# Personal Experiences of College Students in Utilization of Artificial Intelligence (AI) Technology in Mathematics

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## ABSTRACT

In the fast-changing landscape of 21st-century education, the integration of Artificial Intelligence (AI) technologies such as ChatGPT, Mathway, and GeoGebra has relevantly shaped how college students interact with mathematics. This qualitative-descriptive study scrutinizes the personal experiences, attitudes, and practice specimens of ten college students in the Philippines who have utilized AI tools in mathematics learning. Guided by Constructivist Learning Theory, Vygotsky's Sociocultural Theory, and the Technology Acceptance Model (TAM), the research explores how AI affects students' conceptual understanding, problem-solving confidence, and learning behaviors. Data were collected through semi-structured interviews and analyzed using Braun and Clarke's thematic analysis. Findings reveal a nuanced duality: while students perceive AI as a helpful learning companion that enhances clarity, motivation, and autonomy, they also express cautious trust and concern over potential over-reliance and cognitive passivity. AI utilization was found to be largely student-driven and peer-influenced, with learners critically sailing its benefits and limitations. The study underscores the need for AI literacy, balanced usage, and institutional assistance to ensure AI serves as a scaffold for deeper mathematical understanding rather than a shortcut for convenience. These insights inform educators and policymakers aiming to integrate AI in mathematics education responsibly and equitably.

**Keywords:** Artificial Intelligence (AI), Mathematics Education, College Students, Student Experiences, AI Tools (ChatGPT, Mathway, Geogebra, GauthMath)

## INTRODUCTION

In the context of 21st-century education, the integration of emerging technologies such as Artificial Intelligence (AI) has become increasingly relevant, especially in fields like mathematics where problem-solving, conceptual understanding, and computational skills are central. As the global community aligns itself with the United Nations Sustainable Development Goals (SDGs)—particularly SDG 4: Quality Education—there is a clear call to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." One of the SDG 4 targets emphasizes the importance of leveraging technology and digital innovation to improve learning outcomes. This aligns closely with the shift in modern education toward digital literacy, technological integration, and student-centered learning environments, which are key thrusts of 21st-century education.

Mathematics, often perceived as a challenging and anxiety-inducing subject, stands to benefit significantly from AI-driven learning tools that personalize instruction, provide real-time feedback, and offer alternative modes of explanation. Tools such as ChatGPT, Mathway, and GeoGebra are being increasingly adopted by students not only as problem-solving aids but also as supplementary resources to support classroom instruction. These AI tools are capable of enhancing access to learning, particularly for students who struggle with conventional methods or require more individualized learning experiences. The adoption of AI in education reflects the growing emphasis on adaptive learning, critical thinking, and technological fluency—all of which are cornerstones of a future-ready educational framework.

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Despite the potential of AI tools in enhancing mathematical learning, significant research gaps remain. While existing studies have investigated the efficacy of AI in education broadly, there is limited qualitative research exploring students' lived experiences, attitudes, and personal reflections on using these tools, particularly in mathematics. Most studies focus on quantitative performance outcomes or teacher perspectives, leaving the student voice underrepresented, especially in higher education contexts. Furthermore, the rapid and informal adoption of AI tools by students often occurs without institutional guidance or pedagogical frameworks, raising questions about how these tools are actually used, how they affect learning behaviors, and whether they truly foster deeper understanding or merely encourage dependence on automation.

This study sought to address these gaps by exploring the personal experiences of college students in utilizing AI technology for mathematics learning. By examining their attitudes, usage patterns, and perceived impacts on understanding and confidence, this research contributes valuable insights into how students are navigating the intersection of AI and mathematics education. The findings can inform educators, curriculum designers, and policymakers on how to more effectively integrate AI tools in math instruction, ensuring that their use promotes not just convenience, but also meaningful learning and critical engagement with mathematical concepts.

In doing so, the study supports educational innovation in line with SDG 4 and strengthens the evidence base for equitable, tech-enhanced, and student-centered approaches to mathematics learning in the digital age.

Given the increasing presence of AI tools in education and their potential to transform mathematics learning, it becomes essential to understand how students actually experience and interact with these technologies. While the background highlights the broader educational shifts and technological advancements, a closer look into students' attitudes, usage habits, and perceived impacts can offer deeper insights into the practical value and challenges of AI integration.

To this end, the present study aims to explore the personal experiences of college students in using AI technologies for mathematics, focusing on their perceptions, learning behaviors, and the influence of these tools on their confidence and understanding. The following objectives guide this investigation.

1. What are the attitudes of college students toward the integration of AI technology in mathematics learning?
2. How do college students utilize AI tools (e.g., ChatGPT, Mathway, Geogebra) to support their learning in mathematics?
3. How does the use of AI technology affect students' understanding and confidence in solving mathematical problems?

**Framework of the Study**

The conceptual framework of this study is anchored in the integration of three key theoretical underpinnings: Constructivist Learning Theory, Vygotsky's Sociocultural Theory, particularly the Zone of Proximal Development (ZPD), and the Technology Acceptance Model (TAM). Together, these frameworks provide a comprehensive lens to explore the personal experiences of college students in utilizing Artificial Intelligence (AI) tools in mathematics learning, as well as how such experiences affect their understanding, confidence, and attitudes.

Constructivist Learning Theory, developed by Jean Piaget (1970), posits that learners actively construct their own understanding and knowledge of the world through experiences and reflection. In the context of mathematics education, AI tools such as ChatGPT, Mathway, and GeoGebra can be viewed as interactive learning aids that provide immediate feedback, enabling students to explore concepts independently and make sense of mathematical ideas in a self-directed manner. This aligns with the constructivist emphasis on inquiry-based learning, where technology becomes a medium for exploration and discovery rather than mere information delivery.

