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The Impact Of AI On Computer Science In Transforming Education In India

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Abstract

This study examines how artificial intelligence (AI) can improve student-centered computer science instruction, emphasizing problem-solving techniques, adaptive learning, ethical considerations, and personalized feedback. The study gathered primary data from two different groups using a mixed-method approach. First, students between the ages of 17 and 18, with a focus on those who are presently enrolled in computer science courses. Second, professional educators, using Likert-scale-based structured questionnaires. Experts in the field considered AI's influence on teaching workload, instructional quality, and curriculum relevance, while student responses illuminated their experiences with AI tools like IntelliJ IDEA, visualizations, mock tests, and code-completion platforms. An extensive literature review on NEP 2020, India's AI education initiatives, and international studies on AI in learning were all included in the secondary research. The results show that although teachers and students agree that AI can increase engagement, efficiency, and personalization, however, there are worries about over-reliance, ethical lapses, and inequitable infrastructure. To resolve these concerns, this paper incorporates recommendations for students, experts, and curriculum design agencies thus providing useful guidance for the careful incorporation of AI in the classroom, emphasizing the significance of a well-balanced implementation to get students ready for an AI powered future.

Keywords: artificial intelligence, computer science, adaptive learning technology, ethics in AI, AI curriculum development.

I. Introduction

In recent times, there has been a remarkable breakthrough in the advancement of artificial intelligence, impacting both teaching and learning for students and educators. This technology has been pivotal in creating new opportunities, especially personalized learning. Artificial Intelligence works to help students learn at their own pace, with lessons and activities tailored to their own needs and strengths (Yaseen et al., 2025). A crucial aspect AI has enabled is interactive learning spaces, such as ChatGPT-4o. Within these environments, students can instantly get feedback, have full freedom to ask questions, and explore ideas in a constantly changing and engaging space. Through AI-powered robots' ability to communicate in several languages, these tools are becoming extremely accessible. For teachers, AI is helping to reduce workloads, by generating lesson plans to create custom content, teachers can concentrate their attention on important tasks like fostering a better student-teacher relationship. Overall, AI has been observed in reshaping education to be more responsive and empowering all stakeholders involved.

Computer science education is undergoing a major shift as Artificial Intelligence advances from just research labs into classrooms. For decades, AI in education was little more than small-scale tutoring pilots. However, recent gains in machine learning and big data have made large AI driven instruction practical. India's National Education Policy 2020 calls AI an 'unquestionably disruptive technology' that will reshape both what students learn and how they learn (AICTE, 2025). Early expert systems and tutorial programs laid the groundwork for today's adaptive platforms. They proved that software can track performance, tailor lessons and analyze learning data. NEP 2020 now urges schools to adopt technology based learning. It lists AI, machine learning, and data science as core skills for the future workforce. The move from concept to necessity shows India's resolve to prepare students for an AI rich world while boosting outcomes.

In computer science classrooms today, AI is already extremely influential in molding student-targeted learning experiences. By tracking how students write and improve their code, AI can adjust the difficulty of practice problems and offer new challenges based on how much progress a student has made. AI can act like a virtual tutor, instantly helping with feedback or hints when a student finds a concept difficult to understand, hence improving the learning process by making it more supportive and engaging. These AI models have the ability to generate new practice problems, quizzes and examples whenever a user requests it, helping to provide a challenging and fresh type of learning. Altogether, these tools provide more practice and guidance in a timely manner, improving problem-solving skills critical to computer science.

While existing studies on AI may provide valuable insights, many overlook the Indian classroom context. The current research focuses on either students or teachers, rarely capturing the dual-perspective analysis that captures both ends of education. There is also limited exploration of AI ethics in practice, such as addressing issues like data privacy and fairness in grading are addressed. This study aims to bridge these gaps by analysing how these AI tools reshape computer science education in India while balancing personalisation, ethics and human involvement.

