

**THE DOUBLE-EDGED SWORD OF ARTIFICIAL INTELLIGENCE ON
ACADEMIC PERFORMANCE: STRIKING THE EQUILIBRIUM BETWEEN ITS
POSITIVE AND NEGATIVE IMPACTS.**

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DOI: 10.13140/RG.2.2.33952.39688

Abstract

The integration of Artificial Intelligence (AI) in education has sparked intense debate about its impact on students' academic performance. On one hand, AI has the potential to enhance learning outcomes by providing personalized instruction, automating grading, and offering real-time feedback. AI-powered tools can also facilitate access to vast educational resources, making learning more engaging and efficient. On the other hand, excessive reliance on AI may hinder critical thinking, creativity, and problem-solving skills. Over-reliance on AI-generated solutions can lead to a lack of understanding of fundamental concepts, ultimately negatively impacting academic performance. Moreover, AI-driven assessments may prioritize rote memorization over deeper understanding, potentially stifling intellectual curiosity. This research work aims to explore the dual effects of AI on academic performance, examining both the benefits and drawbacks. It also aims to investigate the equilibrium between AI's positive and negative impacts on academic performance, exploring strategies to maximize benefits while mitigating drawbacks. By investigating the interplay between AI and student learning, we can harness the potential of AI to augment education while mitigating its negative consequences. A balanced approach will enable educators to leverage AI as a tool to enhance, rather than replace, traditional teaching methods, ultimately fostering a more effective and inclusive learning environment. The researcher concludes with encouragement to use of both Artificial Intelligence and human intelligence. To maximize benefits and minimize drawbacks, educators must establish guidelines for AI usage, promote digital literacy, and encourage human-AI collaboration. By acknowledging AI's dual nature and striving for equilibrium, we can harness its potential to augment academic performance while maintaining the value of human intelligence. The researcher used secondary data collection for data generation.

Keywords: Double-Edged, Sword, Artificial Intelligence, Academic, Performance

Introduction

Artificial intelligence (AI) refers to computer systems capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems. Recently, artificial intelligence (AI) technologies have been widely used in the field of education both by students and educators in achieving their academic goal, and artificial intelligence in education (AI) has gained increasing attention. Artificial intelligence (AI) refers to the simulation of human intelligence in machines, enabling them to perform tasks that typically require human intelligence, such as: learning, problem-solving, reasoning, perception and language understanding. **Artificial Intelligence (AI)** has evolved rapidly, becoming a transformative technology in many areas of modern life. At its core, AI involves the development of computer systems capable of performing tasks that traditionally require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. Artificial Intelligence is a branch of computer science that aims to create intelligent machines capable of perceiving, learning, reasoning, and acting like humans. It encompasses techniques

like machine learning, deep learning, natural language, language processing, and computer vision, The significance of AI in computer science lies in its ability to pave the way for groundbreaking applications and new technologies that were once deemed impossible.

The integration of Artificial Intelligence (AI) in education has transformed the learning landscape, offering both benefits and drawbacks. This study explores the double-edged sword of AI on academic performance, seeking to strike equilibrium between its positive and negative impacts. Hamari et al (2014), Ritter & Koedinger (2017) opined that, AI has enhanced student engagement, motivation, and learning outcomes. In the vein, Baker & Smith (2019) said, Personalized learning experiences, automated grading, and real-time feedback have improved academic achievement However, Kirschner & Karpinski (2010) are concerned persist regarding over-reliance on technology, hindering critical thinking and problem-solving skills Moreover Barocas & Selbst (2016) are of the opinion that, AI-generated content and assessments may perpetuate biases. While Selwyn (2016) are of the concept that AI may be decreasing students' autonomy and agency.

The literature highlights the need for a balanced approach. This is what Bostrom & Yudkowsky (2014) meant when they said, leveraging AI's potential while maintaining human oversight and critical thinking is necessary. By understanding the complex interplay between AI and academic performance, educators can harness AI's benefits while minimizing its negative consequences.