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Complementing this is Vygotsky's Sociocultural Theory and the concept of the Zone of Proximal Development (ZPD). Vygotsky (1978) emphasized that learning occurs most effectively when students are supported by "more knowledgeable others" who guide them through tasks they cannot accomplish alone but can complete with appropriate support. In modern classrooms, AI technologies can act as these cognitive scaffolds—providing hints, explanations, and step-by-step problem-solving processes that help bridge gaps in understanding. These tools can thus support students in tackling complex mathematical problems that might otherwise be beyond their reach.

The Technology Acceptance Model (TAM), introduced by Davis (1989), adds a technological dimension to the framework by explaining how students' perceptions of an AI tool's usefulness and ease of use influence their attitudes toward its use, which in turn affect their actual usage behavior. In this study, TAM is used to understand why students choose to use (or avoid) certain AI tools and how these choices reflect their trust, satisfaction, and perceived value in the learning process.

Taken together, these theoretical foundations create a framework that allows for a nuanced exploration of how AI tools are integrated into students' mathematical experiences—not only in terms of usage but also in shaping their beliefs, learning behaviors, and academic confidence.

## RESEARCH DESIGN AND METHODOLOGY

This study employed a qualitative-descriptive research design to explore the personal experiences of college students in using Artificial Intelligence (AI) tools to support mathematics learning. This design is appropriate for examining participants' attitudes, behaviors, and reflections in depth, as it focuses on meaning-making and understanding lived experiences rather than measuring variables statistically. Through this design, the study aimed to generate rich, detailed narratives that capture the nuances of students' interactions with AI technologies such as ChatGPT, Mathway, and GeoGebra.

### Methodology

The study utilized semi-structured interviews as its primary method of data collection. This method allows for guided yet flexible conversations that enable participants to elaborate on their experiences, perspectives, and emotions related to the integration of AI in mathematics. This approach is especially suitable for investigating emerging educational phenomena like AI use, where standard survey instruments may be too restrictive to capture complexity.

### Participants

The participants in the study were ten college students enrolled in mathematics or math-related courses (e.g., engineering, education, computer science) at a selected higher education institution in the Philippines. These students had varying levels of exposure to AI tools used in their coursework or self-study.

### Sampling Technique

The study used purposive sampling, a non-probability sampling method where participants are selected based on specific characteristics relevant to the research questions. This technique was appropriate given the study's goal to engage students who had actual experience using AI technologies in learning mathematics.

### Inclusion Criteria

To ensure relevance and depth of data, participants were included based on the following criteria:

- Must be currently enrolled in a mathematics or math-related college course in the academic year 2024-2025.
- Must have used AI tools (e.g., ChatGPT, Mathway, GeoGebra, Gauthmath) for learning or solving mathematical problems.

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- Willing to participate in an in-depth interview and share personal learning experiences.

**Research Instrument**

The main instrument was a semi-structured interview guide developed by the researchers. The guide contained open-ended questions designed to elicit students' experiences, attitudes, usage patterns, perceived advantages, and concerns about using AI tools in math learning. Probing questions were used to encourage deeper insights.

**Validity and Reliability of Data**

To enhance credibility (internal validity), the interview guide underwent expert validation by three educators with backgrounds in educational technology, mathematics instruction, and qualitative research. Their feedback helped refine question clarity, relevance, and alignment with research objectives.

To ensure trustworthiness and reliability, the following strategies were employed:

- Pilot interviews were conducted with two non-participant students to check for clarity and consistency.
- Member checking was done by returning summarized transcripts to participants for confirmation and correction.
- Triangulation was applied by cross-referencing themes across multiple interviews.
- A reflexive journal was maintained by the researcher to document biases, decisions, and evolving interpretations during the research process.

**Data Gathering Procedure**

In conducting the study, informed consent was first secured from each participant to ensure that they fully understood their rights and the purpose of the research. After gathering their consent, participants were interviewed face-to-face to obtain important insights. With their permission, the interviews were audio recorded and later transcribed verbatim for analysis. Throughout the procedure, confidentiality was strictly upheld by assigning coded aliases to participants and storing all gathered data securely.

**Data Analysis Procedure**

The data were analyzed using thematic analysis, following Braun and Clarke's (2006) six-phase approach. The process began with familiarization, where transcripts were read and re-read to immerse in the data. Next, initial codes were generated by systematically coding meaningful segments. These codes were then categorized into potential themes that reflected emerging patterns. The identified themes were carefully reviewed and refined to secure they accurately represented the data. Afterward, the themes were clearly defined and named, with supporting excerpts identified to strengthen the analysis. Ultimately, the themes were integrated into the final narrative and connected to the research questions and significant literature.

This rigorous research design and methodology ensured that the study could authentically capture and analyze the lived experiences of college students regarding AI use in mathematics. By combining validated instruments, ethical procedures, and systematic data analysis, the study offers a credible, in-depth look at how AI is reshaping learning practices in the 21st-century digital classroom.

**Ethical Considerations**

This study adhered to strict ethical standards to ensure the protection, dignity, and rights of all participants involved.

**Informed Consent**

Participation in the study was voluntary. All participants were fully informed about the nature, purpose, procedures, and expected duration of the study. A written informed consent form was provided, which included

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information about their right to decline or withdraw from the study at any point without any negative consequences. Only those who signed the consent form were included in the interviews.

To ensure ethical standards were upheld, several measures were observed throughout the study. Confidentiality and anonymity were maintained by anonymizing all identifying information, using pseudonyms or participants codes in transcriptions and reports, and ensuring audio recordings and transcripts in a password-protected digital folder accessible only to the researcher. No real names or personally identifying details were included in any published outputs.