II. Objectives of the Study

1. To explore the applications of Artificial Intelligence, in student-centered computer science education, such as adaptive learning, and personalized feedback.
2. To analyze how Artificial Intelligence tools affect students' interest in and understanding of computer science subjects.
3. To evaluate how Artificial Intelligence driven platforms affect students' coding and problem-solving skills.
4. To examine how students feel about learning environments that use Artificial Intelligence with special emphasis on ethics, usability, and acceptance of AI tools in their learning journey.
5. To improve individualized learning, suggest best practices for integrating Artificial Intelligence into computer science curricula in a responsible manner.

III. Literature Review

3.1 AI Applications in Student-Centered Computer Science Education

Personalized learning platforms are changing the way students experience computer science education by shaping lessons around each learner's pace, interest and understanding. Tools like intelligent tutoring chatbots allow students to ask coding questions and get instant answers without waiting for help (Fan et al., 2025). Automated feedback systems are also making a big difference: they review code submissions, and provide helpful suggestions within seconds, which helps keep students in consistent learning and improving themselves. These technologies shift the learning experience from being teacher-centered to student driven, by giving learners more control and support exactly when they need it, something traditional classrooms often struggle to provide (Yaseen et al., 2025).

3.2 Influence of AI Tools on Student Interest, Understanding, and Retention

AI tools are helping students connect more meaningfully with what they are learning in Computer Science curriculum. When lessons are tailored to their current needs and skill levels, students feel that the content actually matters to them, which boosts their motivation to learn. Research shows that when practice is spaced out based on the students' performance, it leads to long term memory of the subject matter (Yaseen et al., 2025). AI teachers (chatbots) give targeted feedback that helps clear up confusion early on, making it easier for students to grasp complex ideas. The added advantage is when students can control the pace of learning and get nonjudgmental support from AI assistants, thus enabling them to stay more engaged with fewer dropouts. All of this shows that AI tools don't replace but strengthen good teaching by supporting students' motivation, understanding and long term success (Mustafa & Ashiq, 2024). Thereby relieving teacher workloads, allowing them more time to incorporate personalized guidance and creative instruction.

3.3 Effects of AI-Driven Platforms on Coding and Problem-Solving Skills

AI coding assistants help students write code by offering real time suggestions, pointing out mistakes and explaining bugs in simple understandable language. By removing tiny syntax errors, artificial intelligence helps students focus on concept-based learning. Research has found that when students use AI tools for pair programming, the solutions are more accurate due to which they feel less anxious as compared to working alone (Fan et al., 2025). By slowly incrementing the difficulty of programming problems, Artificial intelligence helps to improve problem-solving abilities over time (Yaseen et al., 2025). However, over reliance on AI generated hints may deprive students of essential debugging skills depicting the need for balance with Artificial and human intervention (Mustafa & Ashiq, 2024). Hence, it is recommended to use these tools as a support system helping students along the way, yet leaving room for creativity and critical thinking (Fan et al., 2025).

3.4 Student Perceptions: Trust, Usability, and Acceptance

Students are more likely to embrace AI tools in computer science classes when they find them easy to use and genuinely helpful. Their trust in these tools also play a big role: if students believe that the AI is reliable, fair and transparent, they would be willing to use it regularly (Nazaretsky et al., 2025). However, when there are security concerns like data privacy, unauthorized access and issues with accountability and misuse of AI, students may withhold from using AI tools even if their effectiveness is the same (Mustafa & Ashiq, 2024). To maintain trust, researchers suggest clear instructions to students about what AI can and cannot do, and give them a choice to withhold when they feel uncomfortable. Having clear educational policies and transparent classroom discussions about the use of AI can go a long way in building confidence and encouraging ethical use (Yaseen et al., 2025).

3.5 Best Practices in India for Responsible Integration of AI

India's Vikasit Bharat 2047 (an initiative by the government to make India a developed nation by 2047) aims to promote inclusivity and high-quality education to help develop skills and life abilities for students. The country hosts 1.5 million schools, 8.5 million primary and secondary school teachers, as well as more than 260 million enrollments in schools yearly. In higher education courses, more than 40 million students enroll in higher than 1000 universities and 42000 colleges yearly (YourStory, 2024). Nevertheless, the education system in India is plagued by fixed curriculums, outdated teaching methods and rigid assessment systems. However, the introduction of AI has proved to be extremely influential. Experts in education are encouraging schools to incorporate AI in the curriculum rather than teaching it in isolation; this enables the AI tools to directly support real learning tools with clear learning objectives (Mustafa & Ashiq, 2024). The National Education Policy 2020 endorses the idea of using technology to personalize learning. The All India Council for Technical Education (AICTE) an Indian regulatory body has declared 2025 as the 'year of AI' working towards creating 14,000 technology equipped educational spaces for AI (AICTE, 2025). But the road ahead isn't without challenges, a

