

# Challenges and Risks of AI Usage on Students' Academic Performance: A Case Study at the University of Nizwa, Oman

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## Abstract

Artificial Intelligence (AI) has revolutionized the world in all spheres of life. Starting with the fundamentals, AI has altered key areas in the industry and is now poised to encroach upon the realm of education, most notably in higher education. Undoubtedly, the reliance on AI has been steadily rising in the past few years, and the University of Nizwa, in the Sultanate of Oman has been taken as a case study to establish the link between student performance and the usage of AI. Being exploratory research, this article attempts to shed light on the perspectives of AI being used to bolster students' motivation and the extent of their involvement in the learning process. The main aim of this study is to observe the moderating factors, such as academic specialization and academic level, which may impact the relationship between the use of AI technologies and the students' academic performance at the University of Nizwa. In doing so, this study seeks to answer questions on how educational specialization influences students' gains from AI technologies. What are the challenges students encounter in utilizing AI technologies in their learning? For the research methodology, this study employed a quantitative approach based on a structured questionnaire analyzed using statistical procedures (descriptive statistics, correlation, regression and t-test) for the 115 random samples.

## Keywords

AI, Adaptive Learning Platforms, Automated Assisted Programs, Chat GPT, Intelligent Learning Systems

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## 1. Introduction and Background

Artificial Intelligence (AI) has made rapid strides fundamentally in many sectors including education. More so, higher education has witnessed leaps and bounds through AI-powered tools like intelligent tutoring systems, adaptive learning platforms, and automated assessment programs to improve student learning experiences and academic performance [1] [2]. These technologies provide teachers and students with personalized learning paths, immediate feedback, and data-driven insights to enhance the learning process. AI's infiltration in education has become all the more essential by assisting students in navigating challenging courses and honing critical thinking skills. Furthermore, AI-driven analytics enable teachers to identify areas of improvement in their courses. Seemingly innocuous in the beginning, AI was a curtain raiser. However, concerns about its impact on student's academic performance has led to some soul searching answers. For instance, nowadays AI tools and technologies are sought to facilitate administrative tasks. Besides this, it has found its way to draft lesson plans and even learning outcomes. Hence, universities ought to keep caution in this regard without compromising critical analysis and cognitive ability.

In Oman especially at the University of Nizwa (UoN), little study has been done on AI about its effects on academic performance. Research around the world has revealed the pros and cons of AI in multiple societies with various learning environments. But this study localizes the uses and impacts of AI in the context of the Sultanate of Oman and in UoN focusing on the students' academic performance, their classroom behavior, and finally their learning experience. Perhaps this could also shed more perspectives on the part of teachers to indulge in self-analysis as it plans to investigate the symbiotic relationship between AI usage and students' academic performance and narrow the gap if any. By analyzing the merits and demerits of AI in education, this study seeks to provide pragmatic suggestions on how to properly combine AI to improve learning results while also addressing possible negative effects [3].

Artificial Intelligence (AI) technologies have advanced significantly in recent years and are now becoming increasingly important in many facets of life, especially education. AI tools and technologies are being used by educational institutions worldwide to improve the learning process overall by streamlining pedagogical approaches, customizing instructional materials, and analyzing student data. Within this context, it is important to understand the extent to which the use of these technologies affects students' academic performance, specifically in universities struggling to keep up with digital transformation. Shedding light on this perspective, the UoN was chosen as a case study for determining the relation between the same. UoN has started incorporating some artificial intelligence tools within its academic setting, employing both intelligent learning systems and academic support software. Here, the main objective is to investigate the correlation between the utilization of AI technologies and the academic attainment of learners, bearing in mind the various influencing variables like subject matter, degree

of engagement with the technologies, and the technical and ethical issues that the learners are likely to face. The research project also aims to supply practical suggestions that can supplement the proper implementation of artificial intelligence within the university environment, thereby improving the quality of education and learning outcomes among learners indirectly.

### 1.1. Problem Statement

AI technologies are successfully incorporated into the classroom to help students succeed academically. AI tools offer tailored learning materials to strengthen comprehension of the course content, sharpen critical thinking abilities, and foster problem-solving skills. It can boost student motivation and involvement in the learning process by achieving higher success rates and good academic performance. On the flip side of it, AI's ever pervasive penetration in academics might affect the quality of learning due to its overemphasis, differences in students' ability to use it, and ethical issues involved therein. Quite often, students effortlessly resort to AI for problem solving, which raises a serious concern in learning, comprehension and analysis. However, in reality not all of them could possibly do so. The digital split between students in terms of their proficiency may also widen the gap in academic performance. Guidoum & Elkhansa (2024), mentioned that some instructors are worried that overuse of AI could cause students' critical thinking abilities to decline and increase their reliance on technology rather than their own capacity for analysis and inference [4].

Students use AI to get pre-written replies with little consideration for ethical and moral issues. Besides this, learning takes a dip as students collect answers with no effort to think and learn. Several studies claim that students who excessively depend on AI struggle to learn on their own, which handicaps them in learning, critical analysis and problem solving [5] [6]. Universities find it difficult to create specific regulations that manage the use of AI in the classroom in order to get the benefits without compromising the integrity of education. The effect of these technologies on students' academic performance in Oman universities, particularly in UoN, ought to be investigated as little research is done in this area especially, the moderating variables—academic specialization and academic level—that influence the association between the use of AI and academic performance. A study by Adewale *et al.* (2024) found that there is a shortage of research on how students benefit from AI technologies differently across self-controls, highlighting the need for a more thorough examination of these tools' effects in various learning circumstances [7]-[10].

The purpose of this study is to observe the moderating factors, such as academic specialization and academic level, which may impact the relationship between the use of AI technologies and the students' academic performance in UoN. Furthermore, it offers suggestions for incorporating AI into higher education, which supports efficient learning and increases academic achievement without undermining students' learning quality and critical thinking abilities.

## 1.2. Research Objectives

- 1) Assess the effect of applying AI technologies on students' academic achievement.
- 2) Investigate the correlation between how often artificial intelligence is used and the level of academic success for students.
- 3) Investigate the impact of academic specialization on students' benefits from AI technologies.
- 4) Explain the issues that students face in using AI technologies.
- 5) Suggest methods for increasing the use of artificial intelligence in the education system to improve academic effectiveness.