Participation was entirely voluntary, and participants were reminded of their right to withdraw from the study at any time without explanation or penalty, as well as their freedom to skip queries they found uncomfortable or intrusive. The integrity and the used of data were strictly for academic and research purposes, with all results reported truthfully and objectively. Interpretations based solely on the data provided by the participants, and audio files and transcripts will be stored securely for a specified retention period (e.g., five years) before being permanently deleted.

Furthermore, respect for intellectual property was secured by properly citing and acknowledging all literature, ideas, and tools used in the research to maintain academic honesty and avoid plagiarism. Through observing these ethical considerations, the study guaranteed that the rights, welfare, and contributions of the participants were respected throughout the research process.

## RESULTS AND DISCUSSIONS

To explore college students' attitudes toward the integration of Artificial Intelligence (AI) technology in mathematics learning, this section presents key findings derived from qualitative data gathered through semi-structured interviews. Guided by a descriptive qualitative research design, the study sought to capture students' personal insights, feelings, and perspectives regarding the role of AI tools—such as ChatGPT, Mathway, and GeoGebra—in their learning experiences. The responses were analyzed using Braun and Clarke's (2006) thematic analysis approach, allowing for the identification of recurring patterns and significant themes. These themes reveal both positive and ambivalent attitudes, highlighting the complexities of students' perceptions as they engage with AI in a subject often perceived as challenging. The themes discussed below offer a deeper understanding of how students relate emotionally, cognitively, and practically to AI integration in their mathematics education.

### College Students' Attitude Towards AI Technology Integration in Mathematics Class

To understand college students' attitudes toward the integration of AI technology in mathematics classes, their personal reflections and experiences were carefully analyzed. The insights gathered revealed a range of perspectives that capture students' enthusiasm, concerns, and overall perceptions of how AI tools influence their learning. From this analysis, several key themes emerged that illuminate the various factors shaping students' attitudes toward AI integration in their math education.

#### Theme 1: AI is a helpful learning companion with cautious optimism

The participants' perspectives strongly support the idea that **AI tools are seen as valuable assistants in learning mathematics**, particularly for complex topics or when traditional resources (e.g., textbooks or classroom instruction) fall short. Tools like **ChatGPT, Gauthmath, Geogebra, and Mathway** are often cited as giving **step-by-step solutions, explanations, and feedback** that help students **clarify mathematical concepts**, **verify their own solutions**, and **build confidence** in problem-solving.

However, this **optimism is balanced by a cautious stance**. Many participants are aware that **AI is not infallible**—errors in output, misleading solutions, or unexplained methods have led them to double-check AI responses with books, notes, or teacher feedback. This shows the students' **growing digital literacy** and **critical thinking** when using AI.

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They do not blindly rely on AI but **position it as a support tool**, not a replacement for their own understanding or for formal instruction. This cautious optimism reflects an emerging **AI-savvy learner identity**: one that blends digital tools with human reasoning.

Further, the students view AI as a **helpful yet imperfect learning companion**, especially in the context of learning mathematics. One of the most notable benefits is how **AI enhances clarity and understanding**, particularly when classroom instruction falls short or when students face especially challenging problems. As Kit expressed,

> *"AI has been assisting my knowledge in Mathematics, especially that*
>
> *I am a product of pandemic. It fosters my learning by supporting*
>
> *the most basic knowledge of mine and it even deepens it."*

Also, Mica echoed a sense of support that when using AI tools like GauthMath for Calculus tasks, she shared that,

> *"The step by step is very detailed and like ma-comprehend mo*
>
> *gid bala," (The steps are very detailed and we can really*
>
> *comprehend them)*

The statement indicates that AI can break down complex concepts in a digestible manner, making learning more accessible and manageable.

Moreover, students recognize that AI enables **self-paced and independent learning**, empowering them to study on their own terms and revisit concepts as needed. However, this optimistic stance is tempered by **critical awareness of AI's limitations**. Students commonly described AI as a **secondary or verification tool**, rather than a primary source of learning. As Rory mentioned,

> *"I use it to verify the answer. For instance, nga I got the same answer with AI,*
>
> *syempre gaka-satisfied and confident ko." (I use it to verify the answer.*
>
> *For instance, if I got the same answer with AI, it brought me satisfaction*
>
> *and confidence.)*

On the other hand, when discrepancies arise, students do not automatically accept AI's answers, but instead return to their own work to validate and correct any inconsistencies.

In this sense, **AI use is situational and selective**, with many participants highlighting that they only turn to these tools when absolutely necessary—such as during tight deadlines, complex topics, or unclear instructions. Josh summarized this well:

> *"Ginagamit ko siya kung kinanglanon ko na gid sang assistance…*
>
> *pero ndi man gd adlaw-adlaw." (I only utilized it if I really*
>
> *need assistance… but not every day.)*

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Similarly, Angelo emphasized the importance of moderation:

*"Not really, not everyday use… because as a teacher dapat indi kita dependent sa AI." (Not really, not in everyday use, because as a teacher we must not be dependent in AI.)*

This deliberate, measured use reflects a broader understanding that while AI is beneficial, overreliance could hinder the development of independent problem-solving skills.

The **emotional dimension** of AI use also emerged strongly. Students often experience **relief, confidence, or satisfaction** when AI helps them arrive at correct solutions or understand difficult concepts. For example, Jenny remarked,

*"So, naging easy para sa akon ang akon nga pagtuon sang Mathematics... with the use of AI kung may nabudlayan ko nga suma... I feel satisfaction and happiness." (So, studying Mathematics became easier for me... with the use of AI, especially when I have difficulty in solving problems... I feel satisfaction and happiness.)*

This also applies for others like Denzel, the experience was,

*"malipay ka… makabulig siya sa imo para ma-motivate ka mag-answer kag mag-discover more pagid." (You will feel happy… it can help to be motivated answering and discovering even more.)*

These positive emotions reveal the affective role AI plays in reducing academic anxiety and increasing students' motivation.