recent policy review by NORRAG pointed out major gaps in rural districts creating a large technological divide due to a lack of technological resources, thus leading to learning inequalities (NORRAG, 2024). To tackle this problem, India's most promising strategies combine national investment in broadband and devices with hands-on teacher training. Also including AI tools in local languages and a 'responsible AI' approach enables transparency, fairness, and human oversight (Damodaran & Kanwar, 2025).

The initiatives by the government include NITI Aayog's initiative called 'AI for All', the introduction of 'Robotics and AI' into the curriculum by The Council for the Indian School Certificate Examinations (CISCE). The Central Board of Secondary Education (CBSE) has introduced AI as a subject for grade 9 and 10 in partnership with global companies like IBM and Intel to develop AI related programs and resources EY India. (n.d.). Lastly, the state of Tamil Nadu has become the first in India to officially integrate AI, coding, digital simulations, into their public school curriculum for students from grades 6 to grade 9 (The New Indian Express 2025). As per the report 'Revolutionizing Indian Education', 72% of Indian students believe AI will help them learn better. 65% of Indian educators are aware of AI tools, but only 32% actively use them. The report also states that the AI education market in India is projected to grow at a rate of 45.12% (CAGR) between 2022 and 2027 (Sarkari School, 26 Aug. 2024).

This explains how AI is still in early phases in Indian education, however is growing rapidly. The National Education Policy 2020 promotes AI's capabilities to boost teaching strategies, student engagement, and efficient management. Government based programs work for AI integration with tech companies, digital infrastructure improvement under Digital India, and teacher training. SWAYAM AND DIKSHA are platforms which are being used to advance digital literacy and allow teachers sufficient resources to adapt AI driven learning. While progress is being made, systemic change is required to guarantee AI is inclusively and meaningfully incorporated into India's educational system.

IV. Research Methodology

This research attempts to evaluate the role of artificial intelligence in improving student-centered computer science education through aspects such as adaptive learning, personalized feedback, and refined problem-solving skills. This research also investigates the perceptions of students and teachers on AI-based learning atmospheres and suggests the most suitable ways to integrate them into the curricula.

For the primary study, two sets of data assessment tools (questionnaire) were created. These data sets include 15 questions each, out of which one set includes the perception of students on AI-incorporated learning spaces and how those spaces influence aspects such as problem-solving skills through mediums such as adaptive learning and personalized feedback. In this research study, the secondary and the primary data have been closely incorporated in order to bring in a uniformity in the research study in terms of consolidating its findings and interpretations.

In Set 1 of the questionnaire, 5 subsections consisting of 3 questions each were created to explore AI applications in computer science education, encompassing, the engagement, understanding and retention of the students, coding and problem-solving skills with AI intervention, the trust, usability and acceptance of AIs, and ways to responsibly integrate AI into the classroom. The study has included 12 respondents between the ages of 17-18 who are students with a computer science background. Each respondent has incorporated AI into their respective computer science courses through projects and using AI to explore curriculum topics.

The set II of the questionnaire consisted of 15 questions exploring the perspective of the teachers, especially how they integrate AI tools to create more immersive, engaging and helpful learning spaces. To cover further depth in this

assessment tool, 4 subsections were created which included AI application in Computer Science, understanding of the role and involvement of AI in the current education scenario, and examining the impact of a futuristic AI curriculum on student learning. 5 respondents for this subset were experts and teachers with in-depth computer science knowledge and expertise.

Each question was based on the Likert scale, which enabled the research to explore several perspectives in the research study. The structured quantitative date obtained from the research tool has greatly helped this study to analyze several aspects in detail.

