THE IMPACT OF OVERDEPENDENCE ON LARGE LANGUAGE MODELS (LLMS) ON THE COGNITIVE COMPETENCE OF UNDERGRADUATE STUDENTS. (WITH REFERENCE TO HYDERABAD)

M. Pavitrambika
Assistant Professor,
Department of Management
St. Mary's College,
Yousufguda, Hyderabad
pavitrakiran3@gmail.com

Lasya Sri Chaluvadi
Student, BBA 2nd Year
St. Mary's College,
Yousufguda, Hyderabad
lasyachaluvadi9@gmail.com

Justine Polepaka
Student, BBA 2nd Year
St. Mary's College,
Yousufguda, Hyderabad
justinepole1246@gmail.com

Abstract

This study explores the impact of the overdependence of undergraduate students on Large Language Models (LLMs) and how it influences their capability to think for themselves, specifically, critical thinking, problem-solving, creativity, and decision-making skills. The rapid increase in students' dependence on LLMs has transformed learning and academic practices by providing instant access to information, writing assistance, explanations, and problem-solving support. This has been accompanied by an abnormally excessive reliance, which has led to passive learning, a reduction in intellectual effort, and weakening of information evaluation and intellectual reasoning skills.

Keywords: Overdependence on LLMs, Large Language Models, cognitive competence, undergraduate students, critical thinking, creativity.

Introduction

Generative AI has quickly become part of academic work for many college students. Students use large language models (LLMs) to get explanations, find answers, understand difficult topics, and improve assignments. Because these tools are fast and accessible, their use has increased in higher education (Sardi et al., 2025; Zhai et al., 2024; Lopulalan et al., 2026). However, this convenience may also encourage excessive dependence on AI. Such overreliance can reduce the effort students put into analysing information, checking evidence, and developing their own ideas (Sardi et al., 2025; Zhai et al., 2024; Jose et al., 2025).

The way students use AI also appears important. Sardi et al. (2025) found that 71.4% of studies in their review reported better self-regulation, while 62.5% reported improvements in critical thinking. Guided AI use can also support reflection, creativity, independent learning, and deeper analysis (Essel et al., 2023; Zhou et al., 2024). In contrast, heavy LLM use for writing and code debugging was associated with lower grades, while using AI for additional explanations did not show the same effect (Jošt et al., 2024).

Therefore, the focus should be on understanding overreliance rather than banning AI. This discussion examines how LLM overreliance may influence undergraduate students' cognitive skills, autonomy, critical thinking, and independent learning (Qian, 2025; Çela et al., 2024).

Objectives

1. To assess the level of overdependence on Large Language Models among students in performing academic tasks.
2. To evaluate the level of cognitive competence among students in terms of critical evaluation, independent problem-solving, reflective thinking, decision-making, and idea development.

Scope

The study focuses on undergraduate students in Hyderabad from different colleges and academic years. It looks at how frequently using and depending too much on Large Language Models (LLMs) may affect students' critical thinking, problem-solving, creativity, and decision-making abilities. It also considers the different levels of students' dependence on LLMs and how these may relate to their cognitive skills. The study aims to provide a better understanding of how students can use AI as a learning aid without allowing it to replace their own thinking and effort.

Research Methodology

This study uses a quantitative research approach to understand how undergraduate students use and depend on Large Language Models (LLMs) in their academic work. Data was collected through a structured questionnaire from undergraduate students studying in different colleges in Hyderabad. The questionnaire covers their level of LLM use and how they feel it affects their critical thinking, problem-solving, creativity, metacognition, and decision-making.

Limitations of the Research

- Sample Representation: The study includes undergraduate students from different colleges in Hyderabad. Since the research is limited to one city, the findings may not represent undergraduate students across India.
- Self-Reported Data: The information collected depends on students answering the questionnaire honestly about their LLM usage and learning habits. Some responses may not completely reflect their actual behaviour.
- Time Constraints: The study is carried out within a limited period. Because of this, it cannot track how students' LLM usage and cognitive abilities may change over a longer period.
- Geographical Scope: The research is conducted only in Hyderabad. Students from other parts of India may have different educational experiences and patterns of AI use, so the findings may differ in other regions.

