

Influence of Generative AI on Problem Solving Skills among Students

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Abstract

The rapid advancement of generative artificial intelligence (AI) has transformed academic learning, providing students with instant access to problem-solving tools. This study examines the impact of generative AI on students' problem-solving abilities, critical thinking, decision-making, and academic performance across various disciplines. A structured, closed-ended questionnaire was used to collect data from 250 students through Google Forms. The findings indicate that a majority of students perceive AI as beneficial in improving efficiency, aligning with course curricula, and enhancing their confidence in tackling complex problems independently. Additionally, AI tools encourage students to explore alternative solutions rather than solely relying on generated responses. However, concerns remain regarding AI's effect on critical thinking, as some students may develop a dependency on automated solutions. While many participants critically evaluate AI-generated responses, a significant portion acknowledges reduced engagement in independent analytical reasoning. The study highlights the need for a balanced approach in integrating AI into education, ensuring that students retain essential cognitive skills while leveraging AI's advantages. Educators and policymakers must develop strategies that encourage critical thinking alongside AI-assisted learning to optimize educational outcomes. By fostering a thoughtful and reflective approach to AI usage, institutions can harness its potential to enhance learning without compromising students' independent problem-solving capabilities.

Keywords: *Generative AI, Problem-Solving, Critical Thinking, Decision-Making, Academic Performance*

1. INTRODUCTION

The exponential growth of generative artificial intelligence has affected a variety of study fields and the field of education in particular. Generative artificial intelligence tools such as ChatGPT and DeepMind and generative models of the technology have been widely accessible and allow students to generate real-time solutions to matters of an academic scope. The tools enhance ease and efficiency, although whether they enhance students' problem-solving abilities has been a controversial subject of study. This study attempts to study the manner in which generative AI enhances and detracts from students' problem-solving abilities in a variety of study fields. Increased application of study aids supported with AI has also

raised concerns about students' independent thought processes. While AI provides instant answers, it may diminish the necessity of students' use of analytical reasoning abilities. This study also seeks to measure the influence of generative AI on students' critical thought processes, decision-making abilities, and independent problem-solving abilities. The primary factors of how AI contributes to efficiency enhancement, creativity boost, and problem-solving strategy development will be examined. The study will also reveal whether the students scrutinize the AI-generated solution or accept it at face value.

With the widening application of AI in education, it becomes crucial that policymakers and educators are familiar with how it influences the development of problem-solving skills so that they can design an effective strategy of learning that balances the application of AI with the development of skills that students will need in independent study and independent decision-making.

2. LITERATURE REVIEW

Johnson and Lee (2021) found that the application of AI tools increases students' grades remarkably, particularly in subject matters that call for analytical reasoning and problem-solving abilities such as computer science and math. The study further found that students who used AI tools had higher problem-solving engagement, and this signifies that AI has the power of augmenting participation and motivation in scholarly activities.

Miller (2023) conducted a study that demonstrated that the application of generative AI may be negatively impacting independent problem-solving skills. Miller's study demonstrated that students who applied AI tools tended to have a lower ability to solve a problem independently.

Smith (2022) writes about the good that AI tools do in the problem-solving skills of students and how the models allow students to quickly and accurately come up with solutions to complex issues. Smith also goes further and explains that generative tools allow students to experience a customized approach, and this improves the students' skills at approaching a problem with multiple perspectives.

Thompson et al. (2020) also investigated the use of AI in encouraging creativity in problem-solving. They concluded that AI tools had the capacity to enhance creativity if they were

applied properly by giving students different perspectives and solution options that they might not otherwise have thought of. They also concluded that students who didn't properly review and critique AI-generated output weren't inclined to devise original solutions independently.

3. OBJECTIVES

1. To analyze the extent to which generative AI tools enhance or hinder students' problem-solving abilities across different academic disciplines.
2. To evaluate the impact of generative AI on students' critical thinking, decision-making, and independent problem-solving skills.

4. RESEARCH METHODOLOGY

- Research Design:** Cross-sectional study design has been used in the analysis of the effect of generative AI on the problem-solving and decision-making skills of students in different study fields. The design allows a snapshot analysis of the effect of AI at a specific moment of time.
- Data Collection Instrument:** A structured and closed questionnaire was the major source of gathering the data. The questionnaire was distributed through Google Forms so that it could be accessible and the data collected effectively.
- Sampling:** Convenience sampling has been applied in this study. The sample comprises 250 students with varied backgrounds who use generative AI tools actively for problem-solving and learning activities.
- Agreement:** Informed consent of the study participants was acquired before they enrolled in the study. They were explained the rationale of the study with the promise of voluntary participation and no external influence or force.
- Data Collection Process:** We disseminated the questionnaire online through the use of Google Forms and allowed the survey takers the ease of filling it at any suitable opportunity. This helped us record the answers systematically.