Today, the term “AI” describes a wide range of technologies that power many of the services and goods we use every day from apps that recommend TV shows to chatbots that provide customer support in real time. But do all of these really constitute artificial intelligence as most of us envision it? And if not, then why do we use the term so often? Artificial intelligence (AI) is the theory and development of computer systems capable of performing tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns. AI is an umbrella term that encompasses a wide variety of technologies, including machine learning, deep learning and natural language processing. Although the term is commonly used to describe a range of different technologies in use today, many disagree on whether these actually constitute artificial intelligence. Instead, some argue that much of the technology used in the real world today actually constitutes highly advanced machine learning that is simply a first step towards true artificial intelligence, or “general artificial intelligence”. Yet, despite the many philosophical disagreements over whether “true” intelligent machines actually exist, when most people use the term AI today, they are referring to a suite of machine learning-powered technologies, such as Chat GPT or computer vision, that enable machines to perform tasks that previously only humans can do like generating written content, steering a car, or analyzing data.

In this article, you will learn more about artificial intelligence, what it actually does, and different types of it. In the end, you'll also learn about some of its benefits and dangers and explore flexible courses that can help you expand your knowledge of AI even further.

Conceptual Clarification

Before delving into the definition of the keywords as contained in the title of the research work, I thought it wise to elucidate the importance of this section of this research. Conceptual clarification is essential for several reasons as follow; it is for precision, clarifying concepts, to ensure that we use terms accurately and consistently, avoiding confusion and miscommunication. Clear thinking: Conceptual clarification promotes clear thinking by forcing us to define and articulate our ideas, making it easier to identify ambiguities and inconsistencies. Effective communication: clarified concepts facilitate effective communication among

researchers, scholars, and practitioners, ensuring that everyone is on the same page. Advancing knowledge: conceptual clarification drives knowledge advancement by enabling scholars to build upon established concepts, refine theories, and explore new ideas. Interdisciplinary understanding: Clarified concepts facilitate communication across disciplines, fostering interdisciplinary research and collaboration. Pedagogy: Clear concepts enhance teaching and learning, ensuring that students and readers grasp complex ideas and develop a strong foundation for further study. By achieving conceptual clarification, we establish a solid foundation for research, theory development, and effective communication, ultimately advancing our understanding of complex phenomena especially in terms as contained in the title of the work. Here are the scholars' detailed definitions for each word as contained in the title of the work:

1. **Double-edged sword:** According to Kahneman & Tversky (1979), "Double-edged sword is a situation or circumstance that has both beneficial and detrimental consequences, requiring careful consideration and management to maximize benefits and minimize harm" (p. 265).

2. **Artificial:** According to Bostrom (2014) "Artificial can be defined as created or produced by human technology, rather than occurring naturally" (p.12).

3. **Intelligence:** According to Gottfredson (1997) "The ability to learn, reason, and adapt to new situations, encompassing various cognitive abilities such as memory, problem-solving, and decision-making", p.13).

4. **Academic:** According to Bourdieu (1988), academic can be defined as, "Relating to education or scholarship, particularly in a formal or institutional setting, emphasizing critical thinking, research, and intellectual inquiry" (p.23).

5. **Performance:** According to Ecclestone (2007), performance can be defined as, "The execution or accomplishment of a task, function, or activity, evaluated based on criteria such as efficiency, effectiveness, and quality" (p.15).

6. **Striking:** According to Lakoff & Johnson (1980) striking can be defined as, "Attracting attention or notice due to unusual or impressive qualities, often conveying a sense of surprise or astonishment" (p.19).

7. **Equilibrium:** according to Marshall (1920) equilibrium can be defined as, "A state of balance or stability, where opposing forces or influences are equal and cancel each other out, maintaining a steady or constant condition" (p.45).

8. **Positive:** According to Luthans (2002) positive can be defined as, "Having a beneficial, favorable, or desirable quality or character, often associated with advantages, gains, or improvements" (p.59).

9. **Negative:** According to Luthans (2002) negative can be defined as, "Having a detrimental, unfavorable, or undesirable quality or character, often associated with disadvantages, losses, or declines" (p.60).

10. **Impacts:** According to Babbie (2013) impacts can be defined as, "The effects or consequences of an event, action, or situation, often evaluated in terms of their significance, magnitude, or duration" (p.122).

The definitions as done on the keywords of the title of the research work will enable the readers

understand the concepts in which they are used in this paper.