For the secondary data of the study, a collection of online sources, including articles, research papers and web pages, have been analyzed to grasp a deeper understanding of the applications of AI and its impact on student-centered computer science education. It has also helped in evaluating AI-based learning environments, thereby suggesting best practices for integrating AI into computer science curricula in a responsible manner.

V. Data Analysis and Interpretation

Data Analysis and Interpretation presents an extracted insight from two distinct sets of questionnaires. The first set consists of expert perception and the second set consists of student perception in evaluating the use of AI tools in computer science education. They summarize expert and student responses on various aspects such as adaptability, engagement, accessibility, ethical awareness, and instructional clarity. The data reflects a nuanced view of how students and teachers interact with AI in their learning environments. The responses serve as a foundation for further analysis to improve AI integration in classrooms.

5.1 Questionnaire Set 1 - Expert Perception on the Impact of AI on Computer Science Education

All 5 experts shared a positive view, with 100% of the respondents agreeing that AI improves the efficiency in lesson planning for teachers, enabling them to focus more on content delivery and individualized support. However, regarding AI's capability in allowing teachers to concentrate more on practical learning skills of a student, opinions were divided: 60% of the respondents agreed, 20% of the respondents disagreed possibly due to a common belief that AI creates more screen time and distractions or requires consistent oversight causing lessened time hands on learning, the remaining 20% were neutral perhaps they may lack experience or have inconsistent successes in applying AI tools for lesson planning.

Similarly, views on whether AI tools reduce the overall workload of educators received variation in responses, while 60% of the respondents agreed, the remaining 40% were neutral, potentially due to AI tools not being completely developed or because teachers have received very little training with the uses of AI. The accuracy of AI-based evaluation systems compared to traditional methods also sparked different opinions, only 40% of the respondents agreed that they were more accurate than traditional methods, while 20% of the respondents disagreed due to the concerns that AI may overlook subjective elements like creativity or student efforts, 40% of the respondents strongly disagreed as they may have experienced errors, bias, or AI grading tools providing impersonal feedback that may have led to a mis-trust in the system. Regarding the enhancement of collaboration between teachers and students through AI integration, 40% of the respondents agreed, 20% of the respondents disagreed, perhaps because AI may motivate more individual screen time reducing student to teacher interactions, the remaining 40% were neutral as they may not have used AI in a collaborative way or are unclear on its effect. Similarly, opinions varied regarding the effectiveness of AI in identifying unique learning needs of students. 40% of the respondents agreed, this could be because teachers may use adaptive platforms to offer a personalized experience for students helping to offer targeted intervention, 40% of the respondents disagreed as they may believe AI is too generalized and lacks an emotional aspect, the remaining 20% were neutral.