## 1.3. Research Questions

- 1) What are the effects of artificial intelligence technologies on the academic performance of students at the UoN?
- 2) Is there a positive relationship between the frequent use of AI resources and the improvement of students' academic achievements?
- 3) How does educational specialization influence students' gains from AI technologies?
- 4) What are the challenges and risks students encounter in utilizing AI technologies in their learning?
- 5) What recommendations can be made to improve the usage of AI in education to improve learning performance?

## 1.4. Significance of the Study

This study offers an evidence-based understanding of how AI tools impact students' academic performance in the context of higher education in Oman, particularly at the University of Nizwa. The essence of this study can be viewed through several dimensions:

### Addressing a Local Research Gap

While numerous international studies mention both the benefits and challenges of AI in education, little study has been conducted locally with regard to how the usage of AI tools impacts learning results at universities within Oman. This study contributes to addressing this gap by providing context-specific insights relevant to the digital transformation happening in higher education institutions in Oman.

### Improving the Quality of Education and Student Participation

AI tools, including adaptive learning platforms and intelligent tutoring systems, are able to offer individual pathways of learning, continuous feedback, and support students in their cognitive growth. The study shows how AI can customize educational content according to the needs of each student, which contributes to improving understanding of materials and developing critical thinking skills. Students at the UoN use these opportunities to further advance academic performance and strengthen learning engagement. A study by [1] and [2] shows that AI helps create interactive learning environments that enhance students' interaction

with the educational content and support effective self-learning.

#### Supporting Institutional Decision-Making and Policy Development

The findings assist university leaders, faculty, and policymakers in designing clear guidelines on mixing AI technologies judiciously into curriculum. It involves a trade-off between the benefits of AI and concerns pertaining to academic integrity, ethical use, and over-dependence. A study by revealed that the use of big data extracted from artificial intelligence systems helps educational institutions make evidence-based decisions about developing curricula that are more compatible with students' needs. The recommendations provided by this research may inform training programs and institutional digitization strategies [4] [11]-[14].

#### Understanding Differences across Academic Specializations

The study emphasizes how academic major and academic level impact the degree to which students benefit from AI tools. Examining these moderating elements will enable educators to consider distinguished instructional support by disciplines and provide equal learning opportunities for all [10].

#### Enhancing Students' Skills

By analyzing the relationship between the use of AI and academic achievement, this research contributes to guiding training programs that aim to enhance students' critical thinking skills and learning. A study by [2] stated that AI technologies can be effective tools for improving student's analysis and inference skills, especially when these tools are used in an integrated manner with traditional teaching methods.

It thus makes the following contributions: theoretical and practical value through providing a more localized and systematic understanding of how AI tools influence learning performance and empirically grounded recommendations for responsible and effective integration of AI in higher education. This study is a significant step towards a deeper understanding of the impact of current technologies in education, simultaneously, serving as a tool to help the development of teaching tactics that are well-matched with the requirements of the digital age.

### 1.5. Scope of the Study

The purpose of this research is to analyze the encroachment of AI on students' academic performance at the UoN, and study the relation between the adoption of these technologies and academic achievement. The goal is to provide practical insights to improve the quality of education and develop teaching strategies that match the requirements of the digital age. Adewale *et al.* [7] says that artificial intelligence can improve the learning experience by providing personalized content which improves understanding and comprehension, which is reflected in academic performance. Additionally, it evaluates how students benefit from the use of AI tools such as smart assistants, adaptive learning platforms, and automated assessment programs. Hamadneh *et al.* [12] also indicated that AI can contribute to improving students' skills through adaptive interaction with educational content.

- **Population and sample**

Students numbering around 115 were randomly selected from different specializations and academic levels at the UoN to participate in this study. The study relies on a randomly selected representative sample to ensure the inclusion of all academic categories.

- **Variables included**

- Independent Variable (IV): AI technologies used in the educational process.
- Dependent Variable (DV): Students' academic performance, measured by GPA, test scores, and academic achievement level.
- Moderating variable: Factors that might impact the connection between AI use and students' academic achievement, such as academic specialization, academic level, and level of technology literacy. Jiao *et al.* mentioned that these factors play a significant role in determining the extent to which students benefit from smart tools.

- **Time frame**

The research was conducted during the academic year 2024/2025, for data collection and analysis in order to monitor the impact of using AI over a specific time period.

- **Geographical framework**

The study is limited to the UoN, which clarifies the local context of the research and provides a deep understanding of the challenges and opportunities besieging the educational environment in Oman.

- **Research methodology**

An empirical approach was chosen for the purpose of analyzing the results. Besides this, there were no interviews, no open-ended responses, and no qualitative coding in the study. The questionnaire was earlier distributed electronically to around 125 students. Finally, 115 students responded.

- **Limitations of the study**

The study did not look into the impact of AI techniques on other aspects such as teaching skills development or the educational environment, which the researchers felt would fall outside the scope of students' academic performance. Yet another limitation of this research is that academic performance was examined through self-reported perceptions instead of official GPA or academic transcripts, which may introduce subjective bias.

## 1.6. Definition of Key Terms

- Artificial Intelligence (AI) is a term used to describe computer systems or software designed to handle tasks usually requiring human cognitive capacities including problem-solving, decision-making, learning, and natural language processing. Usually it refers to instruments and platforms applied in educational settings (e.g., ChatGPT, AI-based tutoring systems, and learning analytics platforms) and GenAI.
- Educational Performance: Normally, this is measured in terms of continuous

internal and external assessments such as tests, assignments, projects, presentations, etc.

- Frequency of AI Application: Students' frequency or number of using AI tools for academic purposes including learning, research, writing, or assignment completion.
- Interaction Level: How actively and successfully the student uses the technology to improve their learning process in relation to artificial intelligence programs?
- Academic Specialization: It is the field, or discipline, a student is registered for study. This study investigates variations among students from different majors who use and benefit from artificial intelligence technologies.
- Technical and ethical issues: Using AI tools involves a range of technical and ethical issues, which might pose challenges if not properly addressed.

## 2. Literature Review

### 2.1. What Is AI?

Artificial Intelligence (AI), in simple terms is a computer-assisted development that has come to replace skills hitherto done by humans with regard to intelligence, recognizing speech, decision making and identifying patterns [15]. Generative AI or GenAI represents tools that are meant to make teaching process easier by incorporating Natural Language Processing (NLP), ChatGPT, machine learning, etc. GenAI is a type of AI encompassing an array of learning patterns (including music) from massive datasets. It “creates new content, like text or images based on patterns in data” [16] [17].