5. DATA ANALYSIS AND INTERPRETATION

The study gathered 250 students with varied backgrounds of study to study the effect of generative AI on problem-solving abilities. The participants were divided into age brackets of 18-20 years (65.6%), 21-25 years (24%), 26-30 years (5.2%), and 30 years and above (5.2%). The sample had 52.4% male and 47.6% female respondents. The education level of the sample had 80.8% of the students at the undergraduate level, 18.4% at the postgraduate level, and 0.8% at the Ph.D. level. Most of the students came from Information Technology/Computer Science (71.6%), followed by Business/Management (16%), Engineering (7.2%), Humanities (3.2%), and Social Sciences (2%). Among the use of generative AI tools in academics, 60% of the students used them every day, 30.8% used them weekly, 4.4% used them monthly, and 4.4% used them sometimes and never at all. The demographic statistics offer a general overview of the sample of the study and set the scene for the analysis of the subsequent data.

Generative AI tools help me understand problem-solving concepts better.
250 responses

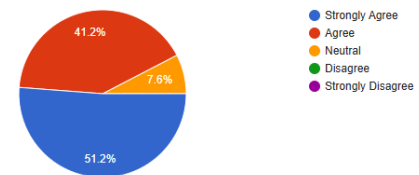


Figure 1

The findings in Figure 1 demonstrate that a majority of students (51.2% of them agreed strongly and 41.2% agreed) share the belief that generative AI tools enhance problem-solving fundamentals' comprehension among them and support the facilitative role of AI in the subject of study. The least fraction of students had a middle option of 7.6% and no students had any differing opinions, representing a general acceptance of AI as a great study aid.

I feel more efficient in solving academic problems with the assistance of generative AI tools.
250 responses

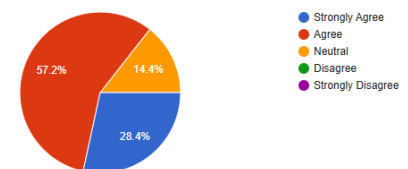


Figure 2

In Figure 2, the results illustrate that the students are more effective at resolving study problems with the aid of generative AI tools. To be specific, 28.4% of them agreed firmly and 57.2% agreed that they utilize AI as an effective device that enhances the problem-solving efficiency. 14.4% of them lie in the middle category and no participant had any expression of disagreement, further attesting the influence of AI in problem-solving in academics.

Generative AI tools provide solutions that align with my course curriculum.
250 responses

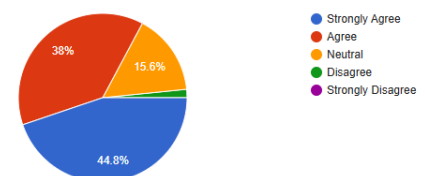


Figure 3

In Figure 3, the answers reveal that generative AI tools mainly offer answers that match students' course curricula. Most students firmly agreed (44.8%) and agreed (38%), indicating that they have confidence that AI's application relates to the contents of their academics. The smaller fraction of 15.6% stay in the middle ground, and a minimal fraction showed that they disagree, indicating that AI-generated answers effectively cater to the needs of academics.

I find it easier to apply AI-generated solutions in real-world problem-solving situations.

250 responses

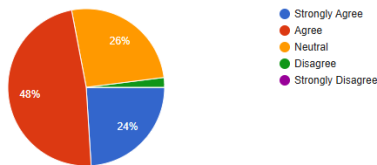


Figure 4

In Figure 4, the findings reveal that the majority of students find it simpler to use AI-generated answers in real life problem-solving contexts. 24% of the students strongly agreed and 48% agreed that AI tools are seen as functional and useful beyond the study environment. 26% of the students had a middle ground attitude and a highly minimal percent of students had a disagreeing attitude, indicating a general positive attitude toward the real life applicability of AI.

Using generative AI for problem-solving has improved my overall academic performance.

250 responses

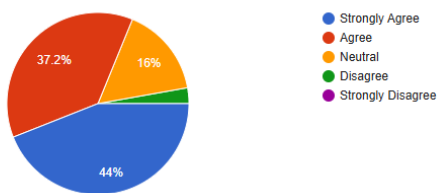


Figure 5

In Figure 5, the findings indicate that problem-solving through generative AI has had a positive effect on the overall academic performance of the students. A vast majority, 44% strongly agree and 37.2% agree, show widespread recognition of AI's contribution to academic achievement. 16% are neutral, while only a small percentage disagree, strengthening the view that AI plays a useful role in academic enhancement.

Using generative AI tools has made me less dependent on my own critical thinking abilities.

