The Impact of Generative AI Usage on Students' Creativity: A Cross-Sectional Study

by

Somaiya Islam Lily
ID: CSE2203027159

Shanam Sultana
ID: CSE2203027118

Supervised by
Prof. Bulbul Ahamed

Submitted in partial fulfillment of the requirements for the degree of
Bachelor of Science in Computer Science and Engineering



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SONARGAON UNIVERSITY (SU)
September 2026

The Impact of Generative AI Usage on Students' Creativity: A Cross-Sectional Study

by

Somaiya Islam Lily
ID: CSE2203027159

Shanam Sultana
ID: CSE2203027118

Supervised by
Prof. Bulbul Ahamed

Submitted in partial fulfillment of the requirements for the degree of
Bachelor of Science in Computer Science and Engineering



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SONARGAON UNIVERSITY (SU)
September 2026

APPROVAL

The thesis titled **"The Impact of Generative AI Usage on Students' Creativity: A Cross-Sectional Study"** submitted by Somaiya Islam Lily (CSE2203027159) and Shanam Sultana (CSE2203027118) to the Department of Computer Science and Engineering, Sonargaon University (SU), has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents.

Board of Examiners

Prof. Bulbul Ahamed
Professor and Head,
Department of Computer
Science and Engineering
Sonargaon University (SU)

Supervisor

(Examiner Name and Signature)
Department of Computer
Science and Engineering
Sonargaon University (SU)

Examiner 1

(Examiner Name and Signature)
Department of Computer
Science and Engineering
Sonargaon University (SU)

Examiner 2

(Examiner Name and Signature)
Department of Computer
Science and Engineering
Sonargaon University (SU)

Examiner 3

DECLARATION

We, hereby, declare that the work presented in this report is the outcome of the investigation performed by us under the supervision of **Prof. Bulbul Ahamed, Professor** and **Head,** Department of Computer Science and Engineering, Sonargaon University, Dhaka, Bangladesh. We reaffirm that no part of this thesis has been or is being submitted elsewhere for the award of any degree or diploma.

Countersigned

(Prof. Bulbul Ahamed)
Supervisor

Signature

Somaiya Islam Lily
ID: CSE2203027159

Shanam Sultana
ID:CSE2203027118

ABSTRACT

Generative Artificial Intelligence (AI) has rapidly transformed the educational environment by providing students with advanced tools for learning, idea generation, problem-solving, and creative assistance. The increasing adoption of AI-based tools such as ChatGPT and other generative AI platforms has created opportunities as well as challenges in academic activities. This study aims to investigate the impact of Generative Artificial Intelligence usage on Students' creativity through a survey-based quantitative research approach.A structured questionnaire was developed and distributed among students to collect data regarding their usage patterns, perceptions, and experiences with Generative AI technologies. The collected data were analyzed using IBM SPSS Statistics. Statistical techniques including reliability analysis, descriptive statistics, Pearson correlation analysis, and regression analysis were applied to examine the relationship between Generative AI usage and Students' creativity.The findings of this study provide insights into how Generative AI influences Students' creative thinking, idea development, and problem-solving abilities. The research highlights the importance of responsible and effective AI usage in education and suggests that Generative AI can be a valuable learning assistant when integrated properly into academic practices.This study contributes to understanding the relationship between emerging AI technologies and Students' creative development and provides recommendations for students, educators, and educational institutions regarding the effective utilization of Generative AI.

Keywords: Generative Artificial Intelligence, Students' Creativity, AI Usage, Survey-Based Study, Artificial Intelligence in Education, Creative Thinking

ACKNOWLEDGMENT

At the very beginning, we would like to express our deepest gratitude to Almighty Allah for giving us the ability, patience, and strength to complete this thesis successfully.

We are grateful to our respected supervisor **Prof. Bulbul Ahamed, Professor and Head, Department of Computer Science and Engineering, Sonargaon University**, whose valuable guidance, continuous support, and constructive suggestions helped us throughout the research work.

We would also like to express our sincere appreciation to all faculty members of the Department of Computer Science and Engineering for their valuable knowledge, encouragement, and support during our academic journey.

Finally, we would like to thank our family members and friends for their continuous encouragement, inspiration, and support throughout the completion of this thesis.

LIST OF ABBREVIATIONS

Abbreviation	Full Form
AI	Artificial Intelligence
AID	AI Dependency
ANOVA	Analysis of Variance
CR	Students' Creativity
DV	Dependent Variable
ETH	Ethical AI Use
GAU	Generative AI Usage
GenAI	Generative Artificial Intelligence
IBM	International Business Machines
IV	Independent Variable
LE	Learning Effectiveness
LLM	Large Language Model
ML	Machine Learning
NLP	Natural Language Processing
PLE	Perceived Learning Effectiveness
RAI	Responsible AI Use
RQ	Research Question
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
VIF	Variance Inflation Factor

TABLE OF CONTENTS

Title Page No.

DECLARATION ……..……..…….. iii

ABSTRACT ……...……..……. iv

ACKNOWLEDGEMENT ……..…….…… v

LIST OF ABBREVIATIONS……..…… vi

CHAPTER 1

INTRODUCTION

1.1 Introduction ……..……..... 1

1.2 Background of the Study……..……... 1-2

1.3 Problem Statement ……..…… 2-3

1.4 Research Aim……... 3

1.5 Research Objectives …….……..... 3

1.6 Research Questions…….…… 3

1.7 Research Hypothesis……... 4

1.8 Research Overview……. 4-5

1.9 Significance of the Study…… 5

1.10 Scope of the Study……... 5-6

1.11 Limitations of the Study…….. 6

1.12 Operational Definition of Key Terms……. 6-7

1.13 Organization of the Thesis…….. 7

1.14 Chapter Summary…… 7

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction …….…..... 8

2.2 Theoretical Foundation…… 9

2.2.1 Self-Regulated Learning Theory…….. 9

2.2.2 Cognitive Offloading Theory……... 10

2.2.3 Human–AI Co-Creation Perspective…… 10-11

2.3 Generative Artificial Intelligence in Higher Education…….. 11-12

2.4 Generative AI Usage (GAU)……... 12-13

2.5 Students' Creativity…… 14-15

2.6 Relationship Between Generative AI Usage and Creativity……... 15-16
2.7 Learning Enhancement and Creativity…… 16-17
2.8 Responsible AI Use and Creativity……. 17-18
2.9 AI Dependency and Creativity…… 18-19
2.10 Ethical AI Use and Creativity……. 19
2.11 Review of Previous Empirical Studies…… 19-20
2.12 Research Gap……... 20
2.13 Development of Hypotheses……... 20-21
2.14 Conceptual Framework……... 21-22
2.15 Chapter Summary…… 22

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction……. 23
3.2 Research Design…….. 23-24
3.3 Research Approach…….. 24
3.4 Research Philosophy……... 25
3.5 Population of the Study……... 25
3.6 Sample Size and Sampling Technique…… 25
3.7 Data Collection Procedure…….. 25-26
3.8 Research Instrument…… 26
3.9 Questionnaire Design…….. 26-27
3.10 Measurement Scale……. 27
3.11 Operationalization of Variables……... 27
3.11.1 Generative AI Usage (GAU)……. 27
3.11.2 Learning Enhancement (LE)……. 27-28
3.11.3 Responsible AI Use (RAI)…… 28
3.11.4 AI Dependency (AID)……... 28
3.11.5 Ethical AI Use (ETH)…… 28
3.11.6 Creativity (CR)…….. 28
3.12 Data Analysis Procedure…….. 28
3.12.1 Reliability Analysis…… 28-29
3.12.2 Descriptive Statistics…….. 29
3.12.3 Pearson Correlation Analysis……. 29

3.12.4 Multiple Linear Regression Analysis……. 29-30
3.12.5 Hypothesis Testing……. 30
3.13 Ethical Considerations……. 30-31
3.14 Chapter Summary…… 31

CHAPTER 4

RESULTS AND FINDINGS

4.1 Introduction ……..…….……. 32
4.2 Response Rate……. 32
4.3 Demographic Characteristics of Respondents……. 32
4.3.1 Gender Distribution…… 32-33
4.3.2 Age Distribution……. 33
4.3.3 Academic Level…….. 33
4.3.4 Department Distribution……. 33-34
4.4 Reliability Analysis…….. 34
4.5 Descriptive Statistics of Variables……... 34-35
4.6 Pearson Correlation Analysis……... 35-36
4.7 Multiple Linear Regression Analysis……... 36
4.7.1 Model Summary……. 36-37
4.7.2 ANOVA Test……. 37
4.7.3 Regression Coefficients……. 37-39
4.8 Multicollinearity Assessment……... 39
4.9 Regression Assumption Tests…….. 39
4.9.1 Normal Probability Plot……. 40
4.9.2 Histogram Analysis…… 40-41
4.9.3 Scatterplot Analysis……... 41
4.10 Hypothesis Testing Results…….. 41-43
4.11 Summary of Major Findings…… 43
4.12 Chapter Summary……. 43-44

CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction …….……..…… 45
5.2 Discussion of Major Findings……. 45
5.2.1 Generative AI Usage and Students' Creativity……. 45-46

5.2.2 Learning Enhancement and Students' Creativity…….. 46
5.2.3 Responsible AI Use and Students' Creativity……..……... 46
5.2.4 AI Dependency and Students' Creativity…….…….. 47
5.2.5 Ethical AI Use and Students' Creativity……..... 47-48
5.3 Overall Interpretation of the Research Model……. 48
5.4 Summary of Hypothesis Testing Results…… 48
5.5 Theoretical Implications…….. 49
5.6 Practical Implications…….. 49
5.6.1 Implications for Students…….. 49
5.6.2 Implications for Educators…… 49-50
5.6.3 Implications for Universities……. 50
5.7 Recommendations……... 50
5.7.1 Encourage Learning-Oriented AI Use……... 50
5.7.2 Promote Responsible AI Practices…… 50
5.7.3 Maintain Human Creative Involvement…… 51
5.7.4 Develop Ethical AI Guidelines……. 51
5.7.5 Monitor AI Dependency…… 51
5.8 Recommendations for Future Research…….. 51-52
5.9 Conclusion……... 52

REFERENCES ……..…… 53-55
APPENDIX A…… 56
APPENDIX B…… 57-58

LIST OF TABLES

Table No.	Title	Page No.
Table 4.1	Gender Distribution of Respondents	32
Table 4.2	Age Distribution of Respondents	33
Table 4.3	Academic Level of Respondents	33
Table 4.4	Department Distribution of Respondents	33
Table 4.5	Reliability Analysis of Research Variables	34
Table 4.6	Descriptive Statistics of Research Variables	35
Table 4.7	Correlation Between Research Variables	35
Table 4.8	Regression Model Summary	36
Table 4.9	ANOVA Results for Regression Model	37
Table 4.10	Regression Coefficients	38
Table 4.11	Multicollinearity Statistics	39
Table 4.12	Summary of Hypothesis Testing Results	41
Table 5.1	Summary of Hypothesis Testing	48

LIST OF FIGURES

Figure No.	Title	Page No.
Fig.1	Overview of the Research Process	5
Fig.2	Conceptual Framework of the Study	21
Fig.3	Research Methodology Framework	24
Fig.4	Normal Probability Plot of Regression Standardized Residual	40
Fig.5	Histogram of Regression Standardized Residual	40
Fig.6	Scatterplot of Regression Standardized Residual	41

CHAPTER 1
INTRODUCTION

1.1 Introduction

The advancement of Artificial Intelligence (AI) has created significant changes in different areas of human activities, including education. In recent years, Generative Artificial Intelligence (GenAI) has become one of the most discussed developments because of its ability to generate new content based on user instructions. Unlike traditional AI systems that mainly analyze existing information, generative AI can produce text, images, code, and other forms of digital content [1].

The availability of generative AI tools such as ChatGPT, Google Gemini, Claude, and Microsoft Copilot has changed the way students interact with technology for academic purposes. University students are increasingly using these tools for searching information, understanding complex topics, generating ideas, and improving academic work [2].

Generative AI provides new opportunities for improving Students' learning experiences and supporting creative activities. However, the impact of these technologies depends on how students use them. Responsible usage, ethical awareness, and the level of dependency on AI-generated information may influence whether AI becomes a useful learning assistant or a replacement for Students' own thinking process [3].

Creativity is an important skill in higher education because it helps students develop original ideas, solve problems, and create innovative solutions. Although generative AI has the potential to support creativity, the relationship between AI usage and creativity requires further investigation. Therefore, this study examines how different dimensions of generative AI usage influence Students' creativity.

This research focuses on five AI-related factors: Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH), and examines their relationship with Students' Creativity (CR).

1.2 Background of the Study

The use of Artificial Intelligence in education has increased rapidly due to technological development and the availability of advanced AI-based applications. Generative AI has introduced a new approach to learning by allowing students to interact with AI systems and receive responses according to their specific requirements. These technologies have created opportunities for students to access information more easily and receive learning support beyond traditional educational resources [1].

In higher education, students use generative AI tools for various academic activities. These include explaining difficult concepts, summarizing learning materials, generating ideas for assignments, improving writing quality, and assisting with problem-solving. The ability of AI

systems to provide immediate responses has made them attractive tools for students who need additional academic support [2].

One important area related to generative AI is learning enhancement. AI tools can help students understand complex topics by providing explanations, examples, and alternative viewpoints. When students use AI as a supportive learning tool, it may improve their knowledge development and encourage deeper engagement with academic content [4].

Apart from learning support, generative AI may also influence Students' creativity. Creativity requires the ability to generate new ideas, explore different possibilities, and develop unique solutions. AI tools can support this process by providing suggestions and alternative perspectives. However, creative outcomes depend on active human involvement because students still need to evaluate, modify, and develop AI-generated ideas [5].

The responsible use of AI is another important factor in educational environments. Students need to verify AI-generated information, consider ethical issues, and maintain academic integrity while using AI tools. Responsible AI practices allow students to benefit from AI assistance while preserving their own critical thinking abilities [3].

However, increasing dependence on AI tools has created concerns among educators and researchers. Excessive reliance on AI-generated responses may reduce Students' involvement in independent thinking and problem-solving activities. Cognitive offloading theory suggests that external tools can reduce mental workload, but the impact depends on how individuals use the saved cognitive resources [6].