Educational sector is all set to benefit from technological innovations in providing educational content and learning processes. Undoubtedly, AI has brought a sea change in the quality and efficiency of educational practices throughout the world albeit its influence is yet to be seen. The study aims to analyze the impact of AI on students' academic performance at the UoN and the factors affecting this relationship. Furthermore, this study shall examine some theories that augment the academic performance through AI. Based on [8], students who use AI technologies successfully show an improvement in self-learning, thereby leading to more productivity in the classroom.

### 2.2. Academic Performance

“Academic achievement” or “performance” is a student's accomplishment of school tasks like examinations, projects, and presentations in relation to set standards [5]. It is one of the most significant parameters on which schooling quality is rated. Measuring academic performance has developed from conventional tests to assessment techniques incorporating technology, *i.e.*, intelligent systems capable of providing detailed reports and analysis of students' progress [1] [2]. Any improvement in academic performance results in increased confidence in the education system and also in student/parent satisfaction. Hamadneh *et al.* contend

that overdependence on AI tools could result in lower independent learning and problem-solving ability [12]. Further research is needed on problems including digital access, academic integrity, and ethical concerns in AI-assisted learning.

### **Education and Artificial Intelligence**

Artificial Intelligence (AI) is a range of technological models that can replicate human intellectual abilities in decision-making and information processing. AI utilization in education is diverse, ranging from adaptive learning settings (that adapt learning materials to meet the individual needs of learners) to learning robots that facilitate learner interaction with learning content [18]. AI is utilized in a wide range of educational software, including autonomous learning, instantaneous feedback, and studying students' learning habits. Adewale *et al.* said that by providing interactive learning environments befitting students' needs, artificial intelligence applications have shown promise in enhancing engagement and motivation [7].

### **2.3. The Effect of Artificial Intelligence on Academic Performance**

Various studies show that AI has a positive impact on students' learning outcomes. Jiao *et al.* (2022) showed that AI-based evaluation systems in the context of distance learning enabled higher performance by students in technical fields like engineering, through a system of repeated assessment that modifies educational content according to the learner's level. Students exploit these evaluation systems, especially in home assignments for quick completion without any safeguards [3].

Garcia-Martinez *et al.* (2023) indicated that AI led to a greater level of motivation, and increased students' willingness to learn [1] [2]. According to Klimova and Pikhart (2025), AI tools create a healthy rapport between the students and instructors, wherein the instructors come to know the students' strengths and weaknesses in learning [18]. Shahzad *et al.* (2024) claimed that interaction with AI technologies makes the students engaged in active learning thereby motivating them to perform better in academics [6].

### **2.4. Moderating Variables**

Moderating factors are essential in establishing the effects of AI tools on students' academic performance. Its use may directly affect or influence other variables either positively or negatively. The interaction level with the AI tool, the type of academic specialization, and the technical challenges presented to the students are included as variables.

#### **2.4.1. Interaction Level with AI**

The effect of AI on students' academic performance is based on the level of students' engagement with AI tools. However, there is a widespread belief that students using AI tools very seriously in interactive learning activities perform much better. But a study by [2], posits that low engagement with AI will have a negative

effect.

#### **2.4.2. Academic Major**

Garcia-Martinez *et al.* (2023) state that academic specialization substantially affects the usage of AI tools. Technical students fared much better than non-technical students [1] [2]. For instance, computer science and engineering students use very sophisticated technological tools that greatly enhance their ability to learn. According to Ben [15], academic specialization influences the readiness of an individual to adopt AI technologies. In fact, students in highly technology-intensive disciplines such as engineering and computer science become familiar with AI tools and make the maximum benefit. However, students in non-technical disciplines find it difficult to use such technologies since their studies require little use.

#### **2.4.3. Technical Issues**

Despite the importance of AI tools in improving academic performance, technical issues could possibly undermine the efficacy of such tools. Hamadneh *et al.* [12] showed that a hard technical infrastructure is necessary for the students to benefit from AI. In virtual learning environments, technical issues like low speed internet, frequent load shedding and inadequate hardware can dampen AI-powered educational technologies. Ben *et al.* [15] continued that technical difficulties may contain a variety of infrastructure-related problems, including poor network facilities and restricted access to suitable devices causing poor utilization of AI tools [15]. These difficulties may prevent the students from interacting with AI-supported learning resources, thus affecting their performance.

### **2.5. Controlled Variables**

AI has advanced significantly in relation to educational needs. The performance of students is improved by using AI tools; conversely, the benefit of tool's usage depends on a number of variables such as age, AI experience, academic level, and allocated time for study.

#### **2.5.1. Age Appropriate Use of AI Tools**

Age is a core variable that can dictate whether a student will use AI tools. Recent studies show that younger students with a technological background get acclimated in dealing with AI tools more effortlessly than those from a non-technical environment [8]. Tanveer *et al.* [19] [20] claim that undergraduates below age 25 were more inclined to use AI applications like ChatGPT probably because they are more exposed to modern technology.

#### **2.5.2. The Effect of Prior Experience in Using Technology**

Prior experience in using technology is another factor in determining the benefits that students accrue from AI tools. A similar study conducted by Altememy *et al.* [13], reveals that those students with prior technology experience such as the use of educational software or AI tools were relatively better equipped than those with

less technological exposure. Hence, their academic performance is comparatively better. Subsequently, they integrate the technological tools into their day-to-day academic activities to a considerable extent, resulting in better academic outcomes [12] [13].

### 2.5.3. AI Usage and Academic Level Interaction

The academic level is a measurable variable in the students' response toward the advantages AI tools offer. Hamadneh *et al.* [12] made it evident that the higher the academic level (graduate studies) is, the more frequently is the usage of AI tools are used as compared to undergraduates. It clarified that advanced students require AI tools to assist them in their complex research and analysis as well as engage AI more extensively in their academic challenge assignments.

