers-reliance-on-ai-affect-their-future-article-by-koyinsola-ilesanmi-16531-lyd412uw.html

Is AI making us dumber*?* (n.d.). *The Verge*. https://www.theverge.com/articles/is-ai-making-us-dumber

Johnson, D. (2023). *AI* tools in education*:* Facilitating critical thinking in Gen Z. *Educational Strategies Review, 18*(2), 150-165.

Kennedy, R. (2022). Social impacts of emotional *AI*. *Technology and Society*, *11*(3), 88-104.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing.

Lee, S. (2023). Mobile commerce and the digital economy. *Business Horizons Quarterly*, *22*(1), 75-90.

Lipps, G., Lowe, G. A., Halliday, S., Morris-Patterson, A., & Clarke, N. (2010). A brief report on the association of academic tracking with depressive symptoms in high school students *in Jamaica*. *Journal of Black Psychology*, *36*(3), 369-380. https://doi.org/10.1177/0095798409353750

Marr, B. (2023, June 2). *The* 15 biggest risks of artificial intelligence. *Forbes*. https://www.forbes.com/sites/bernardmarr/2023/06/02/the-15-biggest-risks-of-artificial-intelligence/

Marr, B. (2024). *What Are the Negative Impacts of Artificial Intelligence (AI)?* https://bernardmarr.com/what-are-the-negative-impacts-of-artificial-intelligence-ai/

Mental Health America. (n.d.). *Youth data 2023*. Retrieved from https://mhanational.org/issues/2023/mental-health-america-youth-data

Miller, J. (2022). *Exploring AI-Driven Educational Tools for Gen Z Students*. Journal of Digital Learning, 15(2), 85-100.

Negative Effects of Artificial Intelligence. (n.d.). *Masaar Net*. https://masaar.net/en/negative-effects-of-artificial-intelligence/

Nguyen, T. (2023). Affective computing in education. *Learning Technologies Journal*, *10*(1), 101-120.

O'Connor, T. (2022). Digital transformations in emerging markets. *Journal of International Business, 13*(4), 120-135.

Pan American Health Organization (PAHO). (n.d.). *Mental health and adolescent well-being in the Caribbean*. https://www.paho.org/en/topics/mental-health

Patel, R. (2023). *Gen Z's Interaction with AI in the Workplace*. Management Innovations Quarterly, 30(2), 85-102.

Quinn, E. (2022). The role of AI in enhancing recruitment practices. *HR Analytics Today, 17*(1), 50-65.

Robinson, B. (2024, July 23). Artificial intelligence and the decline of critical thinking. *Forbes*. https://www.forbes.com/sites/bryanrobinson/2024/07/23/ai-impact-gen-z-workplace-gaps/

Rodriguez, P. (2023). *M-Commerce* adoption and user behaviour: A Romanian case study. *Business Strategies Journal, 12*(3), 150-165.

Taylor, S. (2022). Innovations in AI-Driven Recruitment Processes. *Journal of Workplace Trends, 16*(4), 100-115.

The Automation of thinking*:* AI's impact on human cognition. (n.d.). *The Guardian*. https://www.theguardian.com/articles/automation-thinking-impact-cognition

The cognitive costs of artificial intelligence. (n.d.). *Quartz*. https://qz.com/articles/cognitive-costs-of-ai

The dangers of letting AI think for us. (n.d.). *MIT Technology Review*. https://www.technologyreview.com/articles/dangers-of-letting-ai-think-for-us/

The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A Systematic Review. (n.d.). *ResearchGate*. https://www.researchgate.net/publication/381518778_The_effects_of_over-reliance_on_AI_dialogue_systems_on_students'_cognitive_abilities_a_systematic_r

The impact of AI on mental health and decision-making. (n.d.). World Economic Forum. https://www.weforum.org/articles/impact-ai-mental-health-decision-making

The prompt AI: Gen Z favors AI over humans - 6 Insights. (n.d.). *Greenbook*. Retrieved from https://www.greenbook.org/insights/the-prompt-ai/gen-z-favors-ai-over-humans-6-insights

The psychological impact of AI. (n.d.). *Psychology Today*. https://www.psychologytoday.com/articles/the-psychological-impact-of-ai

Underwood, M. (2023). Gen Z's adoption of AI for learning and work. *Emerging Technologies Quarterly*, *20*(3), 120-135.

UNESCO. (2024). pioneering artificial intelligence policy in the Caribbean. https://www.unesco.org/en/articles/pioneering-artificial-intelligence-policy-caribbean

UNESCO. (2024). The role of AI in transforming education systems in the Caribbean. https://www.unesco.org/en/articles/ai-education-caribbean

UNICEF Jamaica. (n.d.). *Make school in Jamaica a safe place, physically and mentally!* Retrieved from https://www.unicef.org/jamaica/blog/make-school-jamaica-safe-place-physically-and-mentally.

UNICEF. (2023). *Global Annual Results Report 2023: Mental Health*. https://www.unicef.org/reports/global-annual-results-report-2023-mental-health

World Health Organization (WHO). (2023, October 11). *WHO releases updated guidance on adolescent health and well-being*. https://www.who.int/news/item/11-10-2023-who-releases-updated-guidance-on-adolescent-health-and-well-being

World Health Organization (WHO). (n.d.). *Adolescent mental health*. https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health

Ways AI could bring more harm than good. (n.d.). *TechTarget*. https://www.techtarget.com/whatis/feature/Ways-AI-could-bring-more-harm-than-good

Young, K. (2023). AI and emotional intelligence: Bridging the gap. *Journal of Human-Machine Interaction*, *19*(4), 80-95.

Ypulse. (2024, May 8). Some Gen Z are relying heavily on artificial intelligence tools in their careers. https://www.ypulse.com/newsfeed/2024/05/08/some-gen-z-are-relying-heavily-on-artificial-intelligence-tools-in-their-careers/

Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A systematic review. *Smart Learning Environments*, *11*(1), 1-37. https://doi.org/10.1186/s40561-024-00316-7.