Ethical considerations are also important because students need proper understanding of appropriate AI usage. Issues such as plagiarism, incorrect information, and lack of transparency in AI-assisted work highlight the importance of ethical AI practices in education.

Although previous studies have explored the educational benefits and challenges of generative AI, limited research has examined multiple AI-related factors together to understand their combined influence on Students' creativity. Therefore, this study investigates the relationship between Generative AI Usage, Learning Enhancement, Responsible AI Use, AI Dependency, Ethical AI Use, and Students' Creativity.

1.3 Problem Statement

The increasing popularity of generative AI among university students has created both opportunities and challenges in education. Students are using AI tools regularly for academic activities, but the actual influence of these technologies on creativity remains unclear.

Many discussions about generative AI focus on its ability to improve productivity and learning efficiency. However, frequent use of AI does not necessarily mean that students become more creative. The effect of AI may depend on how students use these tools and whether they actively participate in the learning and creative process.

Another concern is AI dependency. While AI tools can provide valuable support, excessive reliance on AI-generated answers may affect Students' independent thinking abilities. On the other hand, appropriate AI assistance may help students explore new ideas and improve creative performance.

Furthermore, responsible and ethical AI usage has become an important issue in educational environments. Without proper understanding of AI limitations, students may misuse AI-generated content or accept inaccurate information without verification.

Previous studies have examined different aspects of AI adoption in education, but there is still a need to understand how multiple AI-related factors collectively influence Students' creativity. Therefore, this study aims to address this research gap by examining the impact of Generative AI Usage, Learning Enhancement, Responsible AI Use, AI Dependency, and Ethical AI Use on Students' Creativity.

1.4 Research Aim

The aim of this study is to examine the impact of generative AI-related factors on Students' creativity in higher education.

1.5 Research Objectives

The objectives of this study are:

1. To examine the relationship between Generative AI Usage and Students' creativity.
2. To investigate the influence of Learning Enhancement through generative AI on Students' creativity.
3. To examine the relationship between Responsible AI Use and Students' creativity.
4. To analyze the relationship between AI Dependency and Students' creativity.
5. To evaluate the effect of Ethical AI Use on Students' creativity.
6. To identify the contribution of each AI-related factor in predicting Students' creativity.

1.6 Research Questions

This study attempts to answer the following research questions:

RQ1: Does Generative AI Usage influence Students' creativity?
RQ2: Does Learning Enhancement through generative AI improve Students' creativity?
RQ3: Does Responsible AI Use affect Students' creativity?
RQ4: Does AI Dependency influence Students' creativity?
RQ5: Does Ethical AI Use contribute to Students' creativity?
RQ6: Which AI-related factor has the strongest influence on Students' creativity?

1.7 Research Hypotheses

The following hypotheses are developed based on previous literature:
H1: Generative AI Usage has a significant positive relationship with Students' creativity.
H2: Learning Enhancement through generative AI has a significant positive relationship with Students' creativity.
H3: Responsible AI Use has a significant positive relationship with Students' creativity.
H4: AI Dependency has a significant negative relationship with Students' creativity.
H5: Ethical AI Use has a significant positive relationship with Students' creativity.

1.8 Research Overview

This research follows a systematic approach to investigate the impact of Generative Artificial Intelligence (GenAI) usage on Students' creativity. The study is designed to explore how different aspects of AI usage, including perceived learning effectiveness, AI dependency, responsible AI use, and ethical AI use, influence Students' creative outcomes. The research process begins with identifying the research problem related to the growing adoption of Generative AI tools in educational environments and the uncertainty regarding their effects on Students' creativity.

After identifying the research problem, an extensive literature review is conducted to understand existing theories, previous empirical studies, and research gaps related to Generative AI adoption, learning effectiveness, AI dependency, ethical practices, and creativity development. Based on the findings from the literature review, a conceptual research model is developed, and hypotheses are formulated to examine the relationships among the selected variables.

The study adopts a quantitative research approach, where primary data is collected from students through a structured questionnaire survey. The collected data is then analyzed using statistical techniques, including reliability analysis, descriptive statistics, correlation analysis, and multiple linear regression analysis, to evaluate the proposed relationships and test the research hypotheses.

Finally, the findings obtained from the statistical analysis are interpreted to determine the influence of Generative AI usage and related factors on Students' creativity. The overall research process followed in this study is illustrated in Figure 1.1.

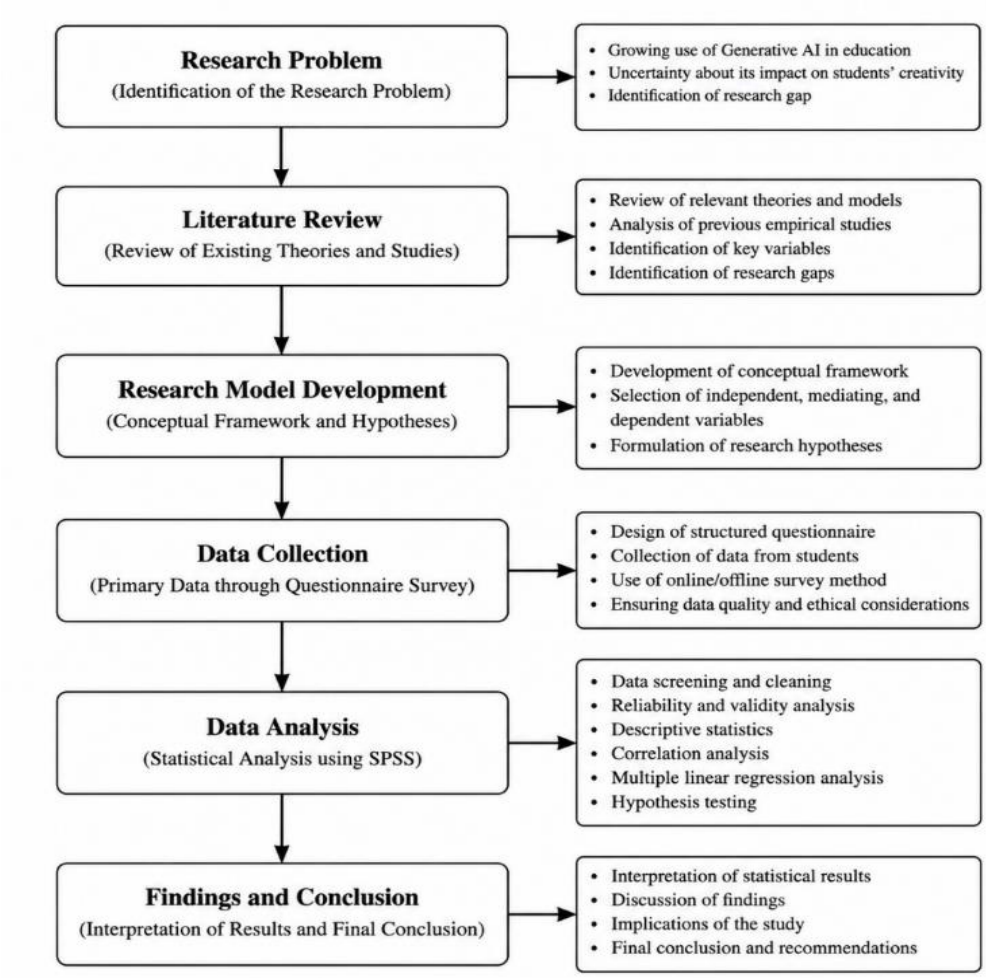


Fig - 1 : Overview of the Research Process

The figure presents the sequential stages of the research, starting from problem identification to the final interpretation of research findings and conclusions. This structured approach ensures that the research objectives are achieved through a systematic and evidence-based investigation.

1.9 Significance of the Study

This study provides a better understanding of how generative AI influences Students' creativity.

For students, the findings may help them understand effective ways of using AI tools while maintaining independent thinking.

For educators, this study may provide insights into how AI can be integrated into learning activities.

For universities, the findings may support the development of guidelines for responsible and ethical AI usage.

For researchers, this study may provide a foundation for future studies related to AI adoption

and creativity.

1.10 Scope of the Study

This study focuses on university students and examines their use of generative AI tools for academic purposes.
The study investigates five independent variables:

- Generative AI Usage
- Learning Enhancement
- Responsible AI Use
- AI Dependency
- Ethical AI Use

and their relationship with Students' Creativity.
A quantitative research approach is used, and data are collected through a structured questionnaire survey.

1.11 Limitations of the Study

This study has several limitations.

First, the research is based on self-reported questionnaire responses, which may be influenced by respondents' personal opinions.

Second, the study focuses on students; therefore, the findings may not represent other groups.

Third, the research uses a cross-sectional design, meaning that it examines relationships between variables at a specific point in time.

Finally, this study considers selected AI-related factors and does not include all possible factors that may influence creativity.

1.12 Operational Definition of Key Terms

Generative Artificial Intelligence (GenAI): AI systems capable of generating new content such as text, images, and code based on user instructions.

Generative AI Usage (GAU): The extent to which students use generative AI tools for academic activities.

Learning Enhancement (LE): The improvement of Students' learning experience through AI-supported assistance.

Responsible AI Use (RAI): The practice of using AI tools carefully, critically, and

appropriately.

AI Dependency (AID): The level of Students' reliance on AI-generated information and assistance.

Ethical AI Use (ETH): The awareness and practice of using AI technologies according to ethical principles.

Creativity (CR): The ability to generate original ideas and develop innovative solutions.

1.13 Organization of the Thesis

This thesis consists of five chapters.

Chapter 1 introduces the research background, problem statement, objectives, research questions, hypotheses, conceptual framework, significance, scope, and limitations.

Chapter 2 presents the literature review related to generative AI, creativity, and the selected research variables. It discusses theories, previous studies, research gaps, and hypothesis development.

Chapter 3 explains the research methodology, including research design, data collection, measurement instruments, and statistical analysis methods.

Chapter 4 presents the research findings obtained from SPSS analysis, including reliability analysis, descriptive statistics, correlation analysis, regression analysis, and hypothesis testing.

Chapter 5 discusses the findings, presents implications, limitations, recommendations, and conclusions of the study.

1.14 Chapter Summary

This chapter introduced the research topic and discussed the importance of understanding the relationship between generative AI and Students' creativity. It presented the research background, problem statement, aim, objectives, questions, hypotheses, conceptual framework, significance, scope, and limitations.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The rapid development of Artificial Intelligence (AI) has significantly transformed the way people interact with technology, particularly in educational environments. In recent years, generative artificial intelligence (GenAI) has gained considerable attention due to its ability to generate human-like text, images, code, and other forms of content. Unlike traditional artificial intelligence systems that mainly perform predefined tasks, generative AI models can create new content based on patterns learned from large-scale datasets [1]. The introduction of advanced generative AI applications such as ChatGPT, Google Gemini, Claude, and other AI-based assistants has created new opportunities for students to enhance learning activities and support creative processes.

Higher education institutions are increasingly adopting AI-based technologies to improve teaching, learning, and academic productivity. Students use generative AI tools for various academic purposes, including information searching, summarizing complex topics, generating ideas, improving writing quality, and assisting with problem-solving activities [2]. These applications have changed the traditional learning process by providing students with immediate access to personalized assistance and diverse sources of knowledge.

Creativity is considered one of the most important skills in modern education because students are expected to develop innovative ideas, solve complex problems, and adapt to rapidly changing environments. Creativity is not only related to artistic activities but also involves critical thinking, originality, idea generation, and the ability to develop effective solutions [3]. As generative AI tools become more integrated into education, researchers have become interested in understanding whether these technologies enhance or limit Students' creativity.

Although generative AI provides significant advantages, its influence on student creativity remains a complex issue. On one hand, AI tools can support creative thinking by providing new perspectives, generating alternative ideas, and reducing the time required for information processing. On the other hand, excessive dependence on AI-generated outputs may reduce Students' independent thinking ability and negatively affect originality [4].

Therefore, understanding the relationship between generative AI usage and student creativity requires examining different factors that influence Students' interaction with AI technologies. This study considers several important dimensions, including Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH), to investigate their impact on Students' creativity.
This chapter reviews the existing literature related to generative artificial intelligence, creativity, and AI-supported learning. It discusses relevant theoretical foundations, previous empirical studies, research gaps, and the development of hypotheses based on existing academic findings. Finally, a conceptual framework is presented to illustrate the relationship between generative AI usage factors and Students' creativity.

2.2 Theoretical Foundation

Theoretical foundations provide the necessary framework for understanding the relationship between generative artificial intelligence usage and Students' creativity. A strong theoretical background helps explain why and how students interact with AI technologies and how these interactions influence their learning behaviors and creative outcomes.

In this study, three major theories are considered to explain the impact of generative AI on Students' creativity: Self-Regulated Learning Theory, Cognitive Offloading Theory, and Human–AI Co-Creation Perspective. These theories explain different aspects of AI-supported learning, including Students' control over learning activities, dependence on technological assistance, and collaboration between human intelligence and artificial intelligence.

2.2.1 Self-Regulated Learning Theory

Self-Regulated Learning (SRL) Theory explains how individuals actively manage their own learning processes through goal setting, strategy selection, monitoring, and self-evaluation. According to Zimmerman, self-regulated learners are not passive recipients of information; rather, they actively participate in controlling their cognitive processes, motivation, and learning behaviors [5].

The theory consists of three main phases: the forethought phase, performance phase, and self-reflection phase. In the forethought phase, learners establish goals and plan their learning strategies. During the performance phase, learners implement strategies and monitor their progress. Finally, in the self-reflection phase, learners evaluate their performance and make improvements for future learning activities [6].

The emergence of generative AI tools has introduced new possibilities for self-regulated learning. AI-based systems can provide personalized explanations, instant feedback, and learning resources according to individual student needs. Students can use AI assistants to understand difficult concepts, generate learning materials, and explore alternative solutions to academic problems.

However, the effectiveness of AI-supported learning depends on Students' ability to regulate their interaction with these technologies. Students with strong self-regulation skills may use AI as a supportive learning partner while maintaining their own critical thinking and decision-making abilities. In contrast, students with poor self-regulation may become overly dependent on AI-generated answers without actively engaging in the learning process [7].