### 2.5.4. The Impact of Study Time

Improved academic performance extensively depends on how much time the students spend with AI. Based on the study by Tanveer *et al.* [19], there is a correlation between the amount of time students spend studying using these technology tools and their academic performance. Pacheco-Mendoza *et al.* [21] in their research proposed that any increase in amount of study time, which has been required in adjusting to digital learning spaces, can lead to improved academic performance. Although the number of study hours decreased, students became more efficient in utilizing their time, thanks to the support of artificial intelligence. As Ward *et al.* [22] noted, the use of AI tools enabled students to manage their study routines more effectively, leading to improved academic outcomes despite reduced study time.

## 2.6. Theoretical Review

Theories that describe the relationship between Artificial Intelligence and academic performance are as follows.

### 2.6.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a simple theoretical model designed to explain an individual's behavior towards adopting new technologies. It presumes that two factors significantly influence an individual's likelihood of adopting the technology: Perceived Usefulness. This refers to an individual's belief in the degree to which his/her performance is expected to be enhanced by the technology. In an academic setting, this implies the manner in which AI technologies contribute to enhancing learning performance, through customized learning, analysis of learning analytics, and giving feedback in real-time. Perceived Ease of Use: This indicates the degree to which the students perceive using AI technologies as being easy and convenient. If the technology is found to be user-friendly, then it is likely that students will adopt AI technologies in their studies [18]. Based on this theory, students who perceive the usefulness of AI tools, such as intelligent learning systems and automatic evaluation tools, in meeting their needs are more

likely to adopt these resources in their pursuit of improved academic performance.

### **2.6.2. Self-Determination Theory (SDT)**

Self-Determination Theory (SDT) is a psychological perspective that focuses on people's motivation and the functionality of their context in promoting or undermining their experience of autonomy and competence. At school, SDT offers theoretical insight into children's achievement and motivation by being aware of the way children who believe they have control over what they are doing and employing materials that aid them in skills development perform more academically. It consists of three parts. First is the autonomy wherein the need to feel free to make choices arises. Secondly, it is the competence stressing the need to feel confident in completing a task successfully followed by social connectedness—the need to feel connected and interact with others. AI-powered tools, such as adaptive learning platforms, can be used in education to create individualized learning experiences to meet their academic needs. For example, AI might provide immediate feedback to students so as to gain improvement in certain areas while also increasing their intrinsic motivation in academics [23].

By using Technology Acceptance Theory (TAM), it clarifies how students' perception of the value of AI technologies may influence their acceptance of their use in classroom setting. However, none can undermine the potential use of Self-Determination Theory (SDT) in relation to students engaging continuously with AI tools enhancing their motivation, autonomy and improving their academic performance.

For want of space, this study limits itself only to handful of theories. For example, Jiao *et al.* showed that AI-based test systems can enhance students' academic performance because they can provide immediate feedback, quite similar to SDT, which highlights competence, motivation, and performance concepts [3]. Furthermore, the Technology Acceptance Model (TAM) gives an account of the quick adoption of systems by students, if they believe the systems are useful and easy to use. Technology Acceptance Theory (TAM) and Self-Determination Theory (SDT) both provide the connection between the use of AI technologies and enhanced student academic performance. Both these theories influence student conduct and engagement in AI-based learning environments with a holistic framework established to assess the effect of AI-enabled technologies on student academic performance at the UoN.

## **3. Research Methodology**

### **3.1. Conceptual Framework**

Theoretical model of the research clarifies the relationship between the independent variable—Artificial Intelligence (AI) usage—and the dependent variable, *i.e.*, academic performance. Based on previous research, the model expands that AI impacts academic performance through adaptive and personalized learning [2]

[3]. Furthermore, the model contains moderating variables, which have the potential to change the direction of this relationship. These are:

- Academic Specialization: Based on previous studies, technical students have more opportunities to use AI tools since their curriculum is aligned with digital study platforms [13] [14].
- The frequent utilization of AI-supported learning systems is linked to better academic performance [2].
- Technical Challenges: Issues like the presence of stable internet connection and proper hardware can hamper or improve the efficiency of artificial intelligence in learning environments [12]. They also synergistically interact within the model to describe the conditions and situations in which the application of AI influences the performance of students at the tertiary education level.

This theoretical framework not only helps in building research hypotheses but also facilitates the choice of appropriate methodologies for collecting and analyzing data. Through analysis of interaction between usage, context, and outcomes, the framework provides a wide range of insight into the strength of artificial intelligence in higher learning, in this case, the University of Nizwa. (Diagram 1)

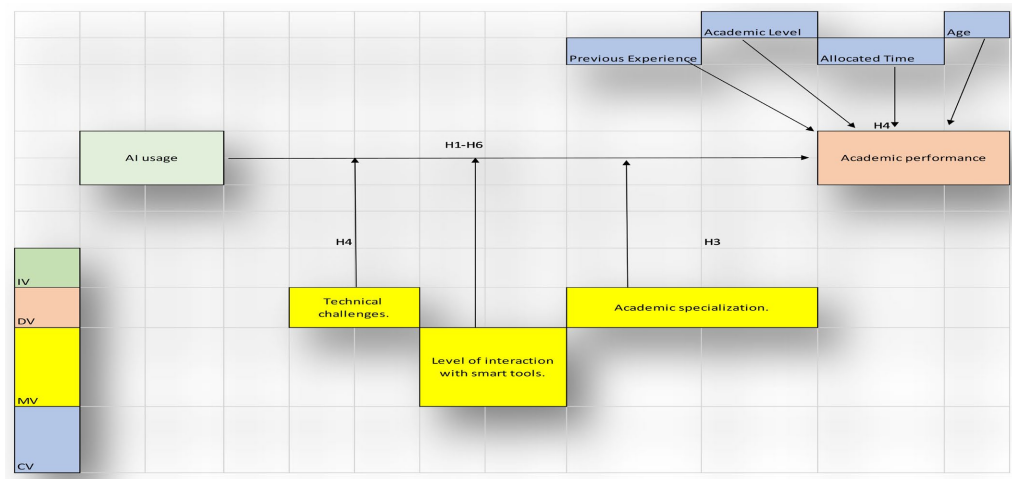


Diagram 1. Hypotheses, objectives, research questions, and variables.