However, not all experiences are positive. Some students expressed **frustration and disappointment** when AI failed to provide complete or accurate information. As Eren recounted,

*"Na disappoint ko kay kis-a waay siya step by step solution... dagdag lang ang kasadyahan mo" (I get disappointed sometimes because it does not provide a step-by-step solution... and suddenly the happiness I have felt will drop.)*

This highlights the emotional letdown that occurs when AI falls short of expectations. Despite these challenges, students like Ram remain analytical and cautious:

*"Gaka-feel ko gid nga kis-a ang akon nga perceptions about sa Math is gaka-dugangan and gaka-less ang burden... but I still analyze the information, not just copy." (I really feel that sometimes my perceptions about Math improve and the burden becomes lighter... but I still analyze the information, not just directly copy it.)*

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The sentiments show a growing maturity in how learners interact with AI—not as passive recipients of answers, but as active users who engage critically with the information they receive.

Ultimately, students see AI as a **valuable ally in their learning journey**, but one that must be used wisely and critically. It supports understanding, enables self-paced learning, and fosters confidence, but also demands caution due to its imperfections. As Angelo aptly concluded,

> *"We felt happy gid and glad about AI nga ga help sa atun especially in*
>
> *Mathematics... but sometimes it's quite scary because students use*
>
> *AI as a replacement rather than as a tool." (We really felt happy*
>
> *and glad about how AI helps us, especially in Mathematics...*
>
> *but sometimes it's quite scary because some students use*
>
> *AI as a replacement rather than just a tool.)*

This tension between appreciation and concern captures the essence of **cautious optimism** that defines the current student experience with AI in mathematics learning.

For example, Denzel pointed out that AI can sometimes provide inaccurate answers, emphasizing the importance of proper usage:

> *"Ang AI bi is kis-a gaka-sala siya sa paghatag sang answers... if ma*
>
> *use mo siya nga in a right way or right usage, ang AI makabulig*
>
> *gid siya aton bilang isa ka estudyante." (AI sometimes gives*
>
> *wrong answers... but if you use it in the right way, or with*
>
> *proper usage, AI can really help us as students.)*

This duality—trust coupled with critical evaluation—highlights a mature, evolving digital literacy among students. They are not passive consumers of AI-generated answers but active evaluators who cross-check outputs, seek validation from textbooks, teachers, or their own logic, and use AI primarily for conceptual reinforcement rather than substitution.

Notably, Rory articulated a selective reliance on AI:

> *"I don't really rely too much [on ChatGPT] especially in Mathematics…*
>
> *There are some parts gid nga indi mo ma-gets kung paano siya*
>
> *ging-derive ang process." (I do not really rely too much on*
>
> *ChatGPT, especially in Mathematics… There are certain*
>
> *parts that you really cannot understand, like how*
>
> *the process was derived.)*

This perspective supports the idea that students view AI not as a replacement for human instruction or independent reasoning but rather as a supplementary learning aid. It underscores a strategic integration of AI—

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students choose to engage with it when it adds value, particularly when grappling with challenging problems or seeking confirmation.

These findings align with Alkhatib et al. (2021), who observed that AI tools, when used judiciously, enhanced student confidence and learning autonomy, especially when AI was employed for solution verification rather than rote dependence. Similarly, Krouska et al. (2020) noted increased student engagement and curiosity, but emphasized the need for students' critical thinking and instructor guidance, as AI accuracy is not guaranteed.

**Theme 2: AI integration is a student-driven and peer-influenced discovery**

The integration of artificial intelligence (AI) tools into the mathematics learning process of students appears to be largely organic and student-initiated, rather than institutionally mandated or formally introduced. This theme captures the grassroots nature of how AI becomes embedded in students' academic routines—through peer sharing, social media exposure, and personal experimentation. As Jenny candidly shared,

*"My classmates suggest man sila nga may mga GauthMath... MathPapa,*

*Mathway. Yes, amo na through my classmates." (My classmates*

*also suggested apps like GauthMath, MathPapa, and Mathway.*

*Yes, I learned about them, through my classmates.)*

This highlights the central role of peer influence in tool discovery and adoption, forming a culture where students crowdsource solutions and collectively determine the credibility and usefulness of digital learning aids.

The informality of AI adoption is echoed across participants, with many describing how they began using tools like ChatGPT, Mathway, and GauthMath not because of teacher recommendations, but due to curiosity, necessity, or suggestions from friends. This informal, socially driven process aligns with what Zawacki-Richter et al. (2019) identify as a key trend in the digital transformation of education: students often adopt emerging technologies more quickly and independently than formal educational systems. Holstein et al. (2020) further emphasize that while student-led experimentation with technology can foster autonomy and motivation, it requires structured support and guidance to ensure that these technologies are applied in pedagogically sound ways.

Interestingly, although a few educators do introduce AI tools in the classroom, this remains the exception rather than the rule. Angelo acknowledged,

*"Some teachers introduce AI, but not all… it's up*

*to us students to discover and try it."*

This suggests a significant disconnect between student innovation and institutional support, which may leave students to navigate AI use without adequate critical literacy or training in its limitations and ethical implications.