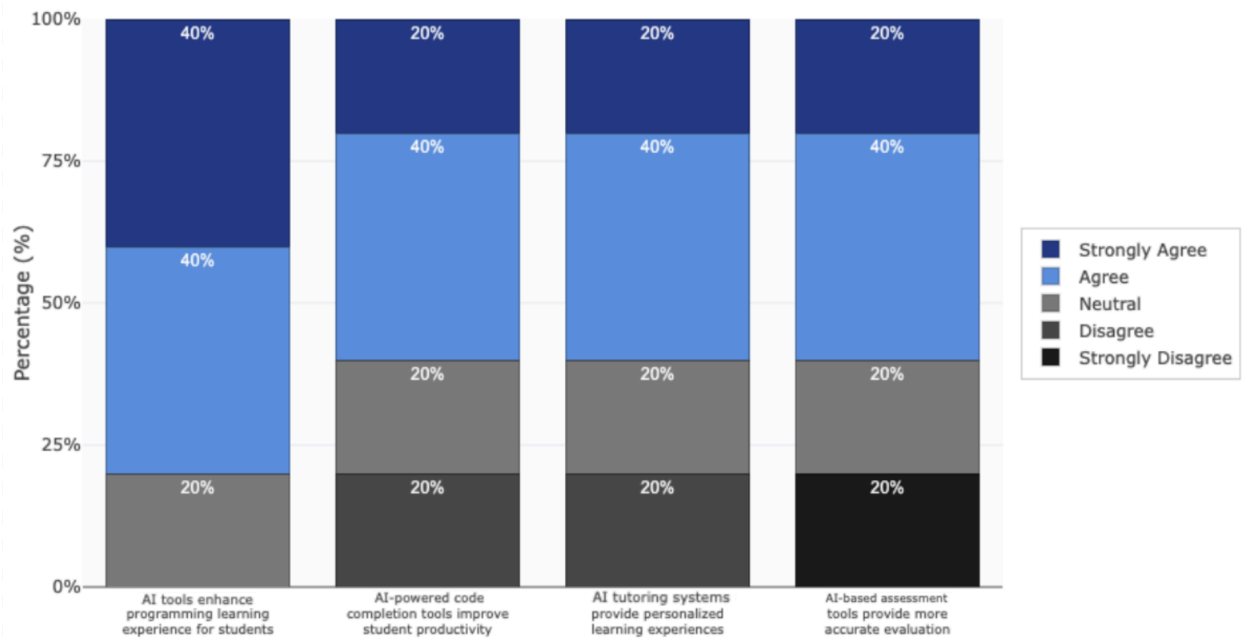

Figure 1. *Current State of AI Integration in Computer Science Education*

There has been a difference in opinion regarding whether AI threatens the traditional role of teachers in education. 40% of the respondents agreed as they may believe AI grading, tutoring or content delivery could make teaching unnecessary, 40% of the respondents disagreed as they may share a belief that AI could function as a tool rather than a replacement for teachers, the remaining 20% were neutral. Regarding the level of student interest in learning AI-related topics, 60% of the respondents agreed this may be because teachers witness interest from students regrading real-world AI applications, coding, or other tech trends, 20% of the respondents disagreed likely because the teachers may teach in atmospheres in which students are overwhelmed, disengaged, or lack the required skills for AI , the remaining 20% were neutral this could be because the curriculums taught in school have not yet incorporated AI and tested AI usage with students. Similarly, opinions varied on whether AI implementation is supported by necessary infrastructure. 20% of the respondents agreed, 40% of the respondents strongly disagreed, most likely due to internet issues, unequipped computers, or lack of training making AI tough to integrate, the remaining 40% were neutral as schools may have partial infrastructure but not enough to support consistent usage of AI. Concerning the scalability of AI technologies for universal adoption in education, 40% of the respondents agreed due to a common belief that AI can function across several levels or schools likely due to positive experiences, 40% of the respondents strongly disagreed as they may feel scaling AI usage is unrealistic due to tech and curriculum inequality gaps, or resistance from staff, the remaining 20% were neutral.