### 3.2. Hypothesis Development

This study is based on the premise that the integration of artificial intelligence (AI) technologies in higher education environments can positively affect students' academic performance. Accordingly, the following hypotheses are proposed:

- H1: The use of Artificial Intelligence (AI) has a positive impact on the performance of students. Earlier research has shown that artificial intelligence tools can greatly improve the learning outcomes of students through adaptive feedback and individual learning pathways [3] [12].
- H2: Students utilizing artificial intelligence tools experience less difficulty in understanding and contributing to academic analysis. Artificial intelligence software, including natural language processing and intelligent tutoring soft-

ware, assists students in comprehending difficult learning content through the decomposition of content and the delivery of explanatory feedback [6].

- H3: Academic achievement is influenced in varying ways by AI according to academic specialization. Altememy *et al.* [13] also found that students in technical fields (e.g., computer science, engineering) showed greater gains in AI use than students in non-technical majors, suggesting academic major moderates AI effectiveness.
- H4: More regular use of AI tools is positively related to better academic performance. Empirical research suggests that regular use of AI platforms correlates with improved academic performance due to higher levels of engagement and maintained learning continuity [6] [19].
- H5: In spite of the positive effect, students might face some difficulties while using AI. Technical limitations such as availability of internet, device compatibility, or inadequate knowledge of interfaces for AI might hinder the use of AI's complete potential [11] [12].
- H6: Suggestions intended to improve the use of AI help in elevating its usefulness in academic outcomes. Customizing artificial intelligence implementation plans based on user reviews and situational requirements improves student receptiveness and learning gains, as reflected in results that are consistent with the Technology Acceptance Model [1] [2] [24]-[26].

The hypothetical propositions will be empirically examined using data gained from a framed questionnaire distributed to the students of UoN. The data will examine various aspects of the incorporation of AI into the students' academic performance and its outcome.

### 3.3. Research Approach

This study surveys a quantitative research design since the data were collected using a structured questionnaire and were analyzed through statistical techniques. In this regard, numerical data and statistical evaluations as part of the quantitative approach can be activated to analyze the relationship among the variables objectively and empirically. The data collected were analyzed through descriptive statistics, Pearson correlation analysis, multiple regression analysis and independent samples t-test to objectively examine the relationships among the study variables. In this quantitative approach, hypotheses such as the influence of AI tools on students' academic performance, academic specialization, and academic level can be tested.

### 3.4. Population and Sampling

#### 3.4.1. Study Population

The sample comprises 115 undergraduate students at the University of Nizwa, representing a range of academic disciplines and study levels. The heterogeneous group provides a panoramic view in terms of the use of AI across disciplines and students' level of exposure.

### 3.4.2. Sampling Technique

Random sampling technique was applied to make it possible for every student to have an equal probability of being selected. This minimizes bias and increases the generalizability of the findings, hence making it possible for the sample to reflect the larger population of students.

### 3.4.3. Sample Size

115 students took part in the research study cumulatively. Linkert scale was used to interpolate the data collected from the students. This sample is considered adequate for statistical analysis according to standards established by Krejcie & Morgan for social research and is reliable while striking a balance between practicality and statistical efficacy.

## 3.5. Instrument Development Process

### 3.5.1. Questionnaire Development

The questionnaire was prepared in both Arabic and English and subsequently examined by academic professionals for clarity and reliability. The questionnaire is also segmented into five distinct sections aimed at measuring various classes of variables that form the core of the study.

### 3.5.2. Layout of the Questionnaire

- Section 1: General Information (Gender, Age, Academic Major, Level, etc.)—These are control variables that are used to understand the demographic composition of the sample.
- Section 2: Utilization of AI Technology—This section evaluates the independent variable, bringing to light the prevalence and kinds of AI tools that students utilize.
- Section 3: Academic Performance—The dependent variable in question examines students' perceived academic performance in relation to their use of artificial intelligence.
- Section 4: Moderating Variables—Discusses factors that may affect the relation between DV and IV as the interaction level, academic specialization, and technical issues encountered by the students.
- Section 5: Control Variables—The questions are about the duration of AI usage, previous experience with technology, and other elements that may affect the outcome, and are in this section.

### 3.5.3. Measurement of Variables

It is important to note that academic performance in this study was measured based on students' self-reported perceptions of their progress rather than official GPA records. Therefore, the performance scores reflect subjective perceptions, which should be considered when interpreting the findings.

- Independent Variable (IV) evaluated through the frequency of artificial intelligence utilization, the variety of tools employed, and the dependence level on AI technologies. The assessment employs a Likert scale alongside multiple-

choice questions.

- **Dependent Variable (DV):** Academic performance, as assessed through students' perceived improvements in grades, understanding of course material, and effectiveness in completing tasks.
- **Control Variables:** Demographic variables like age, level of degree, prior technological experience, and duration of AI use, are measured using categorical and ordinal questions.

### 3.6. Data Analysis Plan

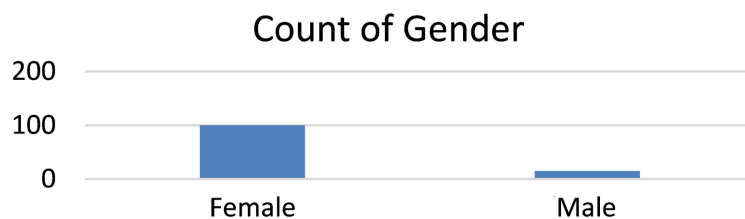
- It involved two major stages of analysis:
  - 1) **Descriptive Statistics:** The demographic characteristics of the sample and general trends linked to the AI used are summarized.
  - 2) **Inferential Statistics:** The following statistical methods were applied in examining the research hypotheses:
    - **Correlation Analysis:** studying connecting between AI usage and academic performance.
    - **Regression Analysis** to ascertain the predictive power of AI usage on academic performance.
    - **Independent Samples t-test:** to analyze the differences in academic performance across academic specializations.

These tests assist one in assessing the gathered data against each hypothesis to see whether it supports or rejects it.

## 4. Findings, Analysis and Discussions

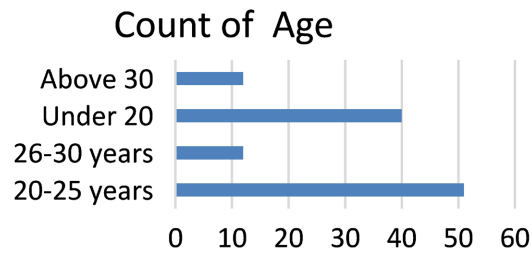
Based on the questionnaire distributed to around 125 students, 115 responded and their feedback was correlated to arrive at a solution. These findings should be interpreted with caution, as the academic performance data were based on students' perceived improvement rather than objective academic records.