Theoretical Study

The double-edged sword of Artificial Intelligence (AI) on academic performance can be understood through the lens of Unified Theory of Acceptance and Use of Technology (UTAUT). The Unified Theory of Acceptance and Use of Technology (UTAUT) is a technology acceptance model. It was formulated by Viswanath Venkatesh in conjunction with Morris, G. Morris, Davis, G. B., & Davis, F. D. in 2003. He is a prominent researcher in the field of information systems and technology acceptance, and has published numerous papers on the topic. Venkatesh used a professor at the McIntire School of Commerce, University of Virginia. Unified Theory of Acceptance and Use of Technology (UTAUT). Was published in "User acceptance of information technology: Toward a unified view". The UTAUT aims to explain user intentions to use an information system and subsequent usage behavior. The theory examines the acceptance of technology, determined by the effects of performance expectancy, effort expectancy, social influence and facilitating conditions. According to Ursavas (2022) opinion on the Unified Theory of Acceptance and Use of Technology (UTAUT).

Research on technology adoption has identified a large number of factors that can affect individuals' behavioral intentions to use various technologies, and many models have emerged. Venkatesh et al. (MIS Quarterly, 27(3), 425–478: 2003) aimed to develop an integrated model based on the idea that researchers may miss the opportunities offered by alternative models when they choose only one of the existing models. In the synthesis study, Theory of Reasoned Behavior, Technology Acceptance Model, Motivation Model, Theory of Planned Behavior, Unified Model of Technology Acceptance and Planned Behavior, PC Use Model, Diffusion Theory, and Social Cognitive Theory were discussed, their deficiencies and strengths were compared, and the Unified Theory of Acceptance and Use of Technology (UTAUT) was developed. According to UTAUT, using behavior is determined directly by behavioral intention and facilitating conditions, and performance expectation, which determines behavioral intention, is indirectly determined by effort expectancy, social influence, and facilitating conditions variables. In addition, age, gender, experience, and voluntariness of use variables were added as directing variables to the relationships in the model. To make the model more consumer-centric, Venkatesh et al. (MIS Quarterly 36, 157–178: 2012a) added hedonic motivation, price value, and habit variables to the model and removed the voluntariness of use moderator from the model, thus expanding the UTAUT model to UTAUT2. In this chapter, UTAUT, which examines the variables that affect individuals' technology acceptance and use with a holistic approach, is examined in an educational context. The reader who completes the section will be able to (a) explain the general structure of the model and for what purpose it was developed (b) define the factors in the model and the relationships between factors (c) give an educational example of the acceptance and use of a technology (d) expand the UTAUT and UTAUT2 models in an educational context, formulate hypotheses/problems, collect and analyze data, and (e) discuss and evaluate the results of a study using the UTAUT and UTAUT2 models. (p.111-133).

Artificial Intelligence Examples

Though the humanoid robots often associated with AI. At the simplest level, machine learning uses algorithms trained on data sets to create machine learning models that allow computer systems to perform tasks like making song recommendations, identifying the fastest way to travel to a destination, or translating text from one language to another. Some of the most common examples of AI in use today include:

Chat GPT

1. **ChatGPT**: Uses large language models (LLMs) to generate text in response to questions or comments posed to it. ChatGPT is an AI chatbot developed by OpenAI, utilizing the GPT (The acronym GPT in Chatgpt simply means; Generative Pre-trained Transformer) architecture (OpenAI, 2021). Brown et al., (2020) opined that, it is trained on vast amounts of text data, enabling it to understand and generate human-like responses. Generative: Capable of generating new content, such as text or images. Pre-trained: Trained on a large dataset before being fine-tuned for specific tasks. Transformer: A type of neural network architecture used for natural language processing tasks. In essence, GPT is a type of AI model designed to generate human-like text based on the input it receives. (p.10). Furthermore, in the words of Radford et al (2019) opined that, ChatGPT can engage in conversations, answer questions, provide information, and create content. Its advanced natural language processing capabilities allow for context understanding, nuance, and empathy. With continuous learning and improvement, ChatGPT becomes increasingly sophisticated. (p.12).
2. **Google Translate**: Uses deep learning algorithms to translate text from one language to another. According to Wu et al., (2016) who asserted the following on the meaning of Google Translate, Google Translate is a machine translation service developed by Google, utilizing neural machine translation (NMT) technology. It translates text and speech in over 100 languages, with accuracy improving over time. (p.23). Schuster et al., (2016) also said, Google Translate uses a large corpus of text data and complex algorithms to generate translations. While not perfect, it facilitates communication across language barriers, with applications in travel, education, and business. Its mobile app and web interface make it accessible worldwide. (p.11).
3. **Netflix**: Uses machine learning algorithms to create personalized recommendation engines for users based on their previous viewing history. According to Gomez-Uribe & Hunt, (2015), Netflix is a streaming service providing access to a vast library of content, including TV shows, movies, and original productions. Founded in 1997, it has revolutionized the entertainment industry with its subscription-based model and personalized recommendations (p.10). Also Lotz (2017) opined that, with a global presence, Netflix has transformed the way people consume media, offering a platform for diverse storytelling and creative expression Its impact on popular culture and the media landscape is significant, with a growing influence on production and distribution strategies.
4. **Tesla**: Uses computer vision to power self-driving features on their cars. Tesla, Inc. is a pioneering electric vehicle (EV) manufacturer and clean energy company founded in 2003 by Elon Musk, JB Straubel, Martin Eberhard, and Marc Tarpennin. Tesla's innovative products, such as the Model S, Model 3, and Powerwall, have disrupted the automotive and energy industries. According Musk (2013), The Company's mission is to accelerate the world's transition to sustainable energy through affordable EVs and renewable energy solutions. Tesla's impact on the environment and transportation sector is significant, with a growing influence on the global shift towards sustainable energy.