The frequency of AI use among students further underscores its situational and needs-based nature. Mica noted,

*"Rarely lang. Ginagamit ko lang siya if I find the Math activities*

*too difficult or very complex…" (Rarely. I only use it when*

*I find the Math activities too difficult or very complex.)*

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Similarly, Josh remarked,

*"Ginagamit ko siya kung kinanglanon ko na gid sang assistance…*

*pero indi man gd adlaw-adlaw." (I only utilized it if I really*

*need assistance… but not every day.)*

These statements reveal that students are selective and strategic in their AI use—turning to it primarily when faced with challenging content or tight deadlines. This trend suggests that AI is perceived not as a routine crutch but as a situational scaffold.

While most students use AI tools sparingly, others like Freya use it for specific academic tasks such as,

*"Note taking and constructing lecture notes"*

However, Freya also shared not for solving complex problems, citing skepticism about AI's reliability:

*"I do not rely on ChatGPT when it comes to problem solving kay*

*may mga questionable man nga process…" (I do not rely on*

*ChatGPT when it comes to problem solving because some*

*of its processes are questionable.)*

This duality—of recognizing AI's helpfulness while remaining critical of its flaws—is a key feature of the current student mindset.

Students are also aware of the potential dangers of overreliance. Eren, for instance, reflected,

*"Kung magsalig ka sa amo na application kag mga AI feeling ko*

*makaguba siya sa aton… indi na ta kabalo magsuma nga halin*

*gid sa aton kaugalingon." (If you rely too much on those*

*applications and AI, I feel like it can ruin us… we might*

*no longer know how to solve problems on our own.)*

This awareness points to an emergent digital literacy among students, where they are not blindly dependent on AI, but are learning to balance its use with their own cognitive effort.

However, a notable barrier to effective AI integration is the lack of foundational mathematical knowledge, especially among high school students. Kit, now an intern teacher, observed:

*"The students do not have the prior knowledge… how can they use*

*or how can this AI assist their learning… if they do not*

*understand a single thing about it?"*

This echoes studies by Luckin et al. (2016), who argue that while AI can provide individualized support, it cannot replace foundational instruction and conceptual understanding—especially in subjects like mathematics that build cumulatively over time.

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Despite the informal pathways to AI adoption, emotional responses to its use are strong and often positive. Many students describe feeling relief, confidence, and satisfaction when AI helps clarify difficult problems. Rory said,

> *"I feel satisfied… For instance, I got the same answer with AI,*
>
> *syempre gaka-satisfied and confident ko." (I feel satisfied…*
>
> *For instance, when I get the same answer as AI,*
>
> *of course, I feel satisfied and confident.)*

Jenny echoed similar sentiments:

> *"Now with the aid of AI… we can always ask the support of the AI and*
>
> *with that daw mas mahagan-hagan ang pagsuma namon." (Now with*
>
> *the aid of AI… we can always ask for its support, and because*
>
> *of that, solving problems feels a bit lighter for us.)*

However, frustrations also arise when AI falls short of expectations or produces incorrect outputs. Mica described such a moment:

> *"Frustrated, sometimes… complex questions nga e-enter mo kay du*
>
> *mafrustrate ka bala kung indi mo makwa ang answer… du nadula*
>
> *ang isa ka variable." (Frustrated, sometimes… when you enter*
>
> *complex questions, you get frustrated if you can't get the*
>
> *answer… it's like one variable just disappears.)*

This reinforces that while AI tools can enhance motivation and reduce cognitive load, they also introduce new forms of confusion, especially when their outputs lack transparency or contain subtle errors.

Overall, this theme emphasizes a critical juncture in digital learning: while students are proactively and creatively integrating AI into their study habits, formal educational institutions are lagging behind. The data suggests a pressing need for schools and teacher education programs to not only acknowledge but actively support this trend—by embedding AI tools within the curriculum, offering training on their effective and ethical use, and aligning technological support with curricular goals.

In essence, the current landscape represents both an opportunity and a challenge: students are leading a quiet but powerful revolution in how they learn mathematics with AI, but without formal scaffolding, the full potential of these tools may remain unrealized. By bridging the gap between institutional practices and student innovation, educators can ensure that the benefits of AI use are equitably and effectively harnessed for deeper mathematical understanding.

**How College Students Utilize AI Tools to Support their Learning in Mathematics**

To explore how college students utilize AI tools such as ChatGPT, Mathway, and Geogebra in supporting their mathematics learning, their experiences and usage patterns were examined in depth. The students' responses revealed diverse ways these technologies are integrated into their study routines, problem-solving processes, and conceptual understanding. From the analysis, several key themes emerged that highlight the practical

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applications, benefits, and challenges of using AI tools in mathematics education.

**Theme 1: AI is a supplementary learning tool for conceptual understanding and verification**

Many participants in the study perceive AI tools not as replacements for traditional learning but as valuable supplements that aid in deepening their conceptual understanding and verifying solutions. For example, Kit shared,

> *"We need this Geogebra to understand more the concept of Geometry...*
>
> *Mathway, we are just there searching for solutions to the equations,*
>
> *if it is right or maybe we can make it easier to answer." (We need*
>
> *GeoGebra to better understand the concepts in Geometry.*
>
> *As for Mathway, we mostly use it to search for solutions*
>
> *to equations — to check if they're correct or to find*
>
> *easier ways to solve them.)*

This highlights how AI tools like Geogebra help visualize abstract geometrical concepts, making them more accessible, while Mathway serves as a means for solution verification and simplification.