Literature Review

Recent studies on Large Language Models (LLMs) in higher education show that these tools can influence students' learning in different ways. Students use LLMs to understand difficult

topics, find information, organise work, and complete academic tasks. Although this can make learning easier, excessive dependence may reduce students' effort to solve problems independently (Deng et al., 2024).

Deng et al. (2024) found that ChatGPT can improve academic performance, motivation, and higher-order thinking, but students may use less mental effort when AI provides quick answers. Alubthane (2026) similarly identified concerns about over-reliance, reduced analytical autonomy, critical thinking, and cognitive offloading. Vendrell and Johnston (2026) noted that students may trust AI-generated answers because they appear confident and clear, while Jose et al. (2025) suggested that heavy AI use can reduce deeper learning and independent problem-solving.

Research among undergraduate students provides further insights. Yeh and Siah (2025) found weaker cognitive awareness alongside stronger metacognitive regulation among nursing students. Suriano et al. (2024) showed that students' engagement with AI can influence critical thinking. Šedlbauer et al. (2024) reported benefits for systems thinking and critical thinking, while also identifying concerns about dependence on AI-generated answers.

Guided use of LLMs appears more beneficial. Essel et al. (2023) found improvements in reflective thinking through classroom-based ChatGPT activities. Zhong et al. (2026) reported improvements in metacognitive regulation, problem-solving, critical thinking, and learning performance when students understood the reasoning behind AI answers. Luo et al. (2026) further highlighted the roles of prior knowledge, self-efficacy, and metacognitive monitoring.

Overall, LLMs are most useful when they support rather than replace students' thinking. Excessive dependence may encourage cognitive offloading and weaken independent reasoning. However, limited research has examined LLM dependence among undergraduate students in Hyderabad. Therefore, the present study examines its relationship with critical thinking, problem-solving, creativity, metacognition, and decision-making.

Data analysis & Interpretation:

The data was collected from 109 undergraduate students studying in different colleges in Hyderabad. Most respondents were 17–19 years old, with male students forming the majority. Among the four academic years, 1st-year students made up the largest share of the sample.

Figure 1 : Demographics table

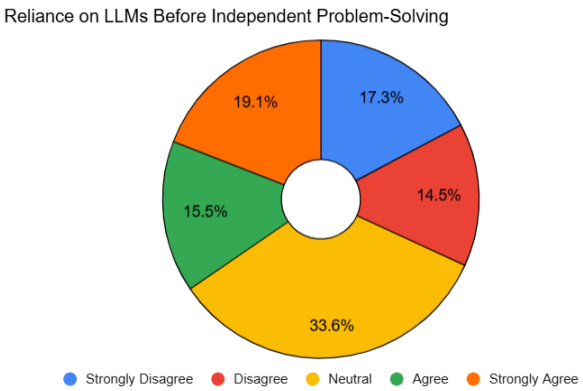
Variable	Category	Frequency (n)	Percentage (%)
Age	17-19	85	77.98
	20-22	18	16.5
	23-25	4	3.67

	25 and above	2	1.83
Gender	Female	61	55.96
	Male	46	42.20
	Prefer not to say	2	1.83

Objective 1: To examine the level of overdependence on Large Language Models among students in performing academic tasks.

As the study was conducted for Undergraduate students in various colleges, a considerable number of students agreed that they use LLMs for tasks they could complete independently and rely on them for generating ideas, explanations, and answers.

Figure 2: Reliance on LLM's



However, responses regarding using an LLM before attempting to solve an academic problem independently were more varied. Similarly, students showed mixed responses about experiencing difficulty in completing academic tasks without LLMs. Overall, the findings indicate a moderate to high level of LLM dependence among students for academic activities, ideas and answers generations.