In relation to creativity, self-regulated learning encourages students to explore new ideas, evaluate different perspectives, and improve their creative abilities. When students use generative AI strategically, AI can support idea generation and creative exploration. Therefore, Self-Regulated Learning Theory provides a theoretical explanation for the relationship between Generative AI Usage (GAU), Learning Enhancement (LE), and Student Creativity (CR).

2.2.2 Cognitive Offloading Theory

Cognitive Offloading Theory describes the process through which individuals use external tools or resources to reduce cognitive effort during problem-solving and information processing activities. Humans naturally use external supports such as written notes, calculators, and digital technologies to store information and reduce mental workload [8].

With the development of generative AI, cognitive offloading has become more advanced because AI systems can perform complex cognitive tasks such as summarization, information organization, content generation, and analytical assistance. These capabilities allow students to reduce the time spent on basic information-processing activities and focus more on higher-level cognitive tasks.

From an educational perspective, cognitive offloading through AI can provide several benefits. Students can use AI tools to quickly understand unfamiliar topics, receive explanations, and explore different viewpoints. This additional support may increase learning efficiency and provide more opportunities for creative thinking.

However, cognitive offloading also creates potential challenges. Excessive dependence on AI-generated solutions may reduce Students' engagement in independent reasoning and problem-solving. When students allow AI systems to perform most cognitive tasks, their ability to develop original ideas and critical thinking skills may decrease [9].

Therefore, the impact of cognitive offloading depends on the level of dependence and the way students use AI technologies. When AI functions as a supportive tool, it can enhance creativity; however, when AI replaces human thinking, it may negatively influence creative development.This theory supports the role of AI Dependency (AID) as an important factor affecting Students' creativity in this research.

2.2.3 Human–AI Co-Creation Perspective

The Human–AI Co-Creation perspective considers artificial intelligence as a collaborative partner that works together with humans during creative activities. Unlike traditional views where technology is considered only a passive tool, this perspective emphasizes interaction and cooperation between human intelligence and AI capabilities.
Generative AI systems have the ability to produce ideas, generate alternative solutions, and assist users during creative tasks. However, human users remain responsible for interpreting, evaluating, and improving AI-generated outputs. Creativity emerges from the combination of human imagination, knowledge, experience, and AI-generated suggestions.

Recent research indicates that human–AI collaboration can improve creative performance by expanding the range of possible ideas and supporting creative exploration [10]. For example, students may use AI tools for brainstorming and then apply their own judgment to refine and personalize the generated ideas.

However, successful human–AI collaboration requires responsible and ethical usage. Students

must maintain control over the creative process and avoid simply accepting AI-generated content without evaluation. Responsible interaction ensures that AI supports human creativity rather than replacing it.

This perspective is highly relevant to the present study because it explains how Generative AI Usage (GAU), Responsible AI Use (RAI), and Ethical AI Use (ETH) contribute to Students' creativity.

2.3 Generative Artificial Intelligence in Higher Education

The integration of Artificial Intelligence (AI) into higher education has significantly changed the traditional approaches to teaching, learning, and academic research. In recent years, the emergence of Generative Artificial Intelligence (GenAI) has created new possibilities by enabling systems to generate human-like content, including text, images, programming codes, and educational materials. Unlike conventional AI systems that mainly analyze existing data or perform predefined tasks, generative AI models can produce new outputs based on patterns learned from large-scale datasets [11].

Large Language Models (LLMs), such as ChatGPT, Google Gemini, and Claude, represent one of the most advanced developments in generative AI technology. These systems are trained using massive amounts of textual data and are capable of understanding natural language, answering questions, explaining complex concepts, and assisting users in various intellectual activities [12]. Due to these capabilities, generative AI has rapidly gained attention among universities, educators, and students worldwide.
In higher education, generative AI tools are increasingly being used to support different academic activities. Students use AI-based applications for searching information, summarizing academic materials, improving writing quality, generating research ideas, programming assistance, and solving academic problems [13]. These tools provide immediate responses and personalized support, which can improve Students' learning experiences and academic productivity.

One of the major advantages of generative AI in education is its ability to provide personalized learning support. Traditional educational systems often follow a fixed teaching approach where all students receive similar learning materials and explanations. However, students have different learning abilities, backgrounds, and knowledge levels. Generative AI can address this limitation by providing customized explanations based on individual student requirements [14].

For example, a student struggling with a complex theoretical concept can request an AI system to provide a simpler explanation, practical examples, or step-by-step guidance. This interactive learning process allows students to learn at their own pace and increases accessibility to educational resources.

Furthermore, generative AI can support Students' creative activities by assisting in idea generation and exploration. Creativity often requires the ability to view problems from different perspectives and develop multiple possible solutions. AI tools can provide alternative

ideas, suggest new approaches, and help students overcome creative barriers during brainstorming processes [15].

However, the adoption of generative AI in higher education also introduces several challenges. One major concern is academic integrity. Since AI systems can generate essays, reports, and other academic content, students may misuse these technologies by submitting AI-generated work without proper acknowledgment. This raises concerns regarding plagiarism, originality, and ethical academic practices [16].

Another important concern is overdependence on AI technologies. Although AI can enhance learning efficiency, excessive reliance may reduce Students' independent thinking, problem-solving ability, and creativity. Students may become dependent on AI-generated answers instead of developing their own analytical skills. Therefore, responsible usage and critical evaluation of AI-generated content are essential for maximizing educational benefits.

Ethical considerations are also important in the adoption of generative AI. Issues such as data privacy, bias in AI-generated outputs, transparency, and responsible decision-making need to be addressed to ensure fair and effective AI integration in education [17]. Universities must develop appropriate guidelines and policies to encourage productive AI usage while minimizing potential risks.

Overall, generative AI represents both an opportunity and a challenge for higher education. When used appropriately, it can enhance learning experiences, improve academic productivity, and support creativity. However, the educational impact of AI depends largely on how students interact with these technologies. Therefore, examining factors such as AI usage behavior, learning enhancement, responsible AI use, AI dependency, and ethical AI practices is necessary to understand the relationship between generative AI and student creativity.

2.4 Generative AI Usage (GAU)

Generative AI Usage (GAU) refers to the extent to which individuals interact with generative artificial intelligence tools for different purposes, including information searching, learning support, content generation, problem-solving, and creative activities. With the rapid development of large language models, students are increasingly using generative AI applications as academic assistants to support their educational activities [13].

Unlike traditional digital resources, generative AI provides interactive communication between users and technology. Students can ask questions, request explanations, generate examples, and receive customized responses according to their specific needs. This interactive capability has changed the way students access and process information in higher education environments [18].

In academic settings, students commonly use generative AI tools for several purposes. These include understanding difficult topics, summarizing articles, improving writing quality, generating assignment ideas, assisting with programming tasks, and preparing academic presentations. The flexibility of these tools allows students to obtain immediate assistance and

explore information beyond traditional learning resources [19].

The increasing use of generative AI among students can be explained through the concept of technology acceptance. According to the Technology Acceptance Model (TAM), individuals are more likely to adopt a technology when they perceive it as useful and easy to use [20]. Since generative AI tools provide fast responses and reduce the effort required for completing academic tasks, many students perceive them as valuable learning resources.

However, the effectiveness of generative AI usage does not depend only on the frequency of use. The purpose and manner of usage are important factors that determine the outcomes of AI adoption. Students who use AI tools for exploration, learning support, and idea development may experience greater benefits compared to students who use AI only for obtaining direct answers.

From a creativity perspective, generative AI usage may provide students with additional opportunities for idea generation. Creativity often involves combining existing knowledge in new ways, and AI systems can support this process by providing alternative perspectives and suggestions. When students interact actively with AI-generated content, they may develop more diverse ideas and improve creative problem-solving abilities [15].

For example, a student working on a research project may use generative AI to identify possible research directions, generate initial ideas, or explore different solutions. However, the final creative outcome depends on the Students' ability to evaluate, modify, and personalize AI-generated suggestions.

Previous studies have shown that AI-assisted creativity is more effective when humans maintain an active role in the creative process. AI can expand the range of possible ideas, but human judgment, experience, and critical thinking remain essential components of creativity [21].

Despite these benefits, excessive or inappropriate AI usage may create challenges. Students who depend completely on AI-generated outputs may reduce their engagement in independent thinking and problem-solving. Therefore, the relationship between generative AI usage and creativity depends on whether AI is used as a supportive tool or as a replacement for human cognitive effort.

In the context of this study, Generative AI Usage represents Students' interaction with AI technologies for academic and creative purposes. It is expected that effective use of generative AI can positively contribute to Students' creativity by supporting idea generation, knowledge exploration, and creative problem-solving.

Based on the above discussion, the following hypothesis is proposed:
H1: Generative AI Usage has a significant positive relationship with Students' creativity.

2.5 Students' Creativity

Creativity is considered one of the most important abilities required in modern education because students are expected to generate innovative ideas, solve complex problems, and develop effective solutions in uncertain environments. Although creativity is often associated with artistic activities, in academic contexts it represents a broader cognitive ability involving originality, critical thinking, idea generation, and the ability to create valuable outcomes from existing knowledge [22].

According to Guilford, creativity involves divergent thinking, where individuals generate multiple possible solutions instead of focusing on a single answer [23]. This ability allows students to explore different perspectives, identify new possibilities, and approach problems from innovative viewpoints. In higher education, creativity is particularly important because students are required to conduct research, analyze information, and develop solutions to real-world challenges.

Creativity is commonly described through two major dimensions: originality and usefulness. Originality refers to the uniqueness or novelty of an idea, while usefulness refers to the practical value and effectiveness of that idea [24]. A creative outcome should not only be different from existing solutions but should also provide meaningful value.
In educational environments, creativity is closely connected with learning processes. Students develop creativity when they actively engage with knowledge, evaluate different perspectives, and apply information in new ways. Learning environments that encourage exploration, experimentation, and independent thinking are more likely to promote creative development [25].

The emergence of digital technologies and artificial intelligence has introduced new opportunities for supporting creativity. Generative AI tools can assist students by providing suggestions, expanding idea possibilities, and helping them overcome creative barriers. Instead of replacing human creativity, AI can function as a collaborative tool that supports the creative process [21].

However, creativity remains fundamentally a human ability that depends on imagination, experience, emotions, and contextual understanding. Although AI systems can generate multiple ideas quickly, humans are responsible for evaluating, selecting, and transforming these ideas into meaningful creative outcomes. Therefore, the relationship between AI and creativity should be understood as collaboration rather than replacement.

In higher education, student creativity is influenced by several factors, including knowledge development, learning motivation, technological interaction, and problem-solving ability. The use of generative AI may enhance creativity by providing students with additional resources and alternative perspectives. However, the actual impact depends on how students interact with AI technologies.

Students who actively engage with AI-generated information, critically evaluate suggestions, and combine AI assistance with their own knowledge may experience greater creative benefits.

In contrast, students who rely passively on AI-generated content may have fewer opportunities to develop independent creative abilities.

Therefore, in this study, student creativity is considered the dependent variable that represents Students' ability to generate new ideas, develop innovative solutions, and approach academic problems creatively. The study investigates how different dimensions of generative AI usage influence Students' creativity.

2.6 Relationship between Generative AI Usage and Creativity

The relationship between Generative AI Usage (GAU) and creativity has become an important area of research due to the increasing adoption of artificial intelligence tools in educational and professional environments. Generative AI systems have the ability to produce ideas, provide suggestions, and assist users in exploring different possibilities, which may influence individuals' creative thinking processes.

Creativity requires the ability to generate original ideas, combine existing knowledge in new ways, and develop innovative solutions. Generative AI can support these activities by providing users with additional information, alternative perspectives, and creative suggestions. Instead of starting the creative process from an empty space, students can use AI-generated outputs as a foundation for further exploration and improvement [21].
Previous studies suggest that AI-assisted creativity can increase the number and diversity of ideas generated by individuals. When students interact with generative AI tools, they may receive multiple suggestions that encourage them to think beyond their initial ideas. This process can improve divergent thinking, which is considered an important component of creativity [23].

For example, students working on academic projects may use generative AI to brainstorm possible topics, develop research ideas, organize information, or explore alternative solutions. Through this interaction, AI can act as a creative partner that supports students during different stages of the creative process.

The Human–AI Co-Creation perspective explains that creativity can be enhanced when humans and AI collaborate effectively. AI systems can provide computational capabilities and generate possible solutions, while humans contribute contextual understanding, emotional intelligence, critical evaluation, and final decision-making [10]. Therefore, the creative outcome depends not only on AI capabilities but also on how users engage with AI-generated content.

However, the relationship between generative AI usage and creativity is not always straightforward. Some researchers argue that excessive reliance on AI-generated outputs may reduce originality and independent thinking. When students accept AI responses without evaluation or modification, they may become passive users rather than active creators. Therefore, the quality of interaction with AI is more important than the frequency of AI usage alone [4].

Responsible interaction with AI is necessary to achieve creative benefits. Students who critically evaluate AI-generated ideas, combine them with their own knowledge, and modify outputs according to their requirements are more likely to experience positive creative outcomes. In contrast, students who use AI only for completing tasks quickly may not develop stronger creative abilities.

Furthermore, generative AI can reduce cognitive barriers during creative activities. According to Cognitive Offloading Theory, external tools can reduce mental workload and allow individuals to focus on higher-level thinking processes [8]. By handling routine information-processing tasks, AI may provide students with more cognitive resources for analysis, evaluation, and innovation.

Empirical studies have also highlighted the potential of generative AI to improve creative performance. Research conducted by Doshi and Hauser found that generative AI assistance can enhance human creativity by increasing idea generation and supporting creative exploration [21]. Similarly, studies on human–AI collaboration suggest that AI can improve creative outcomes when users maintain active involvement in the creative process [10].
Therefore, generative AI usage can positively influence Students' creativity when AI tools are used as supportive resources rather than replacements for human thinking. The benefits of AI depend on Students' ability to interact with AI effectively, critically evaluate information, and transform AI-generated suggestions into original ideas.

Based on the above discussion, the following hypothesis is proposed:
H1: Generative AI Usage has a significant positive relationship with Students' creativity.

2.7 Learning Enhancement and Creativity

Learning Enhancement (LE) refers to the extent to which generative AI improves Students' learning experiences, knowledge acquisition, understanding, and academic performance. In higher education, learning enhancement is an important outcome because students require effective learning strategies to understand complex concepts and develop higher-order thinking abilities.