Impacts of Artificial Intelligence (AI)

In this segment, the researcher will review the positive and negative impacts of artificial Intelligence. AI has a range of applications with the potential to transform how we work and our

daily lives. While many of these transformations are exciting, like self-driving cars, virtual assistants, or wearable devices in the healthcare industry, they also pose many challenges. It's a complicated picture that often summons competing images: a utopia for some, a dystopia for others. The reality is likely to be much more complex. Here are a few of the possible benefits and dangers AI may pose:

Potential Benefits

1. Greater accuracy for certain repeatable tasks, such as assembling vehicles or computers.
2. Decreased operational costs due to greater efficiency of machines.
3. Increased personalization within digital services and products.
4. Improved decision-making in certain situations.
5. Ability to quickly generate new content, such as text or images.

Potential Dangers

- Job loss due to increased automation.
- Potential for bias or discrimination as a result of the data set on which the AI is trained.
- Possible cybersecurity concerns.
- Lack of transparency over how decisions are arrived at, resulting in less than optimal solutions.
- Potential to create misinformation, as well as inadvertently violate laws and regulations.

Here are some other positive impacts of Artificial Intelligence (AI) on academic performance.

1. Personalized learning: According to Knewton (2016) on positive impact of Artificial Intelligence (AI) said, "AI, can tailor learning materials to individual students' needs, abilities, and learning styles."
2. Intelligent tutoring systems: According to VanLehn (2011) on positive impact of Artificial Intelligence (AI) said, "AI-powered systems provide one-on-one support, offering real-time feedback and guidance."
3. Automated grading: According to Santos (2016) on positive impact of Artificial Intelligence (AI) said, "AI, can accurately grade assignments, freeing instructors to focus on teaching."
4. Enhanced accessibility: According to Burgstahler (2015) on positive impact Artificial Intelligence (AI) said, "AI-powered tools can help students with disabilities, such as language translation and text-to-speech."
5. Virtual learning environments: According to Dalgamo & Lee (2010) on positive impact of Artificial Intelligence (AI) said, "AI can create immersive, interactive learning experiences, increasing student engagement."
6. Natural Language Processing (NLP): According to Graham (2017) on positive impact Artificial Intelligence (AI) said, "AI-powered NLP can help students improve writing skills, grammar, and language comprehension."
7. Data analysis: According to Romero & Ventura (2013) on positive impacts Artificial Intelligence (AI) said, "AI can help teachers track student progress, identify knowledge gaps, and develop targeted interventions."
8. Intelligent adaptive assessments: According to Rudner (2017) on positive impacts of Artificial

Intelligence (AI) said, "AI can adjust assessment difficulty and content in real-time, ensuring accurate measures of student knowledge."

Here are some negative impacts of Artificial Intelligence AI on academic performance.

1. Over-reliance on technology: According to Kischner & Kapinski (2010) on negative impact of Artificial Intelligence (AI) said, "Excessive dependence on AI can hinder critical thinking and problem-solving skills."