Figure 3 – Task without LLMs

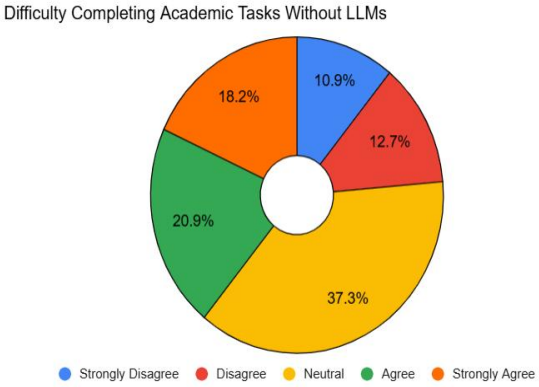
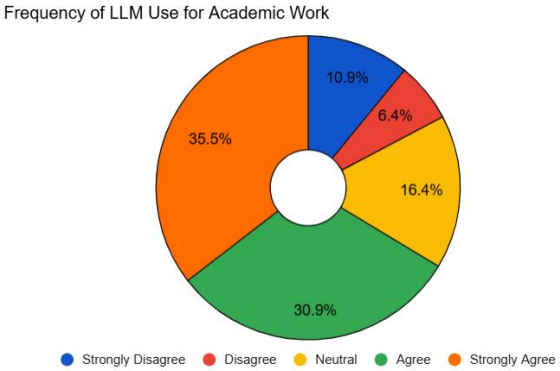


Figure 4: LLM Use for Academic Work



Objective 2: The level of cognitive competence among students in terms of critical evaluation, independent problem-solving, reflective thinking, decision-making, and idea development.

The survey indicates that students generally demonstrate a good level of cognitive competence. A majority of students reported that they critically evaluate information, reflect on their thinking, consider alternatives before making academic decisions. Students also reported that they reflect on their own thinking and identify mistakes in their reasoning, indicating the presence of reflective thinking skills.

Figure 5 :Critical Evaluation

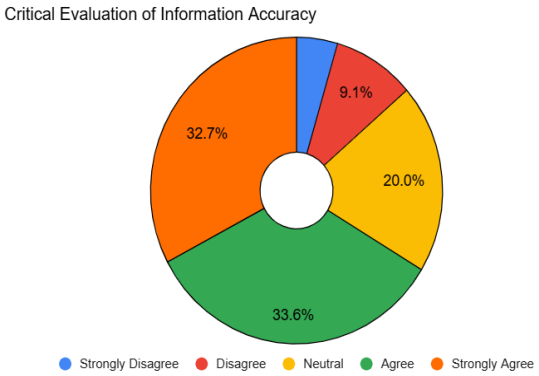
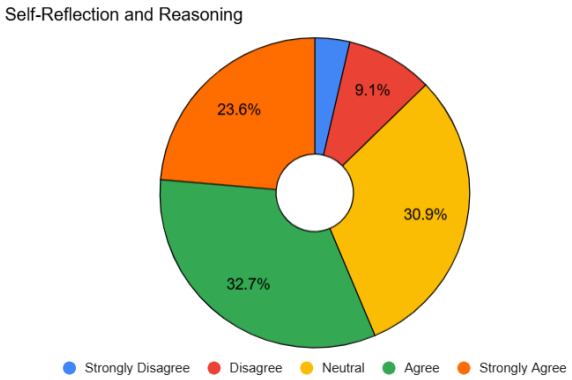


Figure 6 : Self-Reflection and Reasoning



However, independent problem-solving received comparatively weaker responses, with a considerable number of students remaining neutral or expressing difficulty in solving academic problems without relying on LLM-generated answers. Overall, the findings indicate that students possess reasonably strong cognitive competence, although independent problem-solving appears to be an area that requires greater attention in the context of increasing LLM use.