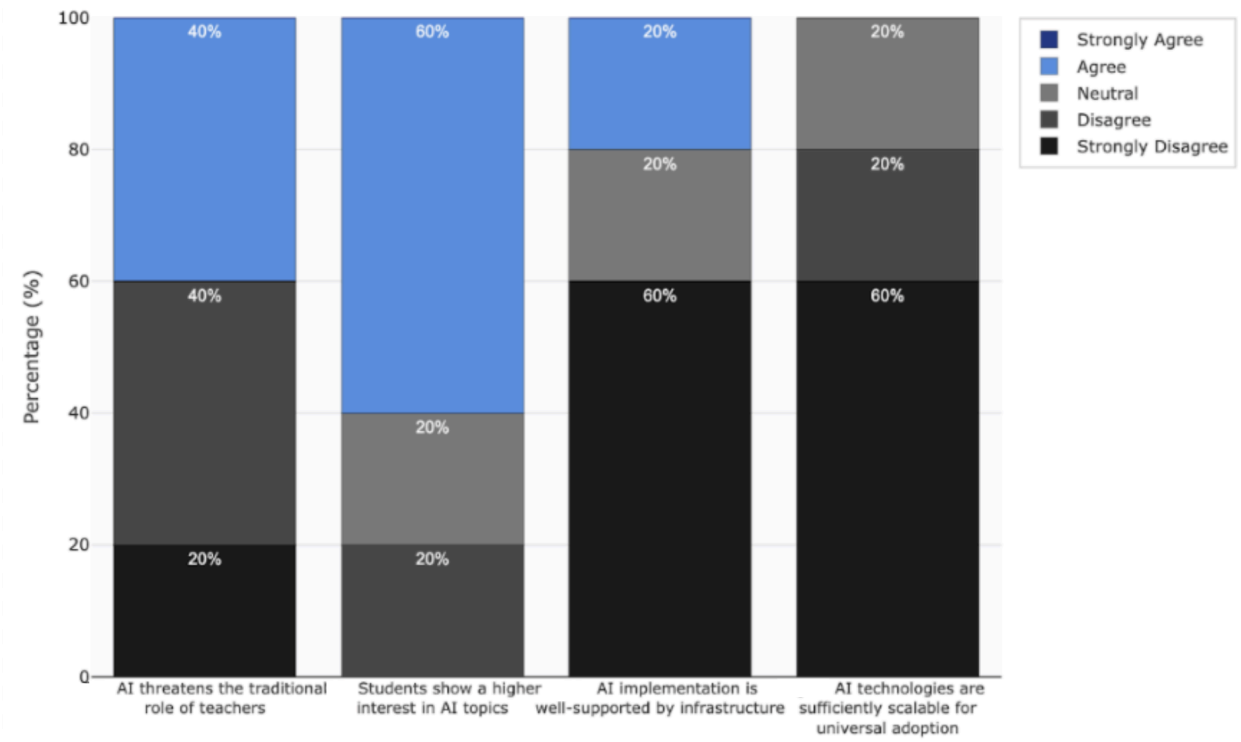

Figure 2. *Role and Involvement of AI in the Current Education Scenario*

There has been a difference in opinion regarding the retention of knowledge with AI-assisted interactive learning. 40% of the respondents have remained neutral in their stand since they may be unconvinced or have not seen conclusive results to form a strong opinion. Another 40% have strongly disagreed with this notion, since they may feel that AI leads to shallow learning and dependency on automation and is even distracting in aiding deep retention. The rest 20% of the teachers have strongly agreed since they may have seen improved engagement and memory through gamified or adaptive AI tools. Similarly, views varied on the potential of futuristic AI systems to develop better cognitive skills. 40% of the respondents agreed, likely due to a common optimism about AI fostering critical thinking, problem-solving, and creativity, 20% of the respondents strongly disagreed as they may believe human instruction is necessary to develop deeper cognitively, the remaining 40% were neutral, as they could be awaiting further development in AI tools before forming an opinion. Opinions also differed on whether AI has made the computer science curriculum more relevant to industry trends, 40% of the respondents strongly agreed as these teachers likely see AI projects and tools correlating with real-world jobs, 20% of the respondents disagreed due to a common belief that the tech industry evolves too quickly for curriculum changes to keep up, the remaining 40% were neutral as they may still be modifying materials or lack sufficient industry exposure to assess alignment. Furthermore, educators expressed varying levels of concern regarding ethical issues such as bias and data privacy. 80% of the respondents strongly agreed as teachers are well versed with problems such as algorithmic bias, data misuse, and fairness, however they may believe safeguards are possible, the remaining 20% were neutral as they likely lack experience with these types of issues. Finally, when it came to the need for greater emphasis on AI ethics in computer science education, 60% of the respondents strongly agreed since they believe students must understand AI's societal and ethical impact, not just its functionality. 20% of the respondents strongly disagreed since teachers may feel technical depth is more important, or that ethics is too subjective and the remaining 20% were neutral since the respondents may be undecided about how or where ethics should be integrated.