Generative AI has introduced new possibilities for improving student learning by providing personalized explanations, instant feedback, and adaptive learning support. Unlike traditional learning resources, AI-based systems can interact with students according to their individual requirements. Students can ask follow-up questions, request examples, and receive explanations at different levels of complexity [13].

Personalized learning is one of the major advantages of generative AI. Traditional classroom environments often provide the same learning materials to all students despite differences in knowledge level and learning speed. Generative AI can overcome this limitation by providing customized assistance based on individual student needs [14].
Learning enhancement through AI can also contribute to creativity development. Creativity is strongly associated with knowledge, because individuals require sufficient understanding of a subject area to generate meaningful and innovative ideas. When AI improves Students'

understanding and provides access to diverse information sources, students may develop stronger foundations for creative thinking.

According to Self-Regulated Learning Theory, students who actively manage their learning process can use external resources effectively to improve knowledge development [5]. Generative AI can function as a learning assistant that supports students during different stages of learning, including information gathering, concept explanation, and idea exploration.

Several studies have highlighted the positive influence of AI-supported learning on student outcomes. AI-based learning environments can increase engagement, encourage exploration, and support deeper understanding when students actively participate in the learning process [18]. Recent systematic reviews also suggest that GenAI can enhance student learning outcomes when proper pedagogical guidance and verification practices are applied.

However, learning enhancement does not occur automatically through AI usage. Students must critically evaluate AI-generated information and combine AI assistance with their own reasoning abilities. Without active involvement, AI may become only a shortcut for completing academic tasks rather than a tool for meaningful learning.
Therefore, this study considers Learning Enhancement as an important factor that may positively influence Students' creativity. When generative AI improves knowledge development and learning efficiency, students may have greater ability to generate innovative ideas.

Based on the above discussion, the following hypothesis is proposed:
H2: Learning Enhancement through generative AI has a significant positive relationship with Students' creativity.

2.8 Responsible AI Use and Creativity

Responsible AI Use (RAI) refers to the practice of using artificial intelligence technologies in a careful, ethical, and appropriate manner while maintaining human control and critical evaluation. Responsible AI usage includes verifying AI-generated information, understanding AI limitations, avoiding misuse, and applying personal judgment before accepting AI outputs.

The rapid adoption of generative AI in education has created opportunities as well as challenges. While AI tools can support learning and creativity, irresponsible usage may lead to misinformation, reduced critical thinking, and academic integrity problems [16].
Responsible AI use is particularly important because generative AI systems may produce inaccurate information, biased responses, or misleading explanations. Therefore, students need AI literacy and critical evaluation skills to determine the reliability of AI-generated content [17].

From a creativity perspective, responsible AI usage allows students to maintain ownership of their ideas. Instead of directly copying AI-generated responses, responsible users analyze, modify, and improve AI suggestions according to their own understanding. This process transforms AI from a simple answer-generation tool into a creative support system.

The Human–AI Co-Creation perspective suggests that creativity improves when humans actively collaborate with AI technologies. AI can provide possible solutions and ideas, while humans contribute contextual knowledge, evaluation, and originality [10].
Recent research on responsible GenAI adoption in higher education emphasizes that ethical guidelines, human oversight, transparency, and AI literacy are essential for achieving educational benefits while reducing risks.

Therefore, responsible AI usage is expected to positively influence Students' creativity because it encourages active engagement, critical thinking, and meaningful collaboration with AI systems.

Based on this discussion:
H3: Responsible AI Use has a significant positive relationship with Students' creativity.

2.9 AI Dependency and Creativity

AI Dependency (AID) refers to the extent to which students rely on generative AI tools for completing academic tasks, solving problems, and generating ideas. As AI technologies become more accessible, students may increasingly depend on these systems for academic assistance.

The relationship between AI dependency and creativity is complex. From a negative perspective, excessive dependency may reduce Students' independent thinking ability. Creativity requires active cognitive involvement, exploration, and personal interpretation. If students rely completely on AI-generated solutions, they may lose opportunities to develop their own creative abilities.

Cognitive Offloading Theory explains that individuals use external tools to reduce mental effort during cognitive activities [8]. Although cognitive offloading can improve efficiency, excessive dependence may reduce cognitive engagement and limit skill development.

However, AI dependency may also have positive aspects. Students who frequently interact with AI tools may use them as creative assistants for brainstorming, idea generation, and knowledge exploration. In such cases, dependency may represent active engagement rather than passive reliance.

Recent studies indicate that the impact of GenAI depends on how learners interact with AI systems. AI provides greater benefits when integrated with appropriate learning strategies, critical thinking, and instructional guidance rather than used only as a shortcut.
Therefore, the effect of AI dependency on creativity depends on whether students use AI as a replacement for thinking or as a support mechanism for creative exploration.
This study examines AI Dependency to understand whether reliance on AI tools influences Students' creative outcomes.

Based on previous discussion:

H4: AI Dependency has a significant negative relationship with Students' creativity.

2.10 Ethical AI Use and Creativity

Ethical AI Use (ETH) refers to Students' awareness and practice of using artificial intelligence according to ethical principles, including academic honesty, transparency, fairness, and responsible decision-making.

The increasing use of generative AI has raised several ethical concerns in higher education. These concerns include plagiarism, authorship issues, privacy risks, misinformation, and inappropriate dependence on AI-generated content [16].
Ethical AI use is important because creativity requires originality and personal contribution. Students who use AI ethically are more likely to treat AI-generated outputs as supporting materials rather than final answers. They can evaluate suggestions, add personal insights, and create original outcomes.

Ethical awareness also encourages students to understand the limitations of AI systems. Since AI-generated responses may contain errors or biases, ethical users are more likely to verify information and apply critical thinking.

Previous research emphasizes that responsible and ethical AI integration requires institutional guidelines, AI literacy, and human-centered approaches.
In creative activities, ethical AI use allows students to benefit from technological assistance while maintaining their intellectual ownership. Therefore, ethical AI practices may contribute positively to creativity.

Based on this discussion:
H5: Ethical AI Use has a significant positive relationship with Students' creativity.

2.11 Review of Previous Empirical Studies

Previous empirical studies have investigated the influence of artificial intelligence on education, learning outcomes, creativity, and student behavior.

Kasneci et al. [13] explored the opportunities and challenges of large language models in education. Their study highlighted that ChatGPT-like systems can support personalized learning, but effective implementation requires responsible usage.

Lo [18] reviewed the educational impact of ChatGPT and found that AI tools provide benefits in learning assistance, information access, and academic support. However, concerns regarding reliability and ethical use remain important.

Dwivedi et al. [19] examined the broader implications of generative conversational AI and emphasized that AI adoption requires balancing technological opportunities with ethical

considerations.

Dellermann et al. [10] introduced the concept of hybrid intelligence and suggested that human–AI collaboration can produce better outcomes than either humans or machines working independently.

Doshi and Hauser [21] investigated generative AI and creativity, suggesting that AI assistance can improve creative performance by increasing idea generation and exploration.

Research on AI-supported learning also indicates that GenAI can improve creativity when students actively engage with AI tools rather than passively consume generated content.
Overall, previous studies demonstrate that generative AI has significant potential to enhance learning and creativity. However, outcomes depend on several factors, including usage behavior, responsible practices, dependency level, and ethical awareness.

2.12 Research Gap

Although previous studies have explored generative AI in education, several research gaps remain.

First, many existing studies focus on the general benefits and challenges of AI adoption. Limited studies examine multiple dimensions of AI interaction simultaneously.

Second, previous research often treats AI usage as a single variable. However, Students' interaction with AI includes different aspects such as learning enhancement, responsible usage, dependency, and ethical behavior.

Third, while researchers acknowledge that AI can support creativity, the relationship between AI dependency and creativity remains unclear. Some studies suggest negative effects due to overdependence, while others indicate that AI assistance can improve creative performance.

Finally, limited empirical research has examined these relationships among university students using quantitative methods.

Therefore, this study addresses these gaps by developing a research model that examines how different dimensions of generative AI usage influence Students' creativity.

2.13 Development of Hypotheses

Based on theoretical foundations and previous empirical findings, five hypotheses are developed:

H1: Generative AI Usage has a significant positive relationship with Students' creativity.
H2: Learning Enhancement through generative AI has a significant positive relationship with Students' creativity.
H3: Responsible AI Use has a significant positive relationship with Students' creativity.

H4: AI Dependency has a significant negative relationship with Students' creativity.
H5: Ethical AI Use has a significant positive relationship with Students' creativity.

2.14 Conceptual Framework

Based on the reviewed literature, this study proposes a conceptual framework to examine the influence of generative AI-related factors on Students' creativity.

Independent Variables:

- Generative AI Usage (GAU)
- Learning Enhancement (LE)
- Responsible AI Use (RAI)
- AI Dependency (AID)
- Ethical AI Use (ETH)

Dependent Variable:

- Student Creativity (CR)

Based on the theoretical foundations and findings from previous studies, this research proposes a conceptual framework to examine the relationship between Generative AI usage and Students' creativity. The framework identifies Generative AI usage as the primary influencing factor and incorporates several AI-related factors, including perceived learning effectiveness, AI dependency, responsible AI use, and ethical AI use, to understand their effects on Students' creative outcomes.

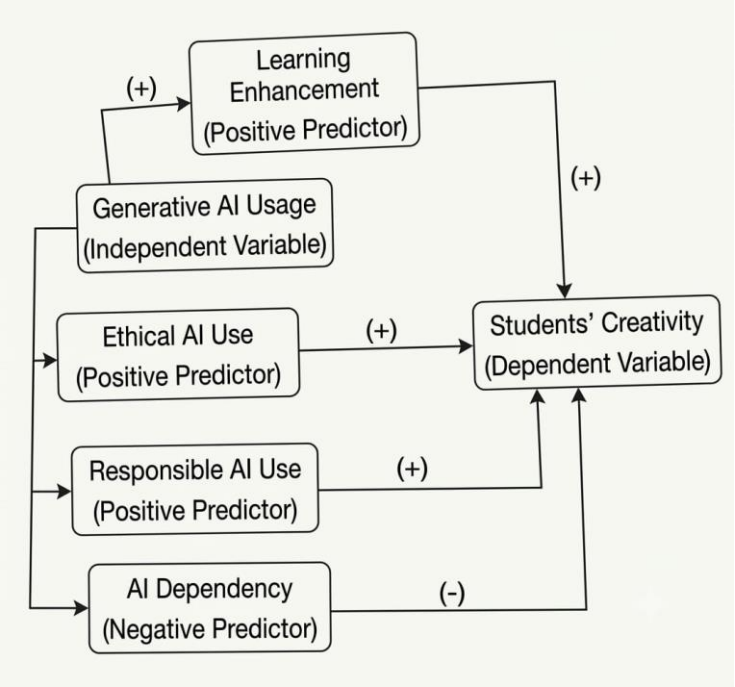


Fig - 2 : Conceptual Framework

The conceptual framework illustrates the proposed relationships among the research variables. In this model, Generative AI Usage is considered the independent variable, while Students' Creativity is considered the dependent variable. The framework suggests that Generative AI usage may directly contribute to Students' creativity by supporting idea generation, knowledge exploration, and problem-solving activities.

Furthermore, Perceived Learning Effectiveness is included as a positive predictor, indicating that effective use of AI tools can improve Students' learning experiences and enhance their creative abilities. On the other hand, AI Dependency is considered a negative predictor because excessive reliance on AI-generated solutions may reduce independent thinking and creative problem-solving skills.

Additionally, Responsible AI Use and Ethical AI Use are considered positive predictors of Students' creativity. Responsible and ethical interaction with AI tools can encourage critical thinking, originality, and appropriate utilization of AI-generated information. Therefore, the proposed framework provides a comprehensive understanding of how different dimensions of Generative AI usage influence Students' creativity.

2.15 Chapter Summary

This chapter reviewed the existing literature related to generative artificial intelligence and Students' creativity. The chapter discussed three theoretical foundations: Self-Regulated Learning Theory, Cognitive Offloading Theory, and Human–AI Co-Creation Perspective.

The chapter also examined the role of generative AI in higher education and discussed the relationships between Generative AI Usage, Learning Enhancement, Responsible AI Use, AI Dependency, Ethical AI Use, and Creativity.

Previous empirical studies indicate that AI can provide significant educational benefits when used appropriately. However, responsible usage, ethical awareness, and active human involvement are necessary to achieve positive outcomes.

Based on the literature review, five hypotheses were developed, and a conceptual framework was proposed to examine the influence of generative AI-related factors on Students' creativity.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology used in this study. The methodology provides a systematic approach for collecting, analyzing, and interpreting data to answer the research questions and test the proposed hypotheses.

This study investigates the relationship between generative AI-related factors and Students' creativity. To achieve this objective, a quantitative research approach was adopted. Data were collected through a structured questionnaire survey, and statistical analysis was performed using IBM SPSS Statistics.

This chapter discusses the research design, research approach, population, sample selection, data collection procedure, research instrument, measurement scales, variable operationalization, and data analysis techniques used in the study.

3.2 Research Design

Research design refers to the overall plan and structure used to conduct a research study. It determines how data will be collected, measured, and analyzed to answer research questions effectively.

This study follows a quantitative research design because the research aims to measure relationships among different variables using numerical data. The study examines how Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH) influence Students' Creativity (CR).
A survey-based research design was selected because it allows data to be collected from a large number of respondents in an efficient manner. The collected responses were analyzed statistically to identify patterns, relationships, and predictive effects among the research variables.

This study follows a quantitative research design to investigate the relationship between Generative AI usage and Students' creativity. The research design provides a structured approach for data collection, measurement of variables, and statistical analysis to evaluate the proposed hypotheses.