Based on **Figure 1**, out of the total 115 respondents, 100 were female and 15 were male students.



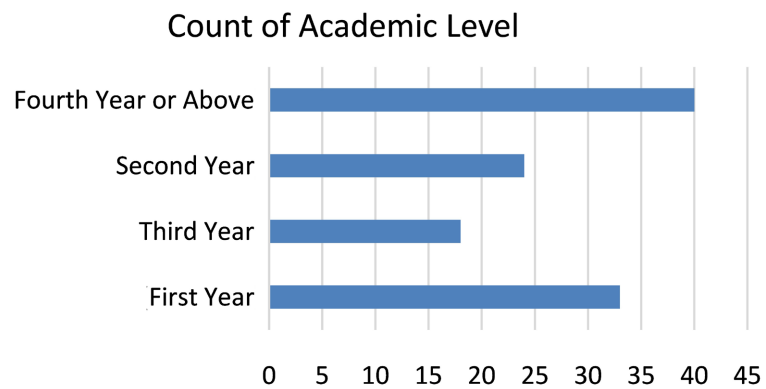
**Figure 1.** Showing the total number of respondents who participated in the survey.

In the above **Figure 2**, it clearly shows that the maximum number of participants (51) belong to the age group from 20 - 25 years followed by 40 students under the category less than 20. However, the other two categories show an equal number of participants (12 each).

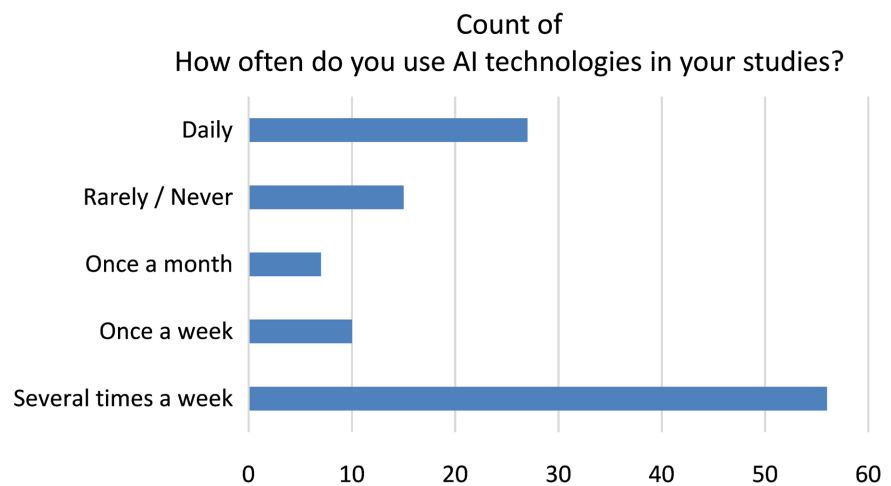


**Figure 2.** Showing number of respondents falling under various age groups.

Here, around 40% of the students belong to the final year undergraduates, while 33% are the freshers. Surprisingly the third year students' participation is less than the rest and 24% belong to the second year. (Figure 3)



**Figure 3.** The academic level of the participants.

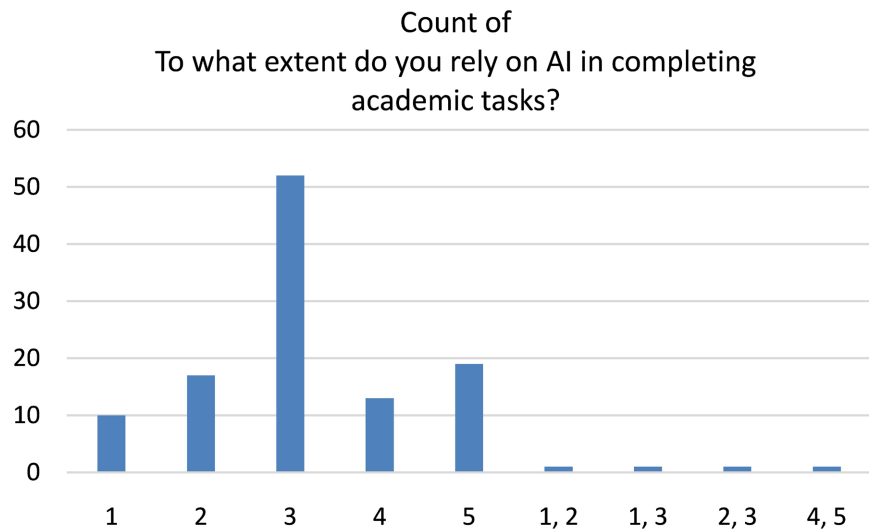


**Figure 4.** How often do you use AI in your studies?

**Figure 4** shows the frequency of AI use by the participants. Out of 115, around 55% informed that they use AI technologies several times a week while 28% said that they use them daily. However, only 8% and 10% said that they use it once a month and once a week respectively.

**Figure 5** illustrates the extent to which students use artificial intelligence tech-

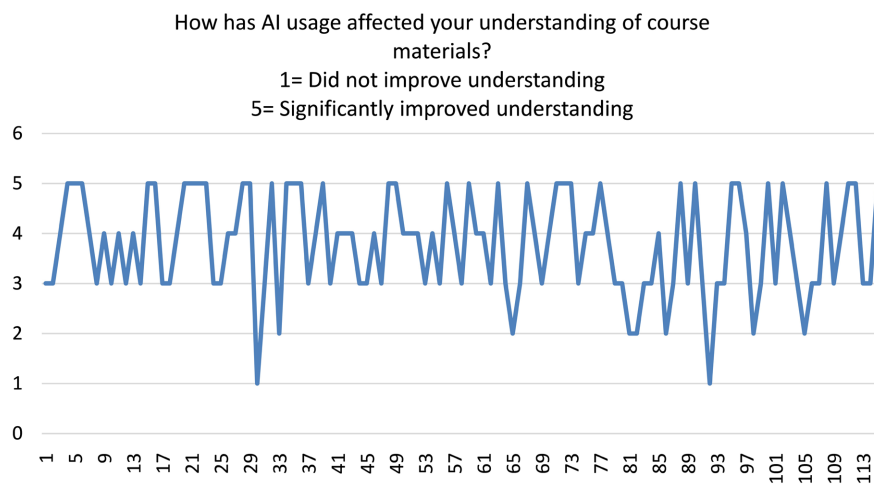
nologies to accomplish their academic tasks. The results indicate that the largest proportion of students fell within the neutral category, meaning that most of them did not express a clear stance toward the use of AI—thus, they cannot be considered active users nor opponents of it.