Similarly, Jenny noted,

> *"Not just Gauthmath lang may-ara man ko Mathway kay gina verify ko...*
>
> *gina compare ko ang ila answer tas gina verify ko man sa akon answer*
>
> *kung chakto gid man bala." (Not just GauthMath — I also use*
>
> *Mathway because I verify and compare their answers, then*
>
> *I check if my own answer is really correct.)*

This illustrates how students cross-check answers from multiple AI sources to ensure accuracy and deepen their understanding. Rory also expressed a cautious but purposeful use of AI:

> *"I do not use [ChatGPT] directly… I use it for verification if it coincides*
>
> *with my answers... there are some parts gid nga indi mo ma-gets*
>
> *kung paano siya ging-derive…" (I do not use ChatGPT directly…*
>
> *I use it for verification, to see if it matches my answers. But*
>
> *there are certain parts that I really cannot understand,*
>
> *like how the solution was derived.)*

It suggests that AI serves as a backup tool to clarify complex steps that students find difficult to grasp independently.

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Ram summed up the general sentiment well:

*"Nami siya nga AI technology because maka-help gd siya about sa*

*pagpainchindi in a way nga easy i-catch up…" (It's a great AI*

*technology because it can really help in making things easier*

*to understand — in a way that's easy to catch up with.)*

The statement affirms the accessibility and clarity AI tools provide in learning challenging mathematical content.

These narratives align with existing literature emphasizing the supportive role of AI in mathematics education. Holstein et al. (2019) found that AI-based tools function effectively as cognitive partners by delivering step-by-step guidance, enabling learners to self-correct and reinforce their conceptual understanding. Likewise, Ekanayake and Wishart (2020) highlighted that AI yields the greatest benefit when positioned as a supplementary resource rather than the primary mode of instruction. Together, these findings underscore that AI technology serves as an empowering scaffold, fostering student autonomy and enhancing comprehension in complex mathematical topics.

**Theme 2: Trusting AI with caution and precaution for over-reliance**

While many college students acknowledge the benefits of Artificial Intelligence (AI) tools in mathematics learning, a prevailing sentiment among participants is cautious trust in these technologies. Students appreciate AI for offering alternative explanations, especially in topics like trigonometry and calculus, but simultaneously express concerns about its accuracy and their increasing dependence on it. Several participants shared personal experiences where AI—particularly ChatGPT—produced inaccurate or confusing results, leading them to question its reliability. For instance, *Mica* openly stated,

*"I tried [ChatGPT] once and I'd say I'm not a fan of it because...*

*the answers that came out is wrong...*

*I really don't trust AI ChatGPT at all."*

Likewise, *Rory* expressed frustration over AI's verbose explanations:

*"The process it provides is too lengthy, and there are*

*certain parts that are hard to understand."*

This skepticism reflects a growing digital literacy among students, who now recognize that AI is not infallible. Many refrains from blindly accepting AI-generated solutions. *Josh*, for example, shared how they often compare AI's answers with their own before deciding whether to trust them:

*"I try to solve it first, then check with AI… and if the answers*

*don't align, I double-check using books or other sources."*

Beyond accuracy, students are increasingly worried about the cognitive impact of AI reliance. *Eren* voiced a widely felt concern:

*"If you rely too much on that kind of application, I feel like*

*it can ruin us… we might no longer know how to solve*

*problems on our own."*

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Similarly, *Angelo* warned,

*"Students are using AI as a replacement — it's no longer*

*being used as a tool, but rather as a substitute."*

These sentiments align with findings from Zawacki-Richter et al. (2019) and Al-Azawei et al. (2022), who both caution that uncritical dependence on AI may hinder the development of critical thinking and self-regulated learning.

The risk of misuse is not merely theoretical—it is observed and admitted by students themselves. Several participants confessed to misusing AI during periods of academic pressure. *Mica* admitted,

*"I copy the whole answer and when we checked it the following morning,*

*the answer is wrong… I just copy it without deeper thinking."*

*Jenny* echoed a similar experience in Calculus:

*"There were assignments I immediately searched using AI…*

*then just copied the answer due to the deadline."*

Others, like *Rory*, attributed misuse to procrastination:

*"When there's a deadline and I'm cramming, I tend to*

*rely on AI and just copy the information it provides."*

However, it is important to note that this misuse is often paired with self-reflection and efforts to regain academic integrity. Many participants now adopt strategies to balance AI use with independent problem-solving. *Kit* described their personal rule:

*"I first try to solve it before I go to AI. If the answer doesn't align,*

*I check with books or ask others. I won't just follow ChatGPT."*

This approach mirrors what Holstein et al. (2019) refer to as "AI as a cognitive partner"—tools that aid rather than replace thinking.

Students have also developed responsible behaviors when interacting with AI tools. *Freya* explained,

*"I'm very vigilant when it comes to what ChatGPT provides.*

*I even ask it for references to verify the accuracy."*

Meanwhile, others emphasized self-discipline and moderation, such *as Rory*, who said,

*"I minimize my use of AI… because I value independent*

*problem-solving more in math."*

The core insight from this theme is not an outright rejection of AI, but a deepening maturity in how students engage with it. They are learning to view AI not as a magic solution but as a learning supplement that must be

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used critically and ethically. As Rory concluded,

> *"AI is helpful… but we need to use our minds or our critical thinking. If you don't understand the concept, AI won't be much help either."*

This theme captures the dual reality of AI integration in mathematics education: it is both a powerful ally and a potential crutch. Students' voices highlight the need for continued guidance in developing digital discernment, ensuring that AI serves as an empowering tool rather than a shortcut that undermines real learning.