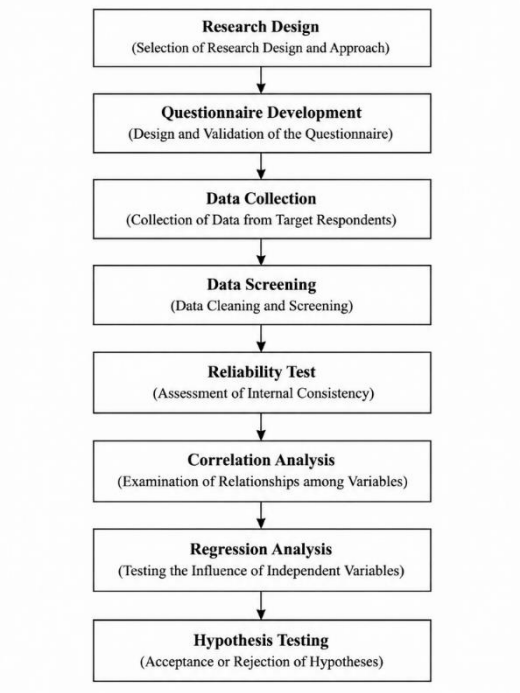


Fig – 3: Research Methodology Framework

Fig.3 presents the overall methodological framework followed in this study. The research process begins with the development of the research design and questionnaire, followed by data collection from respondents. After collecting the data, screening and reliability analysis are conducted to ensure data quality. Finally, correlation and multiple regression analyses are performed to examine the relationships among the research variables and test the proposed hypotheses.

3.3 Research Approach

This study follows a quantitative research approach. Quantitative research focuses on collecting numerical data and analyzing relationships between variables through statistical methods.

The quantitative approach is appropriate for this research because the study aims to examine the influence of multiple independent variables on a dependent variable. Specifically, this study evaluates whether AI-related factors significantly predict Students' creativity.

A structured questionnaire was used to collect responses from participants. The collected data were analyzed using statistical techniques, including reliability analysis, descriptive statistics, correlation analysis, and multiple linear regression analysis.

3.4 Research Philosophy

Research philosophy refers to the assumptions and beliefs that guide the research process. This study follows a positivist research philosophy.

The positivist approach assumes that research phenomena can be measured objectively through systematic observation and statistical analysis. Since this study examines measurable relationships between AI-related factors and creativity using numerical data, the positivist philosophy is considered appropriate.

Through this approach, the study attempts to identify statistically significant relationships between the independent variables and Students' creativity.

3.5 Population of the Study

The population of this study consists of students who use or have experience with generative AI tools for academic purposes.

University students were selected as the target population because they represent one of the major user groups of generative AI technologies. Students increasingly use AI tools for learning support, information searching, idea generation, and academic assistance.
The study focuses on understanding how Students' interaction with generative AI influences their creative abilities.

3.6 Sample Size and Sampling Technique

A total of 205 valid responses were collected and used for data analysis.
The study applied a non-probability sampling technique, specifically convenience sampling, to collect data from university students. This method was selected because it allows researchers to collect responses from participants who are easily accessible and have experience with generative AI tools.

The collected sample size was considered adequate for conducting statistical analyses, including correlation and multiple regression analysis.

3.7 Data Collection Procedure

Data were collected through a structured online questionnaire. The questionnaire was distributed among students who had experience using generative AI tools.

Before participation, respondents were informed about the purpose of the study. Participation was voluntary, and respondents were assured that their information would be used only for academic research purposes.

After collecting responses, the data were reviewed, cleaned, and prepared for statistical

analysis using IBM SPSS Statistics.

3.8 Research Instrument

A structured questionnaire was used as the research instrument for data collection.
The questionnaire consisted of two main sections:

Section A: Demographic Information
This section collected information about respondents' background characteristics, including:

- Gender
- Age
- Academic level
- Department

Section B: Research Variables

This section measured the six main constructs of the study:

- Generative AI Usage (GAU)
- Learning Enhancement (LE)
- Responsible AI Use (RAI)
- AI Dependency (AID)
- Ethical AI Use (ETH)
- Creativity (CR)

The questionnaire items were adapted from previous studies and modified according to the context of generative AI usage among university students.

3.9 Questionnaire Design

The questionnaire for this study was developed based on the research objectives, conceptual framework, and previously validated measurement scales from existing literature. The design process focused on ensuring that all questionnaire items were relevant to the research variables and understandable to the target respondents.

The questionnaire consisted of multiple sections, including demographic information and measurement items related to the key research constructs: Generative AI Usage (GAU), Learning Effectiveness (LE), Responsible AI Use (RAI), AI Dependency (AID), Ethical AI Use (ETH), and Students' Creativity (CR).

Each construct was measured using multiple statements to improve the reliability and accuracy of the measurement. A five-point Likert scale was used to collect respondents' opinions, where

participants indicated their level of agreement with each statement ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The statements were carefully designed using clear and simple language to minimize ambiguity and ensure that respondents could easily understand the meaning of each item. The questionnaire structure allowed systematic collection of quantitative data required for reliability analysis, correlation analysis, and multiple linear regression analysis.

3.10 Measurement Scale

A five-point Likert scale was used to measure respondents' opinions regarding each statement.

The scale was:

Scale	Response
1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

The Likert scale method was selected because it is widely used in social science research to measure attitudes, perceptions, and behavioral intentions.

3.11 Operationalization of Variables

Operationalization refers to the process of defining how abstract concepts are measured in a research study. In this study, the research variables were operationalized based on previous literature and adapted according to the context of generative AI usage among university students.The study consists of five independent variables and one dependent variable.

3.11.1 Generative AI Usage (GAU)

Generative AI Usage refers to the extent to which students use generative AI tools for academic and creative purposes. This variable measures Students' interaction with AI tools for activities such as information searching, idea generation, writing assistance, and problem-solving.GAU was measured using multiple questionnaire items based on Students' frequency and purpose of using generative AI tools.

3.11.2 Learning Enhancement (LE)

Learning Enhancement refers to the extent to which generative AI improves Students' learning experiences. This construct measures whether AI tools help students understand concepts, improve knowledge, receive explanations, and support academic activities.
The variable evaluates the educational benefits students receive from using generative AI as a

learning assistant.

3.11.3 Responsible AI Use (RAI)

Responsible AI Use refers to Students' ability to use generative AI tools carefully and appropriately. This includes evaluating AI-generated information, maintaining critical thinking, and using AI without replacing personal effort.
This variable measures Students' awareness and responsible behavior when interacting with AI technologies.

3.11.4 AI Dependency (AID)

AI Dependency refers to the extent to which students rely on generative AI tools for completing academic tasks and generating ideas.
This construct measures whether students depend on AI assistance during learning activities and problem-solving processes.

3.11.5 Ethical AI Use (ETH)

Ethical AI Use refers to Students' awareness and practice of using generative AI according to ethical principles. It includes academic honesty, appropriate usage, and responsible handling of AI-generated information.
This variable evaluates Students' ethical attitudes toward AI usage.

3.11.6 Creativity (CR)

Creativity refers to Students' ability to generate original ideas, develop innovative solutions, and approach problems from different perspectives.
In this study, creativity is considered the dependent variable that may be influenced by different aspects of generative AI usage.

3.12 Data Analysis Procedure

The collected data were analyzed using IBM SPSS Statistics. Several statistical techniques were applied to evaluate the reliability of measurement items, examine relationships between variables, and test the proposed hypotheses.
The following analyses were conducted:

3.12.1 Reliability Analysis

Reliability analysis was performed to evaluate the internal consistency of the measurement items used for each construct.

Cronbach's Alpha coefficient was used to determine the reliability of each variable. A

Cronbach's Alpha value above 0.70 is generally considered acceptable, indicating that the items consistently measure the same construct.
The reliability analysis was conducted for:

- Generative AI Usage (GAU)
- Learning Enhancement (LE)
- Responsible AI Use (RAI)
- AI Dependency (AID)
- Ethical AI Use (ETH)
- Creativity (CR)

3.12.2 Descriptive Statistics

Descriptive statistics were used to summarize the characteristics of the collected data.
The analysis included:

- Mean
- Standard deviation
- Frequency distribution

This analysis helped to understand the general response patterns of participants and the overall perception of students regarding generative AI usage and creativity.

3.12.3 Pearson Correlation Analysis

Pearson correlation analysis was conducted to examine the strength and direction of relationships between independent variables and the dependent variable.
The correlation analysis was used to determine whether significant relationships exist between:

- Generative AI Usage and Creativity
- Learning Enhancement and Creativity
- Responsible AI Use and Creativity
- AI Dependency and Creativity
- Ethical AI Use and Creativity

The correlation coefficient (r) indicates the strength and direction of the relationship between variables.

3.12.4 Multiple Linear Regression Analysis

Multiple linear regression analysis was performed to examine the predictive influence of independent variables on Students' creativity.
The regression model used:

Creativity (CR) = $\beta_0 + \beta_1(GAU) + \beta_2(LE) + \beta_3(RAI) + \beta_4(AID) + \beta_5(ETH) + \varepsilon$
Where:

- CR = Students' Creativity
- GAU = Generative AI Usage
- LE = Learning Enhancement
- RAI = Responsible AI Use
- AID = AI Dependency
- ETH = Ethical AI Use
- β = Regression coefficient
- ε = Error term

The regression analysis examined:

- Model significance
- Explained variance (R^2)
- Individual contribution of each predictor variable

3.12.5 Hypothesis Testing

Hypothesis testing was conducted based on the results of regression analysis.
The significance level was set at **$p < 0.05$**.
A hypothesis was considered supported when the relationship between variables was statistically significant and the direction of the relationship matched the proposed hypothesis.
The hypotheses tested were:

- H1: GAU → Creativity
- H2: LE → Creativity
- H3: RAI → Creativity
- H4: AID → Creativity
- H5: ETH → Creativity

3.13 Ethical Considerations

Ethical considerations were maintained throughout the research process.
Participation in the study was voluntary, and respondents were informed about the purpose of the research before providing their responses. The collected information was used only for academic purposes.

The privacy and confidentiality of participants were maintained throughout the study. No personal information that could identify individual respondents was disclosed.
The research also followed ethical practices in data collection, analysis, and reporting to ensure accurate and responsible presentation of findings.

3.14 Chapter Summary

This chapter presented the methodology used in this study. It discussed the research design, research approach, population, sample selection, data collection procedure, research instrument, measurement scale, and operationalization of variables.
The chapter also explained the statistical methods used for data analysis, including reliability analysis, descriptive statistics, Pearson correlation analysis, multiple linear regression analysis, and hypothesis testing.
The next chapter presents the results and findings obtained from the statistical analysis of collected data.

CHAPTER 4
RESULTS AND FINDINGS

4.1 Introduction

This chapter presents the results obtained from the statistical analysis of the collected data. The purpose of this chapter is to analyze the relationship between generative AI-related factors and Students' creativity based on the proposed research model.

The collected data were analyzed using IBM SPSS Statistics. The analysis includes respondent demographics, reliability analysis, descriptive statistics, Pearson correlation analysis, multiple linear regression analysis, and hypothesis testing.

The dependent variable of this study is Students' Creativity (CR), while the independent variables are Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH).

4.2 Response Rate

A total of 205 valid responses were collected and used for the final analysis.
All collected responses were examined before statistical analysis to ensure data completeness and suitability. The final dataset contained no missing responses that affected the analysis, and therefore all 205 responses were included in subsequent statistical procedures.

4.3 Demographic Characteristics of Respondents

The demographic characteristics of respondents were analyzed to understand the background information of participants involved in this study.
The demographic analysis includes gender, age, academic level, and department distribution.

4.3.1 Gender Distribution

The gender distribution of respondents is presented in Table 4.1.

Gender	Frequency	Percentage (%)
Male	98	47.8
Female	90	43.9
Prefer not to say	17	8.3
Total	205	100

Table 4.1: Gender Distribution of Respondents

The results indicate that male respondents represented the largest group with 98 participants (47.8%), followed by female respondents with 90 participants (43.9%). A small number of respondents preferred not to disclose their gender.

4.3.2 Age Distribution

Age Group	Frequency	Percentage (%)
Below 18	4	2
18–20	4	2
21–23	83	40.5
24–26	105	51.2
Above 27	9	4.4

Table 4.2: Age Distribution of Respondents

The majority of respondents were between 24 and 26 years old, representing 51.2% of the total sample. The second largest group consisted of respondents aged 21–23 years (40.5%).

4.3.3 Academic Level

Academic Level	Frequency	Percentage (%)
Undergraduate	179	88.6
Master's	10	5
Other	13	6.5

Table 4.3: Academic Level of Respondents

The results show that undergraduate students formed the majority of participants (88.6%). This indicates that the study mainly represents the perceptions of undergraduate students regarding generative AI usage.

4.3.4 Department Distribution

Department	Frequency	Percentage (%)
CSE	118	57.6
EEE	22	10.7
BBA	15	7.3
LLB	13	6.3
Others	13	6.4

Table 4.4: Department Distribution of Respondents

The largest proportion of respondents came from the Computer Science and Engineering (CSE) department. This indicates that students from technology-related backgrounds represented a significant portion of the sample.

4.4 Reliability Analysis

Reliability analysis was conducted to evaluate the internal consistency of the measurement items used in this study. Cronbach's Alpha coefficient was used to determine the reliability of each construct.

A Cronbach's Alpha value above 0.70 is considered acceptable, indicating that the measurement items have sufficient internal consistency. The reliability results for all variables are presented in Table 4.5.

Construct	Number of Items	Cronbach's Alpha	Reliability Level
Generative AI Usage (GAU)	4	0.900	Excellent
Learning Enhancement (LE)	4	0.904	Excellent
Responsible AI Use (RAI)	4	0.802	Good
Creativity (CR)	5	0.834	Good
AI Dependency (AID)	6	0.937	Excellent
Ethical AI Use (ETH)	4	0.941	Excellent

Table 4.5: Reliability Analysis of Research Variables

The results indicate that all constructs achieved Cronbach's Alpha values above the recommended threshold of 0.70. The values ranged from 0.802 to 0.941, indicating good to excellent internal consistency among the measurement items.

Ethical AI Use (ETH) showed the highest reliability value with Cronbach's Alpha of 0.941, followed by AI Dependency (AID) with 0.937. Learning Enhancement (LE) and Generative AI Usage (GAU) also demonstrated excellent reliability, with values of 0.904 and 0.900 respectively.
Therefore, all measurement scales were considered reliable and suitable for further statistical analysis.

4.5 Descriptive Statistics of Variables

Descriptive statistics were conducted to summarize the overall responses of participants regarding the research variables. The analysis included the mean and standard deviation values of each construct.
The mean value represents the average response level of participants, while the standard deviation indicates the variation in responses.