**Figure 5.** To what extent do you rely on AI in completing academic tasks?

Brief Interpretation: This neutrality reflects two possible explanations:

- 1) A lack of sufficient awareness about educational AI tools.
- 2) Limited or irregular use of these technologies.



**Figure 6.** How has AI usage affected your understanding of course materials?

**Figure 6** presents the impact of artificial intelligence on students’ understanding of academic courses. The results show that 46 students were neutral, while 38 and 32 students agreed to varying degrees.

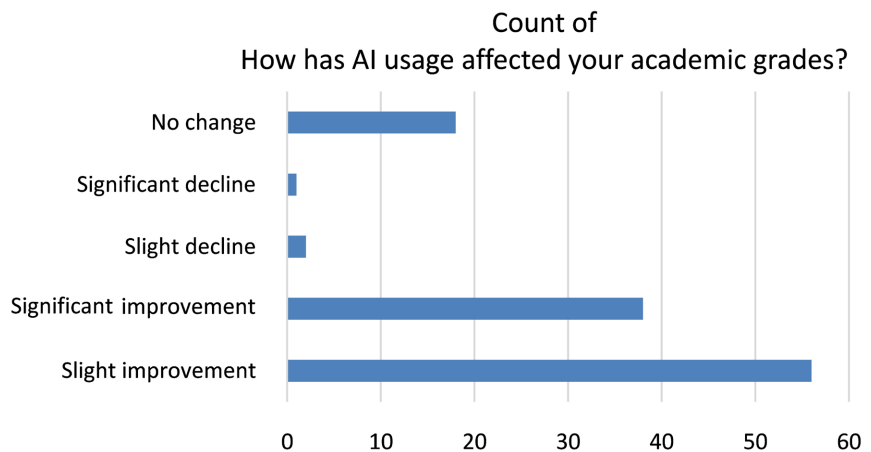
Brief Interpretation:

- This indicates that most students have not yet formed a clear opinion about

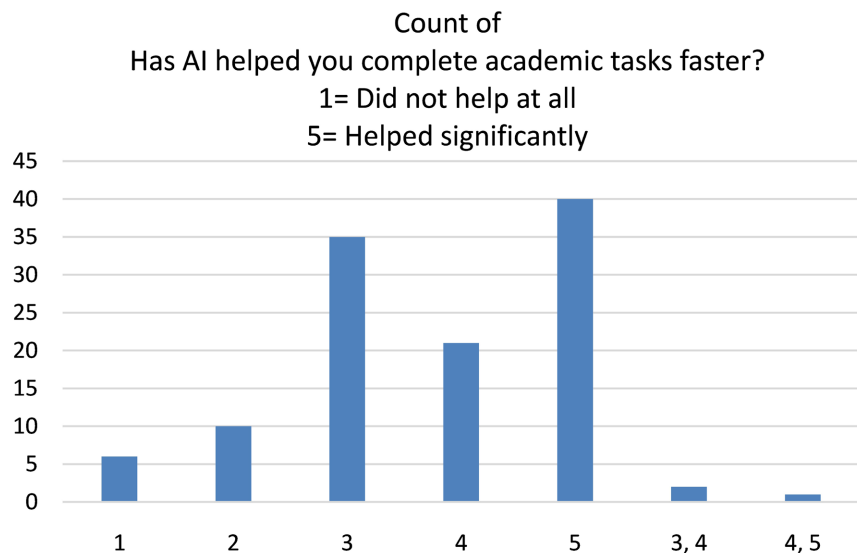
the real impact of AI on their comprehension, suggesting a transitional or exploratory stage in their use of educational AI tools.

- Meanwhile, the proportion of students who agreed reflects a growing group that perceives a tangible improvement in their academic understanding due to the use of AI in learning and academic support.

**Figure 7** shows the impact of AI on the students' grades. A significant number (55%) of students opined that there is a slight improvement while 38% students said that there has been a considerable improvement in their grades. However, 18% of the students reported that there has been no change while a small number of the students agreed that there has been a decline in their overall grades.



**Figure 7.** How has AI usage affected your academic grades?



**Figure 8.** Has AI helped you complete academic tasks faster?

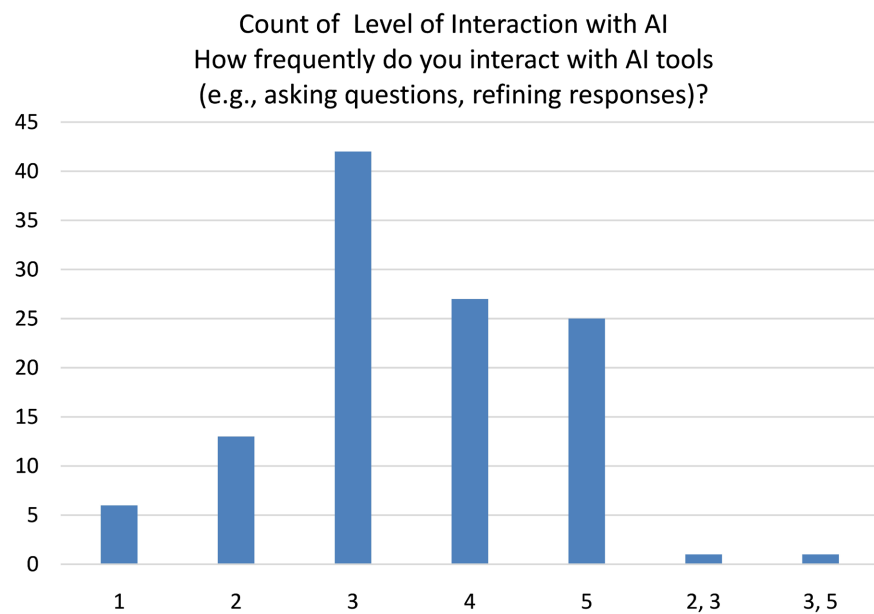
**Figure 8** presents the extent to which artificial intelligence contributes to speeding up students' completion of academic tasks. The results show that most students reported that AI greatly helped them accomplish their tasks faster, while a

smaller proportion remained neutral.