250 responses

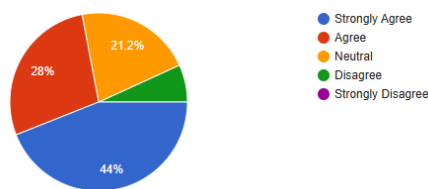


Figure 6

In Figure 6, the results identify the problem with the influence of generative AI on the independent critical skills of the students. Most of the interviewees strongly agree (44%) and agree (28%) that the use of AI tools has made them dependent less on independent critical skills. 21.2% of the interviewees

lie in the middle category, and a small fraction disagree with the notion that AI excels at problem-solving and possibly also a reason behind the lower use of independent analytical skills.

I take time to analyze AI-generated responses before accepting them as final solutions.

250 responses

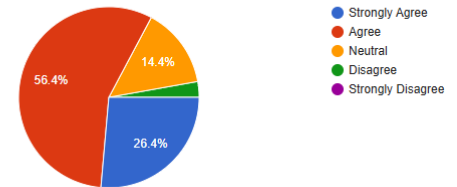


Figure 7

In Figure 7, the findings reveal that the majority of students spend time reviewing AI-generated answers prior to accepting them as final answers. 56.4% of them concur and 26.4% of them strongly concur, indicating a deliberate effort at critical analysis of AI-generated material. 14.4% of them stay neutral and a minimal fraction of them disagree, indicating that although AI usage is rampant, students still subject it to reflective analysis prior to acting based on it.

Generative AI tools encourage me to explore alternative solutions beyond what they generate.

250 responses

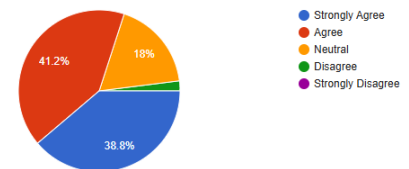


Figure 8

In Figure 8, the findings demonstrate that the generative AI tools encourage students to find further possibilities beyond the solution that has been generated. 41.2% and 38.8% of the students concur and strongly concur that students actively try a variety of possibilities and not the output of the AI system alone. 18% of the students lie in the middle ground and a small percent disagrees that the AI tools serve not as a constraint but a stimulus.

I believe that generative AI supports the development of my decision-making skills.

250 responses

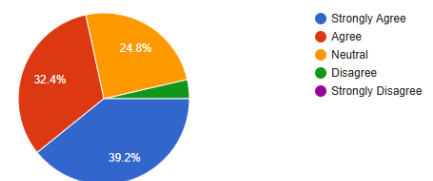


Figure 9

We observe in Figure 9 that the majority of students affirm that generative AI facilitates the enhancement of decision-making abilities. 32.4% of them agree and 39.2% of them strongly agree that the application of AI tools enables them to make good decisions. 24.8% of the students fall in the middle category and a small percent disagree with the premise that AI hinders decision-making processes.

I am more confident in solving complex problems independently after using generative AI for assistance.

250 responses

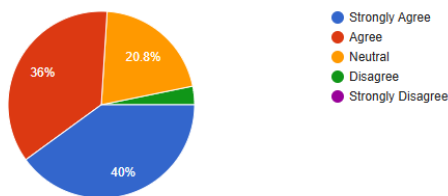


Figure 10

In Figure 10, the results demonstrate that the students are more self-assured at independent problem-solving once they use generative AI tools to aid them. 40% of them highly agree and 36% of them agree that the use of AI tools increases problem-solving confidence. 20.8% of them fall in the middle and a minimal fraction disagrees with it further confirming the overall good attitude toward the application of AI in the acquisition of independent problem-solving skills.

6. RECOMMENDATIONS

Given the increasing integration of generative AI in education, the following recommendations will endeavor to balance and utilize AI effectively within educational contexts:

- **Balanced AI Integration:** Institutions should incorporate AI tools in a way that enhances learning without creating dependency, ensuring AI complements traditional methods.
- **Encouraging Critical Thinking:** Teachers need to make students critically evaluate AI-produced answers, engaging more deeply with problem-solving.
- **Blended Learning Methodology:** The combination of AI-supported and conventional exercises needs to be followed in order to sustain good independent analytical skills.
- **Controlled AI Usage:** In tasks requiring deep reasoning, educators should limit AI reliance by requiring AI-free drafts to evaluate students' original thinking.
- **Ongoing Research:** Continuous studies should be conducted to assess AI's long-term impact on cognitive development, ensuring sustainable academic benefits.

7. CONCLUSION

The study has found that generative AI enhances the problem-solving efficiency of students, decision-making skills, and confidence of working with complex tasks. Even if AI tools encourage students to use multiple options, there also arise concerns of losing critical reasoning and heavy dependency on

pre-programmed results. Most students review AI-generated results and thus exhibit a middle ground of usage. Teachers should use AI judiciously so that it supplements and does not replace independent analytical skills and maintains a teaching environment that leverages the strengths of AI and ensures intellectual development.

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