2. Lack of understanding: According to Sloman & Fembach (2017) on negative impact of Artificial Intelligence (AI) said, "AI-generated solutions may not promote a deep understanding of fundamental concepts."

3. Limited contextual understanding: According to Bostrom & Yudkowsky (2014) on negative impact of Artificial Intelligence (AI) said, "One may struggle to understand nuances and context, potentially leading to misinterpretation."

4. Inaccuracy and bias: According to Barocas & Selbst, (2016) on negative impact of Artificial Intelligence (AI) said, "AI systems can perpetuate existing biases and inaccuracies if trained on flawed data."

5. Decreased attention span: According to Cain & Gradisar (2010) on negative impact of Artificial Intelligence (AI) said, "Overexposure to AI-powered learning tools can lead to decreased attention span and reduced engagement."

6. Dependence on technology for answers: According to Knezek & Christensen (2006) on negative impact of Artificial Intelligence (AI) said, "Students may rely too heavily on AI for answers, rather than developing their own problem-solving skills."

These are just some of the ways that AI provides benefits and dangers to society. When using new technologies like AI, it's best to keep a clear mind about what it is and isn't. With great power comes great responsibility, after all.

Why does Artificial Intelligence Matter?

Artificial Intelligence (AI) matters for several reasons as follow:

1. **Efficiency and Automation:** Automating repetitive tasks can boost efficiency and productivity, freeing up organizations to concentrate on more intricate and strategic activities.
2. **Insights and Decision Making:** AI can analyze large datasets to uncover patterns, trends, and insights that humans might miss. This can lead to better decision-making and strategic planning.
3. **Personalization:** AI can be used to personalize experiences for customers, such as personalized recommendations in e-commerce or personalized healthcare treatments.
4. **Cost Savings:** By automating tasks and improving efficiency, AI can help organizations save costs in various areas of their operations.
5. **Innovation:** AI is driving innovation in various industries, from healthcare to finance to transportation. It is enabling the development of new products, services, and business models.
6. **Competitive Advantage:** Organizations that leverage AI effectively can gain a competitive advantage by being more agile, innovative, and customer-focused.
7. **Addressing Complex Problems:** AI can be used to address complex problems that are difficult for humans to solve, such as climate change, healthcare challenges, and cyber security threats.

Importance of AI in Education

1. **Personalized Learning:** AI is enabling personalized learning experiences by analyzing students' learning styles, preferences, and performance data. This allows educators to

tailor educational content and activities to meet the individual needs of each student, leading to improved learning outcomes.

2. **Adaptive Learning:** AI-powered adaptive learning platforms can adjust the pace and difficulty of learning materials based on students' progress. This helps students learn at their own pace and ensures that they are challenged appropriately.
3. **Automated Grading:** AI can automate grading for assignments and assessments, saving educators time and providing students with immediate feedback. This can help students improve their performance and retention of material.
4. **Virtual Assistants:** AI-powered virtual assistants can provide students with support and guidance outside of the classroom. These virtual assistants can answer questions, provide explanations, and help students navigate educational materials.
5. **Data Analysis:** AI can analyze large amounts of data to identify trends and patterns in student performance. This information can help educators identify areas where students may be struggling and provide targeted interventions.

Artificial Intelligence (AI) is a transformative technology with wide-ranging implications across various industries and sectors. Its ability to analyze data, learn from patterns, and make intelligent decisions has the potential to revolutionize processes, improve outcomes, and drive innovation. From healthcare to finance, education to environmental conservation, AI is reshaping the way we live, work, and interact. As AI continues to evolve, its importance in our lives is only expected to grow, leading to a future where intelligent machines work alongside humans to solve complex problems and enhance the quality of life for all.

Conclusion

The double-edged sword of artificial intelligence (AI) on academic performance necessitates striking a balance between its positive and negative impacts. In the words of Baker & Smith (2020), "On one hand, AI enhances learning experiences through personalized instruction, automates grading, and provides real-time feedback. On the other hand, AI can lead to over-reliance, decreased critical thinking, and increased cheating. Also Krumhuber & Manstead, (2019) opined that, to maximize benefits and minimize drawbacks, educators must establish guidelines for AI usage, promote digital literacy, and encourage human-AI collaboration. By acknowledging AI's dual nature and striving for equilibrium, we can harness its potential to augment academic performance while maintaining the value of human intelligence.

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