Figure 7 : Problem Solving without LLMs

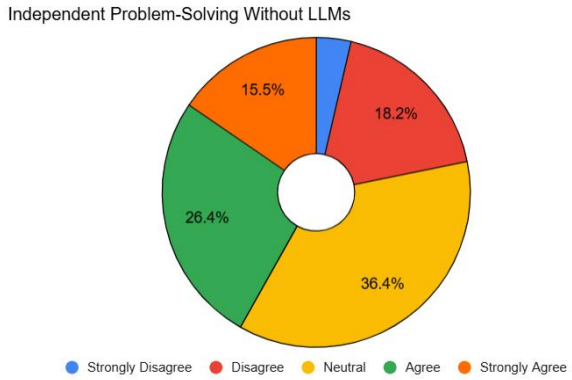
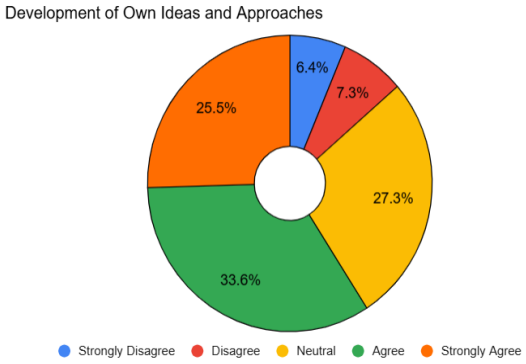


Figure 8 : Development of own ideas and approach



Analysis:

The responses from 109 undergraduate students give a clear picture of how LLMs are being used for college work. A good number of students said they use LLMs regularly, and 39

students (35.8%) chose the highest level of usage. Students also said they use LLMs for things they feel they can do themselves, as well as for getting ideas, explanations, and answers. For academic ideas and explanations, 50 students (45.9%) selected the two highest levels. Another point worth noticing is that 21 students (19.3%) chose the highest level for using an LLM before trying to solve an academic problem on their own. Also, 43 students (39.4%) selected the two higher levels when asked if they find some academic tasks difficult without an LLM.

The answers about cognitive competence were fairly positive. 73 students (66.9%) selected levels 4 or 5 for checking information before accepting it. Many students also said they consider different options, reflect on their own thinking, and come up with their own ideas. So, even though LLM use is quite common, the responses suggest that most students still feel able to think and work independently. However, students were not equally dependent on AI.

Findings:

From the responses, it is clear that LLMs are a regular part of academic work for undergraduate students. Students mainly use them for tasks, explanations, and developing new ideas. Some responses also show a level of dependence, especially when students use AI before trying to solve a problem themselves. At the same time, students reported strong cognitive skills. Most said they check information, consider alternatives, reflect on their work, and develop their own ideas. Overall, the results show that LLM use and cognitive competence can exist together, although too much dependence may reduce the effort students put into thinking independently.

Suggestions/Implication:

For Students

Students should use LLMs when they need support, but they should not depend on them for every academic task. It is important for students to first try to understand, think, and solve problems by themselves.

For Teachers

Teachers can allow students to use AI as a learning aid while also giving them activities that require their own reasoning, problem-solving, and creativity. This can help students use AI without becoming too dependent on it.

For Colleges

Colleges can introduce basic AI literacy programmes to help students understand both the benefits and limitations of LLMs.

For Academic Learning

The study shows that there needs to be a balance between AI-assisted learning and independent learning. LLMs can save time and provide useful support, but students still need to take responsibility for their own thinking, learning, and decisions.

Conclusions:

This study shows that LLMs have become a regular part of academic work for many undergraduate students. From the responses of 109 students, it is clear that they use LLMs for different things, such as completing tasks, understanding topics, and getting ideas. However, the responses also show that some students are becoming dependent on them. For

example, 21 students (19.3%) said they turn to an LLM before trying to solve a problem themselves, and 43 students (39.4%) found it difficult to do academic tasks without an LLM. Even with this level of AI use, students still reported having their own thinking skills. Around 73 students (66.9%) said they usually check information before accepting it. Many students also said they think about different options, reflect on their work, and come up with their own ideas. Overall, the study suggests that LLMs can be useful for learning, but overdependence may affect independent thinking and problem-solving. Students should therefore use LLMs for support while continuing to make their own effort, think critically, and make decisions independently.

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