Variable	N	Mean	Standard Deviation
Generative AI Usage (GAU)	205	3.779	0.779
Learning Enhancement (LE)	205	3.731	0.775
Responsible AI Use (RAI)	205	3.606	0.681
Creativity (CR)	205	3.533	0.684
AI Dependency (AID)	205	2.724	0.935
Ethical AI Use (ETH)	205	4.177	0.911

Table 4.6: Descriptive Statistics of Research Variables

The descriptive statistics show that Ethical AI Use (ETH) obtained the highest mean score (Mean = 4.177), indicating that respondents generally demonstrated positive attitudes toward ethical AI practices.

Generative AI Usage (GAU) also showed a relatively high mean score (Mean = 3.779), suggesting that students actively use generative AI tools for academic purposes.
AI Dependency (AID) recorded the lowest mean score (Mean = 2.724), indicating that respondents generally did not show strong dependency on AI tools.

Overall, the results suggest that respondents had positive perceptions regarding the usefulness and responsible use of generative AI technologies.

4.6 Pearson Correlation Analysis

Pearson correlation analysis was performed to examine the relationships between the independent variables and Students' creativity.
The correlation coefficient (r) indicates the strength and direction of the relationship between variables. The significance level was considered at $p < 0.01$.

Relationship	Correlation (r)	Significance
GAU and Creativity	0.602	$p < 0.001$
LE and Creativity	0.703	$p < 0.001$
RAI and Creativity	0.669	$p < 0.001$
AID and Creativity	0.470	$p < 0.001$
ETH and Creativity	0.492	$p < 0.001$

Table 4.7: Correlation Between Research Variables

The correlation results indicate that all independent variables have significant positive relationships with Students' creativity.

Learning Enhancement (LE) showed the strongest correlation with creativity (r = 0.703), indicating a strong positive relationship. This suggests that students who perceive AI as improving their learning experience tend to report higher levels of creativity.

Responsible AI Use (RAI) also showed a strong positive relationship with creativity (r = 0.669), followed by Generative AI Usage (GAU) with r = 0.602.
AI Dependency (AID) and Ethical AI Use (ETH) showed moderate positive relationships with creativity, with correlation values of 0.470 and 0.492 respectively.
Overall, the correlation analysis indicates that all selected AI-related factors are positively associated with Students' creativity.

4.7 Multiple Linear Regression Analysis

Multiple linear regression analysis was conducted to examine the predictive effects of Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH) on Students' Creativity (CR).
The purpose of regression analysis was to determine whether the selected independent variables significantly explain variations in Students' creativity and to identify the individual contribution of each predictor variable.

The regression model used in this study is:
Creativity (CR) = $\beta_0 + \beta_1(GAU) + \beta_2(LE) + \beta_3(RAI) + \beta_4(AID) + \beta_5(ETH) + \varepsilon$

Where:

- CR = Students' Creativity
- GAU = Generative AI Usage
- LE = Learning Enhancement
- RAI = Responsible AI Use
- AID = AI Dependency
- ETH = Ethical AI Use
- β = Regression coefficient
- ε = Error term

4.7.1 Model Summary

The model summary presents the overall explanatory power of the regression model.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.800	0.640	0.631	0.41505

Table 4.8: Regression Model Summary

The results indicate that the regression model has a strong relationship between the independent variables and Students' creativity, with an **R value of 0.800**.
The **R Square value of 0.640** indicates that Generative AI Usage, Learning Enhancement, Responsible AI Use, AI Dependency, and Ethical AI Use collectively explain **64.0% of the variance in Students' creativity**.

The adjusted R Square value of **0.631** shows that the model maintains strong explanatory power after considering the number of predictors included in the analysis.
The remaining **36.0% of variation** in Students' creativity may be explained by other factors that were not included in this research model.

4.7.2 ANOVA Test

The ANOVA test was performed to determine whether the overall regression model was statistically significant.

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	61.070	5	12.214	70.903	<0.001
Residual	34.281	199	0.172		
Total	95.351	204			

Table 4.9: ANOVA Results for Regression Model

The ANOVA results indicate that the regression model is statistically significant:
$F(5,199) = 70.903, p < 0.001$

This result confirms that the combination of Generative AI Usage, Learning Enhancement, Responsible AI Use, AI Dependency, and Ethical AI Use significantly predicts Students' creativity.

Therefore, the overall regression model is suitable for explaining the relationship between AI-related factors and creativity.

4.7.3 Regression Coefficients

The regression coefficients table shows the individual contribution of each independent variable toward Students' creativity.

Predictor	Standardized Beta (β)	t-value	Sig.	Decision
Generative AI Usage (GAU)	-0.019	-0.270	0.787	Not Significant
Learning Enhancement (LE)	0.337	4.916	<0.001	Significant
Responsible AI Use (RAI)	0.227	3.569	<0.001	Significant
AI Dependency (AID)	0.320	6.441	<0.001	Significant
Ethical AI Use (ETH)	0.230	3.716	<0.001	Significant

Table 4.10: Regression Coefficients

Generative AI Usage (GAU)
The regression result shows that Generative AI Usage does not have a significant effect on Students' creativity.
The coefficient value was:
β = -0.019, p = 0.787

Since the significance value is greater than 0.05, GAU does not make a significant unique contribution to predicting creativity when other variables are considered in the model.
Although correlation analysis showed a positive relationship between GAU and creativity, the regression result indicates that general AI usage alone is not a significant predictor of creativity.

Learning Enhancement (LE)
Learning Enhancement was found to have a significant positive influence on Students' creativity.
The result shows:
β = 0.337, p < 0.001

Among all predictors, Learning Enhancement had the highest standardized beta coefficient, indicating that it is the strongest predictor of Students' creativity.
This suggests that students who perceive generative AI as improving their learning experience tend to demonstrate higher creativity.

Responsible AI Use (RAI)
Responsible AI Use significantly predicts Students' creativity.
The result shows:
β = 0.227, p < 0.001

This indicates that students who use AI tools responsibly and critically are more likely to experience positive creative outcomes.

AI Dependency (AID)
AI Dependency was found to have a significant positive relationship with creativity.
The result shows:
β = 0.320, p < 0.001

Although the original hypothesis expected a negative relationship, the findings show a positive

effect. This suggests that AI dependency, within this sample, may also represent frequent AI-assisted engagement that supports idea generation and creative activities.
However, this result should be interpreted carefully because dependency does not necessarily mean that AI directly creates creativity; rather, it indicates a positive association between the two variables.

Ethical AI Use (ETH)
Ethical AI Use significantly influences Students' creativity.
The result shows:
$\beta = 0.230, p < 0.001$

This indicates that students who demonstrate stronger ethical awareness in using AI technologies tend to report higher creativity levels.

4.8 Multicollinearity Test

Multicollinearity analysis was conducted to examine whether the independent variables were highly correlated with each other.
Tolerance and Variance Inflation Factor (VIF) values were examined.

Variable	Tolerance	VIF
GAU	0.362	2.762
LE	0.385	2.596
RAI	0.446	2.241
AID	0.732	1.367
ETH	0.472	2.118

Table 4.11: Multicollinearity Statistics

The results indicate that all VIF values are below the recommended threshold of 5. Therefore, there is no serious multicollinearity problem among the independent variables.This confirms that the predictors can be included together in the regression model.

4.9 Regression Assumption Tests

Before performing multiple linear regression analysis, regression assumptions were examined to ensure the reliability and validity of the regression model. The assumptions tested in this study include normality, linearity, and homoscedasticity.
The normal probability plot, histogram analysis, and scatterplot analysis were used to evaluate whether the data met the required assumptions for regression analysis.

4.9.1 Normal Probability Plot

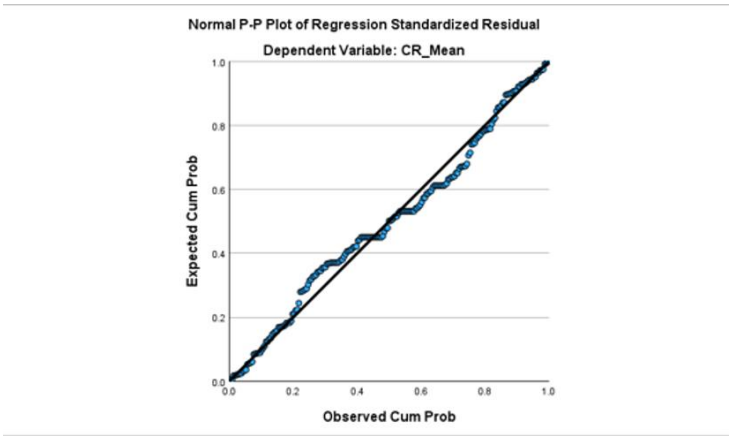


Fig - 4: Normal Probability Plot of Regression Standardized Residual

The Normal Probability Plot (P-P Plot) was examined to assess whether the residuals of the regression model follow a normal distribution. The points in the plot are closely aligned with the diagonal reference line, indicating that the residuals are approximately normally distributed. Therefore, the normality assumption required for multiple linear regression analysis is satisfied.

4.9.2 Histogram Analysis

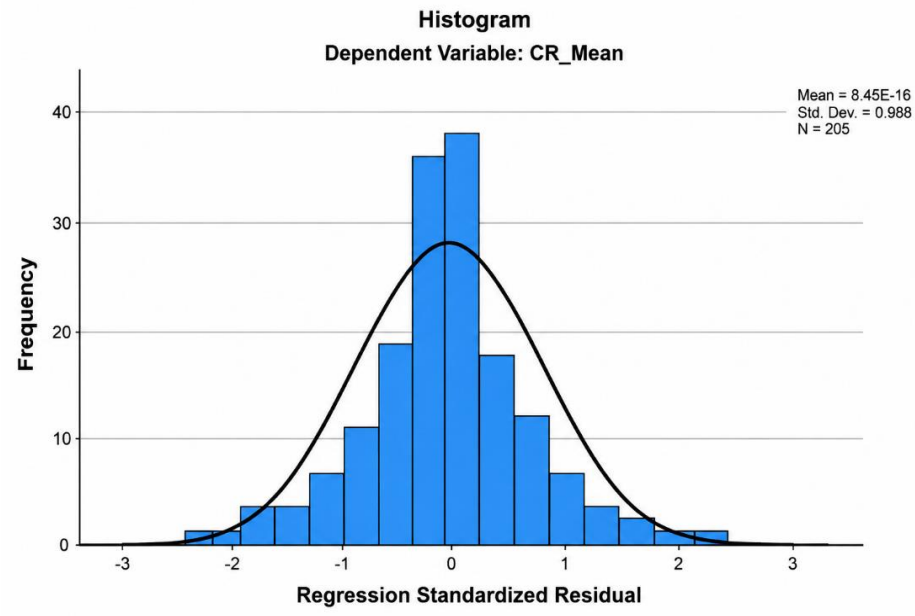


Fig - 5: Histogram of Regression Standardized Residual

The histogram analysis was performed to evaluate the distribution pattern of regression

residuals. The residual values show an approximately normal distribution pattern around the mean, confirming that the regression model satisfies the assumption of normality.

4.9.3 Scatterplot Analysis

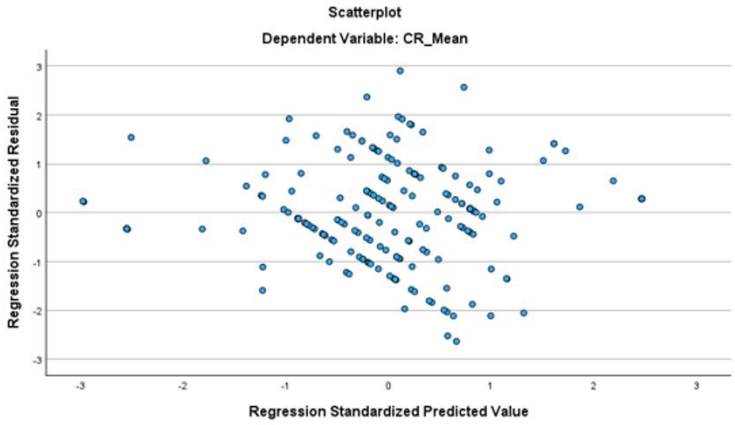


Fig - 6: Scatterplot of Regression Standardized Residual

The scatterplot was analyzed to examine the linearity and homoscedasticity assumptions of the regression model. The residual points are randomly distributed around the zero line without forming any specific pattern. This indicates that the variance of residuals is approximately constant, and there is no serious violation of the linearity and homoscedasticity assumptions.

4.10 Hypothesis Testing

Hypothesis testing was conducted to determine whether the proposed relationships between the independent variables and Students' creativity were statistically supported.
The decisions were made based on the regression coefficient values and significance levels. A hypothesis was considered supported when the p-value was less than 0.05 and the relationship direction matched the proposed hypothesis.

Hypothesis	Relationship	β	p-value	Decision
H1	Generative AI Usage → Creativity	-0.019	0.787	Not Supported
H2	Learning Enhancement → Creativity	0.337	<0.001	Supported
H3	Responsible AI Use → Creativity	0.227	<0.001	Supported
H4	AI Dependency → Creativity	0.320	<0.001	Not Supported
H5	Ethical AI Use → Creativity	0.230	<0.001	Supported

Table 4.12: Summary of Hypothesis Testing Results

H1: Generative AI Usage and Creativity
The first hypothesis proposed that Generative AI Usage has a positive relationship with Students' creativity.
However, the regression analysis showed that GAU was not a significant predictor of creativity:
β = -0.019, p = 0.787
Therefore, H1 was **not supported**.

Although correlation analysis indicated a positive relationship between GAU and creativity, the regression result suggests that general usage of generative AI alone does not significantly explain Students' creativity when other factors are considered.

H2: Learning Enhancement and Creativity
The second hypothesis proposed that Learning Enhancement through generative AI positively influences Students' creativity.
The regression result showed a significant positive relationship:
β = 0.337, p < 0.001
Therefore, H2 was **supported**.

This indicates that students who perceive AI as improving their learning experience are more likely to demonstrate higher levels of creativity.

H3: Responsible AI Use and Creativity
The third hypothesis examined the relationship between Responsible AI Use and creativity.
The result showed:
β = 0.227, p < 0.001
Therefore, H3 was **supported**.