**How Does the Use of AI Technology Affect Students' Understanding and Confidence in Solving Mathematical Problems?**

In recent years, the integration of Artificial Intelligence (AI) into education has gained momentum, offering powerful tools such as ChatGPT, Gauthmath, and other AI-driven platforms that provide instant feedback and step-by-step solutions to mathematical problems. These tools are especially attractive to learners struggling with complex concepts or lacking access to real-time instructional support. However, while AI offers unprecedented opportunities to support mathematical learning, it also raises critical questions about its impact on students' **conceptual understanding** and **confidence in problem-solving**. This study seeks to explore the question: **"How does the use of AI technology affect students' understanding and confidence in solving mathematical problems?"**

Insights gathered from students' experiences reveal nuanced and often conflicting views. On one hand, AI is celebrated for its ability to simplify explanations, provide multiple solution methods, and clarify abstract mathematical ideas—benefits that can boost learner confidence and comprehension. On the other hand, concerns persist about **AI's accuracy, over-reliance**, and the **potential erosion of critical thinking and problem-solving independence.** These themes emerged strongly in students' narratives, including admissions of AI misuse for assignments, frustrations with incorrect answers, and efforts to balance AI support with traditional study practices. Many participants described their journey from blind dependence to more reflective and strategic use of AI tools.

As such, the emerging themes—**cautious trust in AI, concerns about misuse and over-reliance,** and **efforts to preserve independent thinking**—highlight the complex ways AI influences not just academic performance, but also students' learning behaviors, beliefs, and confidence. This study, therefore, aims to contribute to ongoing discussions about how educators and learners can best navigate the evolving role of AI in mathematics education, ensuring that its integration empowers rather than replaces student learning.

**Theme 1: AI becomes the tool for personalized and efficient learning**

The integration of AI into students' academic routines has transformed how many approaches learning mathematics. For a significant number of participants, AI tools have become essential companions in their learning journey—allowing for personalized, adaptive, and efficient study practices. Students reported using AI for a variety of purposes: summarizing complex topics, generating organized notes, creating practice tests, and offering visual or interactive content that aligns with their individual learning styles.

Rory emphasized how AI has helped streamline his study process:

> *"With the use of AI technology, I can ask it to provide me with the precise or pinakalip-ot nga pag-plastar nga pwede mabutang sa isa ka file… mapagamay ya ang pinakalaba-laba nga topic para*

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*mas mahapos ini tun-an." (I can ask AI to provide me with a*

*more simplified format that can be compiled into a file—it*

*shortens lengthy topics and makes them easier to study.)*

Similarly, Josh shared how AI-based applications such as Kilo Notes provide structure and ease of access:

*"Sa Kilo Notes… mas gahapos ang access sang akon pagtuon kay*

*naka-organize na ang tanan kag may mga given questions or*

*test like multiple choice… pwede ko practicesan." (Studying*

*becomes easier for me because everything is already*

*organized, and there are test questions like multiple*

*choice that I can use for practice.)*

Participants appreciated how these tools offer tailored assistance, particularly in breaking down abstract concepts or long readings into manageable chunks. However, some also expressed concern over the convenience potentially breeding dependency. Jenny, for instance, admitted:

*"With the use of AI… daw nadula nana ang akon pagkamapisan*

*sa pagbasa sang libro kay mangita pako sa page... kung i-type*

*ko lang sa AI ara na dayon ang sabat." (With the use of AI,*

*I've become less diligent in reading books because I still*

*have to search for the page, but with AI, I just type it*

*in and the answer is there instantly.)*

This reflects a subtle tension—while AI enhances efficiency, it may also discourage the development of essential academic habits such as deep reading or independent research.

Interestingly, others highlighted how AI can go beyond shortcuts to actually foster deeper learning. Kit explained:

*"Applications like Kahoot and GeoGebra encourage our critical*

*thinking and engagement. It opens our minds… not just to*

*answer but also to think critically."*

The data suggests that students view AI not just as a source of answers, but as a learning scaffold—one that adapts to their preferred study strategies and accelerates their understanding of mathematics. These tools help students engage with the content in more accessible and organized ways, enabling them to learn at their own pace and style. Visual learners benefit from graphs and animations in tools like GeoGebra, while verbal learners appreciate summarized explanations from platforms like ChatGPT.

However, the discussion also reveals a growing dependence on convenience. While AI saves time and effort, it risks diminishing students' intrinsic motivation to engage in deeper learning practices, such as reading

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textbooks, solving problems manually, or reflecting on mistakes. The loss of "*pagkamapisan*" or industriousness in traditional study methods—as mentioned by Jenny—indicates a need to strike a balance between utilizing AI effectively and maintaining strong learning habits.

**Theme 2: AI paves way to dual functions: empowerment and dependence**

AI in mathematics education is a double-edged sword—its potential to empower learners is as significant as its risk of fostering dependency. On one hand, AI technologies promote active engagement by simplifying complex concepts, supporting diverse learning styles, and providing personalized feedback. On the other hand, when overused or misused, AI can suppress students' critical thinking and undermine their capacity for independent problem-solving. The key distinction lies in how students choose to interact with AI—whether they see it as a learning companion or simply as a shortcut.

Participants in the study clearly recognized both the empowering and limiting aspects of AI. For instance, Ram highlighted the importance of learner agency, stating that,

> *"Naga-promote sa both passive and active kay nakadepende*
>
> *gid na siya sa person… kung ikaw ang naga-control sa AI*
>
> *daw nagiging active learner."* (It promotes both passive
>
> and active learning because it really depends on the
>
> person… if you are the one controlling the AI,
>
> you kind of become an active learner.)

His insight reflects a nuanced understanding that AI is inherently neutral—its impact depends on how it's used. Similarly, Denzel observed that,

> *"Maybe ang AI maka do both… naga-help siya nga mangin active*
>
> *man ang participation… but kis-a man naga-depende man siya*
>
> *sa mood or manner sang student."* (Maybe AI can do both…
>
> it helps encourage active participation… but sometimes, it
>
> also depends on the mood or attitude of the student.)

This statement reinforces that motivation and personal learning style influence whether AI facilitates deeper learning or fosters complacency.