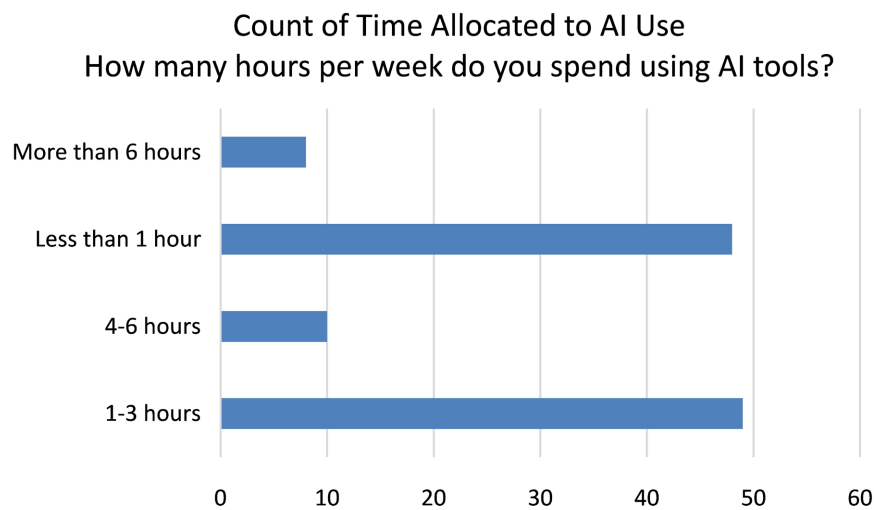
Brief Interpretation:

- This indicates that the majority of students perceive a direct positive impact of AI tools in facilitating and accelerating their academic work.
- The lower percentage of neutral responses suggests an increasing awareness among students of AI’s effectiveness in enhancing time efficiency and productivity.

**Figure 9** illustrates the extent to which students use artificial intelligence interactively, such as by asking questions or engaging in dialogue with AI systems. The results show that most students fell within the neutral category, followed by those who strongly agreed.



**Figure 9.** How frequently do you interact with AI tools?



**Figure 10.** Frequency of the usage of AI tools per week.

Brief Interpretation:

- This suggests that active interaction with AI tools remains relatively limited, although a group of students is using them effectively.
- The high proportion of neutral responses may reflect inconsistent or irregular experiences with interactive AI use, or a lack of sufficient training on how to employ it continuously in academic activities.

In **Figure 10**, the data shows the frequency of AI usage by the students per day. On average, the survey revealed that an overwhelming majority (90%) of the students indulge in AI for less than 3 hours/day. Surprisingly the figure shows that less than 10% of the students are involved in AI ranging from 4 hours or more.

## 5. Hypothesis & Statistical Test Used

Results and Interpretation

H1: AI usage has a positive impact on academic performance.

Pearson Correlation + Regression Analysis - Supported ( $r = 0.355$ ,  $\beta = 0.148$ ,  $p < 0.05$ )

Higher frequency of AI use is linked to better academic performance.

H2: AI usage improves understanding of course content.

Correlation (Understanding Score)—Supported ( $r \approx 0.42$ ). Interaction with AI enhances conceptual understanding.

H3: Impact of AI differs across academic majors.

Independent Samples t-test Not Supported ( $t = 1.216$ ,  $p = 0.229$ ). No significant performance difference between majors.

H4: Continuous use of AI improves academic performance.

Regression Analysis Supported ( $\beta = 0.148$ ,  $p < 0.05$ ). Consistent AI use yields better academic results.

H5: Students face technical challenges when using AI tools.

Descriptive Frequency Analysis—Partially Supported (31% reported difficulties). Technical limitations reduce the effectiveness of AI use.

H6: Institutional guidance improves responsible AI usage.

Theoretical Interpretation + Discussion

Supported contextually, Clear guidelines and training improve AI effectiveness.

## 6. Recommendations and Conclusions

The findings of this research indicate that Artificial Intelligence (AI) has become a powerful tool in supporting students in their academic performance. However, its use is still limited and not yet fully mixed into daily learning, while most students know its importance and ability in making the academic duties easier. By adopting AI in our teaching and learning systems, the learning experience can be personalized in that the students' progress and their blind spots can be tracked and additional support may be given to the students. This represents a need for bigger awareness and a more structured approach to its tools in the learning environment.

Despite several benefits of AI, educators cannot blindly incorporate the teaching and learning systems as it raises alarming potential regarding ethical concerns and bias. Using AI en masse poses immense challenges and risks as AI might inherit similar biases that humans experience as it is largely fed on human data.

**Enhancing Digital Awareness:** By organizing training programs and workshops to help students understand AI applications as well as how to use them effectively in learning and academic research. As a result, it will lead to more confident, informed, and determined use of AI.

**Integrating AI into the curriculum:** By integrating AI tools into course activities and classroom learning, it will become a part of students' regular academic experience. Moreover, using adaptive systems and intelligent feedback platforms can provide personalized content that fits each student's learning level and improves knowledge.

**Determining a Clear Ethical Framework:** The university should establish clear rules that guide the ethical use of AI, save academic integrity, and prevent extreme dependence on technology. In contrast, promoting a culture of critical thinking and responsibility in using AI tools is essential.

**Enhancing Technical Infrastructure:** The university's digital infrastructure should be improved as well as providing continuous technical support, which will ensure all students have equal access to current technologies, particularly in programs that heavily depend on smart applications.

In summary, this research confirms that when AI is used consciously and systematically, it can substantially improve the quality of learning. By helping students complete their tasks faster, they understand subjects better and stay motivated to learn. But the success of integrated AI does not depend on technology alone; it depends on how the academic institutions balance technology with critical thinking, creativity, and human awareness.

## **Ethical Concerns**

Participants were made aware of the research aims, their volunteer basis and they were assured of their information being kept confidential. A statement of consent was provided in the questionnaire to the respondents. Ethical approval was sought from the university research committee to confirm adherence to all applicable ethical principles and standards.

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## **Authenticity**

This manuscript is an original work.

## **Conflicts of Interest**

The authors hereby declare that there is no conflict of interest involved while re-

searching on this area.

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