This finding indicates that responsible interaction with AI tools contributes positively to Students' creative outcomes.
H4: AI Dependency and Creativity
The fourth hypothesis proposed that AI Dependency negatively influences creativity.
However, the regression result showed:
β = 0.320, p < 0.001
The relationship was statistically significant but positive rather than negative.
Therefore, H4 was **not supported**.

The finding suggests that students who reported higher AI dependency also showed higher creativity within this sample. This may indicate that AI dependency in this context represents frequent AI-assisted learning and idea exploration rather than only passive reliance.

H5: Ethical AI Use and Creativity
The fifth hypothesis proposed that Ethical AI Use positively influences Students' creativity.
The regression result showed:
β = 0.230, p < 0.001

Therefore, H5 was **supported**.

This indicates that students who follow ethical practices while using AI technologies are more likely to achieve positive creative outcomes.

4.11 Summary of Findings

This chapter presented the results obtained from the statistical analysis of 205 valid responses. The reliability analysis confirmed that all measurement constructs had acceptable internal consistency, with Cronbach's Alpha values ranging from 0.802 to 0.941.
The descriptive statistics showed that respondents had generally positive perceptions toward generative AI usage, with Ethical AI Use receiving the highest mean score.
The correlation analysis revealed that all independent variables had significant positive relationships with Students' creativity. Among these relationships, Learning Enhancement showed the strongest correlation with creativity.

The multiple linear regression analysis demonstrated that the overall model was statistically significant and explained 64% of the variance in Students' creativity. Among the predictors, Learning Enhancement was the strongest significant predictor, followed by AI Dependency, Ethical AI Use, and Responsible AI Use.
However, Generative AI Usage did not show a significant individual contribution in predicting creativity.

The final hypothesis results showed that:

- H1 was not supported.
- H2 was supported.
- H3 was supported.
- H4 was not supported.
- H5 was supported.

The findings indicate that the influence of generative AI on creativity depends not only on AI usage frequency but also on how students use AI as a learning support tool, how responsibly they interact with AI, and their ethical awareness.

4.12 Chapter Summary

This chapter presented the results and findings obtained from the statistical analysis of the collected survey data. The analysis was conducted to examine the relationships between Generative AI-related factors and Students' creativity. Initially, the demographic characteristics of the respondents were analyzed to understand the background information of the participants.

The reliability analysis was performed using Cronbach's Alpha to evaluate the internal consistency of the measurement items. The results confirmed that the research variables

demonstrated acceptable reliability for further analysis. Descriptive statistics were then conducted to summarize the overall responses and identify the mean and standard deviation values of the studied variables.

Furthermore, Pearson correlation analysis was conducted to examine the relationships among Generative AI Usage, Learning Effectiveness, Responsible AI Use, AI Dependency, Ethical AI Use, and Students' Creativity. The results indicated the strength and direction of relationships among the variables.

Multiple linear regression analysis was performed to determine the predictive effects of the independent variables on Students' creativity. The regression model was found to be statistically significant and explained a substantial proportion of variance in Students' creativity. Regression assumption tests, including Normal Probability Plot, Histogram Analysis, and Scatterplot Analysis, were also conducted to confirm that the data satisfied the requirements for regression analysis.

Finally, hypothesis testing was conducted based on the regression results. The findings revealed which proposed relationships were statistically significant and provided evidence regarding the influence of different Generative AI-related factors on Students' creativity.

The next chapter discusses the findings in relation to previous studies, presents the theoretical and practical implications of the research, and provides the conclusion and recommendations for future research.

CHAPTER 5
DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter discusses the major findings of the study in relation to the research objectives and previous literature. The purpose of this chapter is to interpret the statistical results presented in Chapter 4 and explain their implications in the context of generative AI usage and Students' creativity.

The study examined the influence of five generative AI-related factors: Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH) on Students' Creativity (CR).

The regression analysis showed that the overall research model was statistically significant and explained 64% of the variation in Students' creativity. Among the predictors, Learning Enhancement showed the strongest positive influence, while Generative AI Usage alone did not significantly predict creativity.

This chapter presents a detailed discussion of each hypothesis, theoretical and practical implications, recommendations, limitations, and the conclusion of the study.

5.2 Discussion of Major Findings

5.2.1 Generative AI Usage and Creativity

The first hypothesis proposed that Generative AI Usage has a positive influence on Students' creativity. However, the regression analysis showed that GAU was not a significant predictor of creativity (**β = -0.019, p = 0.787**). Therefore, H1 was not supported.

This finding indicates that simply using generative AI tools does not necessarily improve Students' creativity. Although students may frequently use AI applications for searching information, generating content, or completing academic tasks, the frequency of usage alone may not determine creative outcomes.

The finding is consistent with the idea that AI acts as a supportive technology rather than an automatic source of creativity. Creativity requires human involvement, critical thinking, and the ability to transform information into original ideas. Therefore, students who only use AI for obtaining direct answers may not experience significant improvement in creative ability.

Previous studies have also suggested that the creative benefits of generative AI depend on the quality of interaction between humans and AI rather than only the amount of AI usage [5]. When students actively analyze, modify, and develop AI-generated suggestions, AI can support creativity. However, passive usage may not produce meaningful creative

improvement.

Therefore, this study suggests that the role of generative AI in creativity depends more on how students use AI rather than how frequently they use it.

5.2.2 Learning Enhancement and Creativity

The second hypothesis examined whether Learning Enhancement through generative AI positively influences Students' creativity. The regression result showed a significant positive relationship (**$\beta = 0.337$, $p < 0.001$**). Therefore, H2 was supported.

Learning Enhancement was found to be the strongest predictor among all variables included in the model. This indicates that students who perceive AI tools as helpful for improving their learning experience are more likely to demonstrate higher creativity.
This finding suggests that AI contributes to creativity indirectly by improving Students' understanding and knowledge development. Creativity often depends on existing knowledge because individuals need sufficient understanding of a topic to generate meaningful ideas.

The result supports previous research indicating that AI-assisted learning can improve Students' engagement, provide personalized support, and encourage deeper learning processes [3]. When students use AI to understand concepts, explore examples, and receive explanations, they may develop better foundations for creative thinking.
Therefore, generative AI appears to be more valuable as a learning enhancement tool rather than simply a content-generation tool.

5.2.3 Responsible AI Use and Creativity

The third hypothesis proposed that Responsible AI Use positively influences Students' creativity. The regression analysis supported this relationship (**$\beta = 0.227$, $p < 0.001$**). Therefore, H3 was supported.

The finding indicates that students who use AI responsibly are more likely to achieve positive creative outcomes. Responsible AI use involves evaluating AI-generated information, maintaining critical thinking, and using AI as assistance rather than replacing personal effort.

This result supports the human–AI collaboration perspective, which suggests that creativity improves when humans and AI work together effectively. AI can provide suggestions and alternative perspectives, but human judgment remains necessary for selecting, improving, and developing ideas.

Students who use AI responsibly are more likely to engage with AI-generated content actively. Instead of directly accepting AI responses, they may analyze and modify them according to their own understanding. This process can support creative development.

5.2.4 AI Dependency and Creativity

The fourth hypothesis examined the relationship between AI Dependency and Students' creativity. The hypothesis proposed that AI Dependency would have a negative influence on creativity. However, the regression analysis showed a significant positive relationship between AI Dependency and creativity (**$\beta = 0.320, p < 0.001$**). Therefore, H4 was not supported.

The finding indicates that students who reported higher levels of AI dependency also demonstrated higher creativity within this study context. Although this result was different from the expected direction, it provides an important insight into how students may be using generative AI tools.

One possible explanation is that AI dependency in this context may not always represent passive reliance on AI-generated answers. Instead, frequent interaction with AI tools may indicate greater engagement with AI-assisted learning activities, idea exploration, and creative experimentation.

According to Cognitive Offloading Theory, external tools can reduce cognitive effort and provide additional support during problem-solving activities [6]. When students use AI assistance to reduce routine tasks, they may have more time and mental resources to focus on higher-level thinking and creative activities.

However, this finding should be interpreted carefully. Dependency on AI does not necessarily mean that AI directly creates creativity. Excessive dependence without critical evaluation may still create risks for independent thinking. Therefore, the positive relationship found in this study may reflect productive AI-assisted usage among respondents rather than unhealthy dependence.

5.2.5 Ethical AI Use and Creativity

The fifth hypothesis examined whether Ethical AI Use positively influences Students' creativity. The regression analysis showed a significant positive relationship (**$\beta = 0.230, p < 0.001$**). Therefore, H5 was supported.

This finding suggests that students who demonstrate stronger ethical awareness when using AI tools are more likely to experience positive creative outcomes.
Ethical AI use involves using AI responsibly, verifying information, maintaining academic integrity, and recognizing the limitations of AI-generated content. When students follow ethical practices, they are more likely to use AI as a supportive resource while maintaining their own contribution to creative tasks.

The result supports previous discussions that effective AI integration requires not only technical ability but also ethical awareness and responsible decision-making [3], [4]. Students who understand appropriate AI usage can combine AI-generated suggestions with their own knowledge and creativity.

Therefore, ethical awareness plays an important role in ensuring that generative AI supports creativity rather than replacing human thinking.

5.3 Overall Interpretation of the Research Model

The overall regression model demonstrated that generative AI-related factors significantly influence Students' creativity. The model explained 64% of the variance in creativity, indicating that the selected variables provide strong explanatory power.
Among the predictors, Learning Enhancement was the strongest factor influencing creativity. This suggests that students benefit most from AI when they perceive it as a tool that improves their understanding and learning process.

Responsible AI Use and Ethical AI Use also showed significant positive relationships with creativity. These findings indicate that the effectiveness of AI depends not only on access to technology but also on responsible and meaningful interaction with AI systems.
Although AI Dependency showed a significant positive relationship, the result differed from the expected negative direction. This suggests that dependency may have different meanings depending on how students use AI. In this study, frequent AI engagement may represent active AI-assisted learning rather than complete replacement of human effort.
On the other hand, Generative AI Usage alone did not significantly predict creativity. This indicates that simply using AI tools is not sufficient to improve creativity. The quality, purpose, and manner of AI usage are more important factors.

Overall, the findings suggest that generative AI can support creativity when students use it as a learning partner rather than simply as an answer-generation tool.

5.4 Summary of Hypothesis Testing Results

The final hypothesis testing results are summarized below:

Hypothesis	Relationship	Result
H1	Generative AI Usage → Creativity	Not Supported
H2	Learning Enhancement → Creativity	Supported
H3	Responsible AI Use → Creativity	Supported
H4	AI Dependency → Creativity	Not Supported
H5	Ethical AI Use → Creativity	Supported

Table 5.1: Summary of Hypothesis Testing

The results indicate that three hypotheses were supported, while two hypotheses were not supported.

5.5 Theoretical Implications

This study provides several theoretical contributions to the understanding of generative AI and creativity in higher education.

First, the findings support the importance of Self-Regulated Learning Theory in explaining AI-assisted learning behavior. Students who actively manage their learning process and use AI as a supportive resource may achieve better creative outcomes.
Second, the findings provide support for the Human–AI Co-Creation perspective. The significant effects of Learning Enhancement, Responsible AI Use, and Ethical AI Use suggest that creativity improves when students actively collaborate with AI rather than passively depend on it.

Third, the findings contribute to the discussion of Cognitive Offloading Theory. The positive relationship between AI Dependency and creativity suggests that external cognitive support may sometimes enhance creative performance when students use AI tools effectively.

Overall, this study expands existing understanding by showing that the impact of generative AI on creativity depends on multiple behavioral factors rather than AI usage alone.

5.6 Practical Implications

5.6.1 Implications for Students

Students should consider generative AI as a supportive learning tool rather than a replacement for their own thinking abilities.

The findings suggest that students can gain greater creative benefits by using AI for:

- Exploring new ideas
- Understanding difficult concepts
- Receiving feedback
- Improving problem-solving approaches

Students should also develop responsible AI habits by verifying information and maintaining academic honesty.

5.6.2 Implications for Educators

Educators should recognize that generative AI can be integrated into learning activities when appropriate guidelines are provided.

Instead of completely restricting AI usage, educators can encourage students to use AI as a learning assistant while focusing on critical thinking, evaluation, and creativity.
Teachers can design activities that require students to analyze, improve, and reflect on AI-

generated outputs rather than simply submit AI-generated work.

5.6.3 Implications for Universities

Universities should develop clear policies and guidelines regarding generative AI usage. Institutions should focus on:

- Promoting responsible AI practices
- Providing AI literacy training
- Encouraging ethical AI usage
- Supporting AI-assisted learning environments

Proper guidance can help students receive the benefits of AI while reducing potential risks.

5.7 Recommendations

Based on the findings of this study, several recommendations are proposed to maximize the benefits of Generative Artificial Intelligence (GenAI) while minimizing potential risks associated with its use among students. Since the findings indicate that factors such as learning effectiveness, responsible AI use, ethical AI use, and AI dependency significantly influence Students' creativity, appropriate strategies should be developed to encourage productive and balanced AI adoption in educational environments.

5.7.1 Encourage Learning-Oriented AI Use

The findings suggest that Generative AI can contribute positively to Students' creativity when it is used as a learning-support tool rather than as a replacement for individual thinking. Therefore, students should be encouraged to use AI tools for activities such as idea generation, information exploration, brainstorming, and improving learning efficiency.

Educational institutions should promote AI-assisted learning approaches where students actively engage with AI-generated content, evaluate information critically, and develop their own creative solutions. This approach can help students gain the benefits of AI while maintaining their independent thinking abilities.

5.7.2 Promote Responsible AI Practices

Responsible AI use plays an important role in ensuring that students utilize AI technologies effectively and appropriately. Universities should provide awareness programs and training sessions that guide students on responsible interaction with Generative AI tools.

Students should be encouraged to verify AI-generated information, avoid excessive dependence on AI-generated answers, and use AI as a supportive resource for academic development. Responsible AI practices can enhance Students' digital skills and promote meaningful learning experiences.

5.7.3 Maintain Human Creative Involvement

Although Generative AI provides powerful capabilities for content creation and problem-solving, human creativity remains essential. Students should maintain active involvement in the creative process by combining AI assistance with personal knowledge, critical thinking, and original ideas.