However, concerns about mental laziness and over-reliance also emerged. Mica candidly shared,

> *"Like kung budlay-budlay nagid natamad na ko mag-inchindi… Okay*
>
> *nani ah copyhon ko nani kay AI mani."* (Like when it gets really
>
> hard and I'm already too lazy to understand… I just think,
>
> "This is fine, I'll just copy it since it's from AI anyway.)

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In which the statements reveal how AI can be misused as a quick fix when motivation wanes. Eren echoed this concern, noting that,

> *"Passive, kay ang estudyante du tamaran na lang mangita sang*
>
> *solution… spoon-feed na lang… basta may AI."* (Passive,
>
> because the student just gets lazy to find the solution…
>
> they just want to be spoon-fed… as long as there's AI.)

Leading a warning that uncritical dependence on AI can lead to cognitive stagnation. This "spoon-feeding" phenomenon raises a critical issue: AI, when treated as a solution provider rather than a thinking partner, can erode students' confidence and discipline in problem-solving.

The analysis reveals that AI serves either as a cognitive amplifier or a crutch depending on student behavior. Students who approach AI with curiosity, verify its responses, and use it to supplement their understanding can develop stronger problem-solving skills and confidence. In contrast, those who use AI to bypass effort risk weakening their foundational understanding—especially in a subject like mathematics, where process and reasoning are just as important as final answers. This dichotomy reflects broader pedagogical challenges. Learners who use AI to generate additional practice problems, break down complex concepts, or compare multiple solutions benefit from enriched learning experiences. Conversely, those who passively accept AI-generated outputs without engaging in verification or deeper analysis fall into patterns of surface learning.

This theme reinforces the idea that AI is neither the enemy nor the savior in education—it is a reflection of user intent. As Angelo put it,

> *"Use AI as a tool, not a replacement for everything."*

Educators, therefore, have a crucial role in shaping how AI is integrated into learning environments. They must encourage reflective, ethical, and purposeful use of AI, guiding students to recognize when to leverage its strengths and when to rely on their own reasoning.

Ultimately, the dual nature of AI use in mathematics signals a need for enhanced digital literacy and self-regulated learning. Students must not only ask what AI can do for them but also what they are still responsible for doing themselves. The goal is not to remove AI from the classroom, but to ensure its use cultivates growth rather than dependency.

## CONCLUSIONS

College students likely perceive AI tools as supplementary aids rather than replacements for traditional learning methods. Their use of platforms like ChatGPT, Mathway, and GeoGebra appears to be driven by a desire to verify answers, clarify complex steps, and enhance their conceptual understanding. This cautious use is probably shaped by their awareness of AI's limitations, such as occasional errors or vague explanations, and reflects a growing digital literacy as they balance convenience with critical thinking.

Students generally feel that AI tools boost their confidence and comprehension—especially when used strategically. Tools that offer visualizations or simplified explanations likely cater to diverse learning styles, helping make abstract math concepts more digestible. However, when AI is used passively or for shortcutting assignments, its benefits tend to diminish. This suggests that AI can only meaningfully support learning when students remain actively engaged in the problem-solving process.

Many students are also mindful of the risks of over-reliance on AI, particularly during periods of academic pressure or procrastination. They admit that copying solutions without deeper understanding can lead to weakened problem-solving skills over time. The ease and speed of AI responses probably tempt some students

to bypass traditional study habits, raising concerns about the erosion of effort, persistence, and independent reasoning—skills essential to mastering mathematics.

Another significant finding is that AI adoption is largely peer-driven and informal. Most students discovered these tools through classmates or online communities rather than formal instruction. This organic, self-directed exploration perhaps leads to varied usage patterns—from responsible use to misuse—depending on personal discipline, motivation, and prior math competence. Without institutional guidance, students are navigating AI use largely on their own, learning from trial, error, and shared experience.

Ultimately, students' attitudes toward AI reflect a duality: they appreciate its power to support and personalize learning but remain wary of its drawbacks. This awareness probably stems from both personal experiences and broader educational values emphasizing critical thinking and independence. As AI continues to evolve, helping students develop ethical, reflective, and balanced use of these tools will be essential to ensure that technology remains a scaffold for learning—not a substitute for it.

## RECOMMENDATIONS

*Integrate AI Literacy into the Curriculum*. Educators and institutions may consider incorporating AI literacy into mathematics instruction. This includes teaching students how to critically evaluate AI-generated solutions, understand their limitations, and use these tools ethically. Workshops or modules on effective and responsible AI use can help students move beyond blind dependence and develop digital discernment.

*Promote Active Learning with AI Tools*. Faculty may encourage students to use AI tools not just for answer retrieval but for engaging with mathematical processes. Activities such as comparing AI outputs with manual solutions, asking students to explain AI-derived steps, or integrating AI tools into collaborative problem-solving can foster deeper understanding and reinforce critical thinking.

*Monitor and Address Over-Reliance on AI*. To mitigate the risk of academic laziness, educators are encouraged to create assessments and learning tasks that require process-based reasoning and explanation. Encouraging students to document their own problem-solving steps, rather than submitting AI-generated answers, can help preserve independent thinking and discourage shortcut-seeking behavior.

*Provide Institutional Guidance and Resources*. Since students often discover AI tools informally, schools and universities may take a more active role in guiding their use. Providing approved AI resources, tutorials, and guidelines—along with clear policies about acceptable use—can ensure consistency, prevent misuse, and align AI use with academic integrity standards.

*Foster a Culture of Reflective and Balanced AI Use*. Educators and mentors may engage students in discussions about the ethical and cognitive implications of AI use. Reflection activities, such as journaling about when and why they use AI, can help students become more mindful of their learning habits and better understand when AI enhances—or hinders—their learning process.

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