Educational activities should be designed in a way that encourages students to analyze, modify, and improve AI-generated outputs instead of directly accepting them. This will help preserve creativity, originality, and problem-solving skills.

5.7.4 Develop Ethical AI Guidelines

Educational institutions should establish clear ethical guidelines for the use of Generative AI in academic environments. These guidelines should address issues such as academic integrity, transparency, responsible content generation, and proper acknowledgment of AI assistance.

Providing ethical AI guidelines can help students understand the limitations of AI technologies and encourage fair and responsible usage. Such policies can ensure that AI adoption supports educational goals without compromising academic values.

5.7.5 Monitor AI Dependency

Although AI tools can improve learning effectiveness, excessive dependency on AI may negatively affect Students' independent thinking and creativity. Therefore, students should be encouraged to maintain a balanced approach when using AI technologies.
Universities and educators should monitor AI usage patterns and design learning activities that require students to demonstrate personal understanding, creativity, and analytical skills. Maintaining an appropriate balance between AI assistance and human effort is essential for sustainable creative development.

5.8 Recommendations for Future Research

Based on the limitations of this study, several directions are suggested for future research.
First, future studies may use a longitudinal research design to examine how continuous interaction with generative AI affects Students' creativity over time.

Second, future research can include additional variables such as AI literacy, digital competency, motivation, critical thinking ability, and innovation behavior to develop a more comprehensive research model.

Third, future studies may compare different groups of respondents, such as students from different academic disciplines, educational levels, or professional backgrounds, to identify differences in AI usage behavior.

Fourth, qualitative research methods such as interviews and focus group discussions can be applied to obtain deeper insights into Students' experiences and perceptions regarding generative AI.

Finally, future research may examine specific AI applications or compare different generative AI platforms to understand whether different tools produce different effects on learning and creativity.

5.9 Conclusion

This study examined the influence of generative AI-related factors on university Students' creativity. The research investigated five important factors: Generative AI Usage (GAU), Learning Enhancement (LE), Responsible AI Use (RAI), AI Dependency (AID), and Ethical AI Use (ETH).

The findings revealed that Learning Enhancement, Responsible AI Use, and Ethical AI Use significantly influence Students' creativity. Among these factors, Learning Enhancement showed the strongest contribution, indicating that students benefit from generative AI when it improves their understanding and learning experiences.

The study also found that Generative AI Usage alone does not significantly predict creativity. This suggests that the creative benefits of AI do not depend only on how frequently students use AI tools, but rather on how effectively they interact with these technologies.

Additionally, AI Dependency showed a significant positive relationship with creativity, although the relationship was different from the originally proposed hypothesis. This indicates that AI dependency may represent active AI-supported learning and idea exploration within this research context.
Overall, the study concludes that generative AI can positively contribute to Students' creativity when it is used responsibly, ethically, and as a supportive learning partner. The findings highlight the importance of developing appropriate AI usage strategies that balance technological assistance with human creativity and independent thinking.

REFERENCES

[1] T. Brown et al., "Language Models are Few-Shot Learners," *Advances in Neural Information Processing Systems*, vol. 33, pp. 1877–1901, 2020.

[2] A. Vaswani et al., "Attention is All You Need," in *Advances in Neural Information Processing Systems*, vol. 30, 2017.

[3] I. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*. Cambridge, MA, USA: MIT Press, 2016.

[4] H. Kasneci et al., "ChatGPT for good? On opportunities and challenges of large language models for education," *Learning and Individual Differences*, vol. 103, 2023.

[5] C. K. Lo, "What is the impact of ChatGPT on education? A rapid review of the literature," *Education Sciences*, vol. 13, no. 4, p. 410, 2023.

[6] F. Miao and W. Holmes, *Guidance for Generative AI in Education and Research*. Paris, France: UNESCO, 2023.

[7] R. Dwivedi et al., "Opinion Paper: So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy," *International Journal of Information Management*, vol. 71, 2023.

[8] E. B. Brown and A. B. Green, "Artificial intelligence applications in education: A systematic review," *IEEE Access*, vol. 8, pp. 75264–75278, 2020.

[9] W. Holmes, M. Bialik, and C. Fadel, *Artificial Intelligence in Education: Promises and Implications for Teaching and Learning*. Boston, MA, USA: Center for Curriculum Redesign, 2019.

[10] Z. Zawacki-Richter et al., "Systematic review of research on artificial intelligence applications in higher education," *International Journal of Educational Technology in Higher Education*, vol. 16, 2019.

[11] B. J. Zimmerman, "Becoming a self-regulated learner: An overview," *Theory Into Practice*, vol. 41, no. 2, pp. 64–70, 2002.

[12] B. J. Zimmerman, "Attaining self-regulation: A social cognitive perspective," in *Handbook of Self-Regulation*, Academic Press, pp. 13–39, 2000.

[13] E. F. Risko and S. J. Gilbert, "Cognitive offloading," *Trends in Cognitive Sciences*, vol. 20, no. 9, pp. 676–688, 2016.

[14] N. Carr, *The Shallows: What the Internet Is Doing to Our Brains*. New York, NY, USA: Norton, 2010.

[15] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319–340, 1989.

[16] J. P. Guilford, "Creativity," *American Psychologist*, vol. 5, no. 9, pp. 444–454, 1950.

[17] T. M. Amabile, *Creativity in Context*. Boulder, CO, USA: Westview Press, 1996.

[18] R. J. Sternberg and T. I. Lubart, *The Concept of Creativity: Prospects and Paradigms*. Cambridge University Press, 1999.

[19] K. Sawyer, *Explaining Creativity: The Science of Human Innovation*, 2nd ed. Oxford University Press, 2012.

[20] A. M. Doshi and O. Hauser, "Generative artificial intelligence enhances creativity," *Journal of Creativity Research*, 2024.

[21] M. Dellermann et al., "Hybrid intelligence," *Business & Information Systems Engineering*, vol. 61, pp. 637–643, 2019.

[22] J. Shneiderman, "Human-centered artificial intelligence: Reliable, safe & trustworthy," *International Journal of Human–Computer Interaction*, vol. 36, no. 6, pp. 495–504, 2020.

[23] J. Jobin, A. Ienca, and E. Vayena, "The global landscape of AI ethics guidelines," *Nature Machine Intelligence*, vol. 1, pp. 389–399, 2019.

[24] M. Floridi and J. Cowls, "A unified framework of five principles for AI in society," *Harvard Data Science Review*, vol. 1, 2019.

[25] OECD, *Recommendation of the Council on Artificial Intelligence*. Paris: OECD Publishing, 2019.

[26] UNESCO, *Recommendation on the Ethics of Artificial Intelligence*. Paris: UNESCO, 2021.

[27] N. Sparrow, J. Liu, and D. Wegner, "Google effects on memory: Cognitive consequences of having information at our fingertips," *Science*, vol. 333, pp. 776–778, 2011.

[28] M. Skjuve et al., "My chatbot companion: A study of human–AI interaction," *International Journal of Human-Computer Studies*, 2021.

[29] M. Chiu et al., "Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education," *Computers and Education: Artificial Intelligence*, 2023.

[30] A. Tlili et al., "What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education," *Smart Learning Environments*, vol. 10, 2023.

[31] B. Bozkurt et al., "Speculative futures on ChatGPT and generative artificial intelligence in education," *Asian Journal of Distance Education*, vol. 18, no. 1, 2023.

[32] S. Bubeck et al., "Sparks of artificial general intelligence: Early experiments with GPT-4," Microsoft Research Technical Report, 2023.

[33] L. Chen, P. Chen, and Z. Lin, "Artificial intelligence in education: A review," *IEEE Access*, vol. 8, pp. 75264–75278, 2020.

[34] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 8th ed. Cengage Learning, 2019.

[35] A. Field, *Discovering Statistics Using IBM SPSS Statistics*, 5th ed. London: Sage Publications, 2018.

[36] U. Sekaran and R. Bougie, *Research Methods for Business: A Skill Building Approach*, 8th ed. Wiley, 2019.

[37] J. Pallant, *SPSS Survival Manual*, 7th ed. Open University Press, 2020.

[38] K. Kasneci et al., "Artificial intelligence and the future of education," *Learning and Individual Differences*, 2023.

[39] M. Cotton, P. Cotton, and J. Shipway, "Chatting and cheating? Ensuring academic integrity in the era of ChatGPT," *Innovations in Education and Teaching International*, vol. 61, no. 2, pp. 228–239, 2024.

[40] R. A. Luckin, *Machine Learning and Human Intelligence: The Future of Education for the 21st Century*. London: UCL IOE Press, 2018.

[41] P. K. K. Chan and C. Lee, "The role of generative AI in student learning and creativity," *Computers & Education: Artificial Intelligence*, 2024.

[42] J. Holmes and W. Tuomi, "State of the art and practice in AI in education," *Computers and Education: Artificial Intelligence*, 2022.

[43] M. Coeckelbergh, *AI Ethics*. Cambridge, MA: MIT Press, 2020.

[44] B. Wang et al., "Large language models in education: Opportunities and challenges," *IEEE Transactions on Learning Technologies*, 2024.

[45] X. Zhang and Y. Li, "Generative AI and student creativity: A systematic review," *Education and Information Technologies*, 2024.

APPENDIX A

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GAU_Mean	205	1.67	5.00	3.7793	.77940
LE_Mean	205	2.00	5.00	3.7305	.77467
RAI_Mean	205	2.00	5.00	3.6061	.68063
CR_Mean	205	2.00	5.00	3.5327	.68367
AID_Mean	205	1.00	5.00	2.7236	.93498
ETH_Mean	205	1.00	5.00	4.1768	.91093
Valid N (listwise)	205				

Correlations

		GAU_Mean	LE_Mean	RAI_Mean	CR_Mean	AID_Mean	ETH_Mean
GAU_Mean	Pearson Correlation	1	.719***	.655***	.602***	.263***	.637***
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	<.001
	N	205	205	205	205	205	205
LE_Mean	Pearson Correlation	.719***	1	.688***	.703***	.301***	.554***
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001
	N	205	205	205	205	205	205
RAI_Mean	Pearson Correlation	.655***	.688***	1	.669***	.327***	.514***
	Sig. (2-tailed)	<.001	<.001		<.001	<.001	<.001
	N	205	205	205	205	205	205
CR_Mean	Pearson Correlation	.602***	.703***	.669***	1	.470***	.492***
	Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001
	N	205	205	205	205	205	205
AID_Mean	Pearson Correlation	.263***	.301***	.327***	.470***	1	-.091
	Sig. (2-tailed)	<.001	<.001	<.001	<.001		.194
	N	205	205	205	205	205	205
ETH_Mean	Pearson Correlation	.637***	.554***	.514***	.492***	-.091	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.194	
	N	205	205	205	205	205	205

***. Correlation is significant at the 0.001 level (2-tailed).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	.307	.180		1.707	.089	-.048	.661		
	GAU_Mean	-.017	.062	-.019	-.270	.787	-.139	.105	.362	2.762
	LE_Mean	.297	.060	.337	4.916	<.001	.178	.416	.385	2.596
	RAI_Mean	.228	.064	.227	3.569	<.001	.102	.354	.446	2.241
	AID_Mean	.234	.036	.320	6.441	<.001	.162	.306	.732	1.367
	ETH_Mean	.172	.046	.230	3.716	<.001	.081	.264	.472	2.118

a. Dependent Variable: CR_Mean

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.800[a]	.640	.631	.41505	2.071

a. Predictors: (Constant), ETH_Mean, AID_Mean, RAI_Mean, LE_Mean, GAU_Mean

b. Dependent Variable: CR_Mean

APPENDIX B

Title : The Impact of Generative AI Usage on Student's Creativity

This survey is conducted for academic research purposes to examine how the use of Generative AI influences student's learning, creativity, critical thinking, and dependency on AI. Participation is voluntary, and all responses will remain anonymous and confidential. The survey will take approximately 4–5 minutes to complete.

QUESTIONNAIRE

Section A: Demographic Information

1. Gender
2. Age
3. Department
4. Academic Level

Section B: Generative AI Usage (GAU)

No.	Statement
GAU1	How often do you use Generative AI tools?
GAU2	Which Generative AI tool do you use most frequently?
GAU3	I frequently use Generative AI for academic tasks.
GAU4	I use Generative AI when brainstorming ideas for assignments or projects.
GAU5	I use Generative AI to understand difficult academic concepts.
GAU6	I use Generative AI to assist with academic writing or problem-solving tasks.

Section C: Perceived Learning Effectiveness (LE)

No.	Statement
LE1	Generative AI helps me understand difficult topics.
LE2	Generative AI improves my learning efficiency.
LE3	Generative AI saves my study time.
LE4	Generative AI helps me become a better learner.

Section D: Responsible and Critical AI Use (RAI)

No.	Statement
RAI1	I try to solve problems on my own before asking Generative AI.
RAI2	I compare AI-generated answers with other reliable sources.
RAI3	I critically evaluate AI-generated responses before using them.
RAI4	I avoid relying entirely on Generative AI for academic tasks.

Section E: Students' Creativity (CR)

No.	Statement
CR1	Generative AI helps me generate original ideas for academic tasks.
CR2	Generative AI encourages me to think creatively.

No.	Statement
CR3	Generative AI inspires me to solve problems in new ways.
CR4	I feel that my academic work has become generic or uniform because of Generative AI usage.
CR5	Generative AI limits my imagination by providing ready-made structures before I can think independently.

Section F: AI Dependency (AID)

No.	Statement
AID1	I find it difficult to analyze complex academic problems deeply without consulting Generative AI first.
AID2	I find it difficult to start an assignment or academic task without using Generative AI first.
AID3	I rely more on AI-generated suggestions than on my own knowledge when brainstorming a new topic.
AID4	If Generative AI tools are temporarily unavailable, I feel anxious about completing my academic tasks on time.
AID5	Using Generative AI has made me less willing to read textbooks or academic research papers.
AID6	I feel that frequent Generative AI usage has weakened my ability to recall information or analyze information independently.

Section G: Trust and Ethical AI Use (ETH)

No.	Statement
ETH1	I trust the information generated by Generative AI.
ETH2	Universities should establish guidelines for the responsible use of Generative AI.
ETH3	Students should use Generative AI ethically in academic work.
ETH4	Generative AI should be used as a learning-support tool rather than as a replacement for human critical thinking.