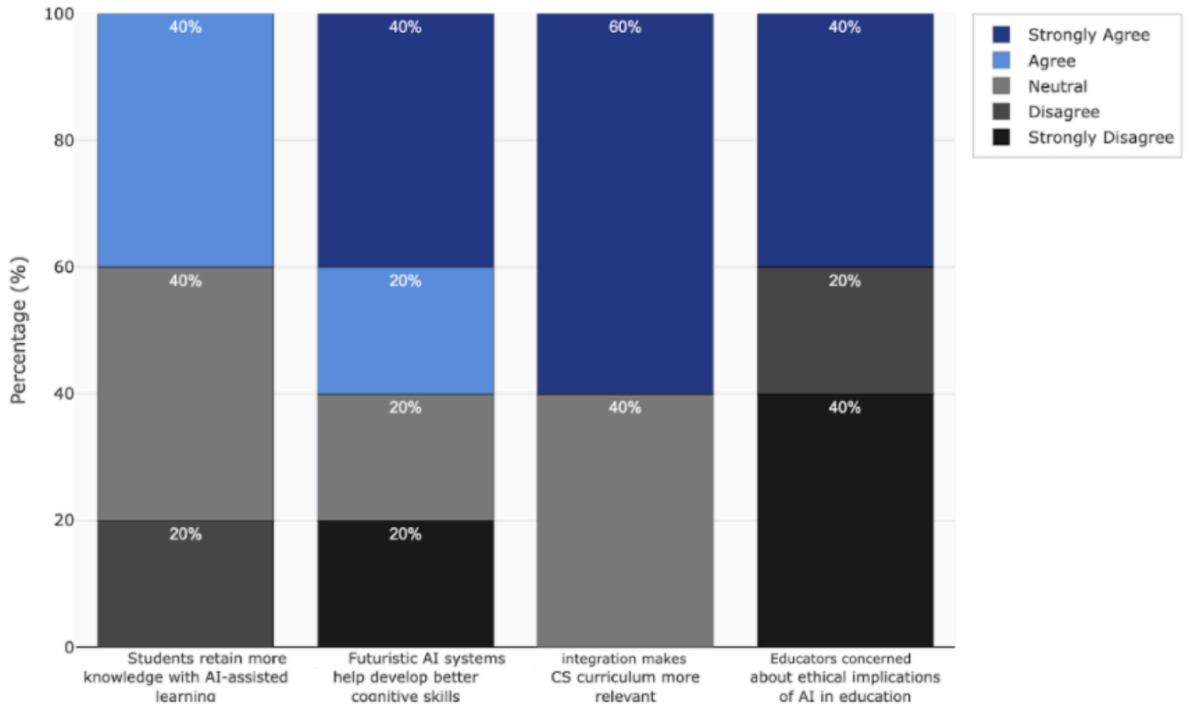

Figure 3. *Futuristic AI-Integrated Curriculum on Student Learning and Ethical Considerations*

5.2 Questionnaire Set 2 - Student Perception Regarding the Impact of AI on Computer Science Education

There has been a difference in opinion regarding whether the adaptive learning features (Teacher delivery, slideshows and coding software such as IntelliJ IDEA) in CS classes adjust content to match students' learning pace. While, 8% of the students strongly agreed, possibly because they found the AI feature exceptionally beneficial or engaging. 67% of the students agreed, likely due to positive experiences with lesson adaptation. Meanwhile, 17% were neutral, perhaps due to limited exposure or unclear impact, while 8% disagreed, possibly because the pacing did not suit their needs. When asked if the range of AI-powered resources (videos, tests, and code samples) fits the individual learning styles of the students, the responses were diverse. Of the respondents, 8% disagreed, 25% were neutral, 50% agreed, and 17% strongly agreed, this demonstrates that although multimedia learning formats are beneficial to many students, some may find the material repetitious or unsuitable for their tastes. Regarding whether AI-driven activities make computer science lessons more engaging than traditional ones, 17% disagreed, 42% agreed, 25% were neutral, and 17% strongly agreed. According to the responses, while AI can increase student engagement, not all students may benefit from it in place of more conventional teaching strategies. Lastly, opinions on whether AI visualizations are helpful in assisting students in understanding abstract computer science concepts were also divided, 8% strongly disagreed, 33% agreed, 33% were neutral, and 25% strongly agreed. This could be since visual aids are obviously beneficial to some students, but they may be too complex or useless for others. Responses to the question of whether AI-generated practice tests maintain students' interest over time also differed, 8% disagreed, 8% strongly disagreed, 50% were neutral, and 25% strongly agreed. This large disparity points to either different quiz quality or different assessment style preferences among students.

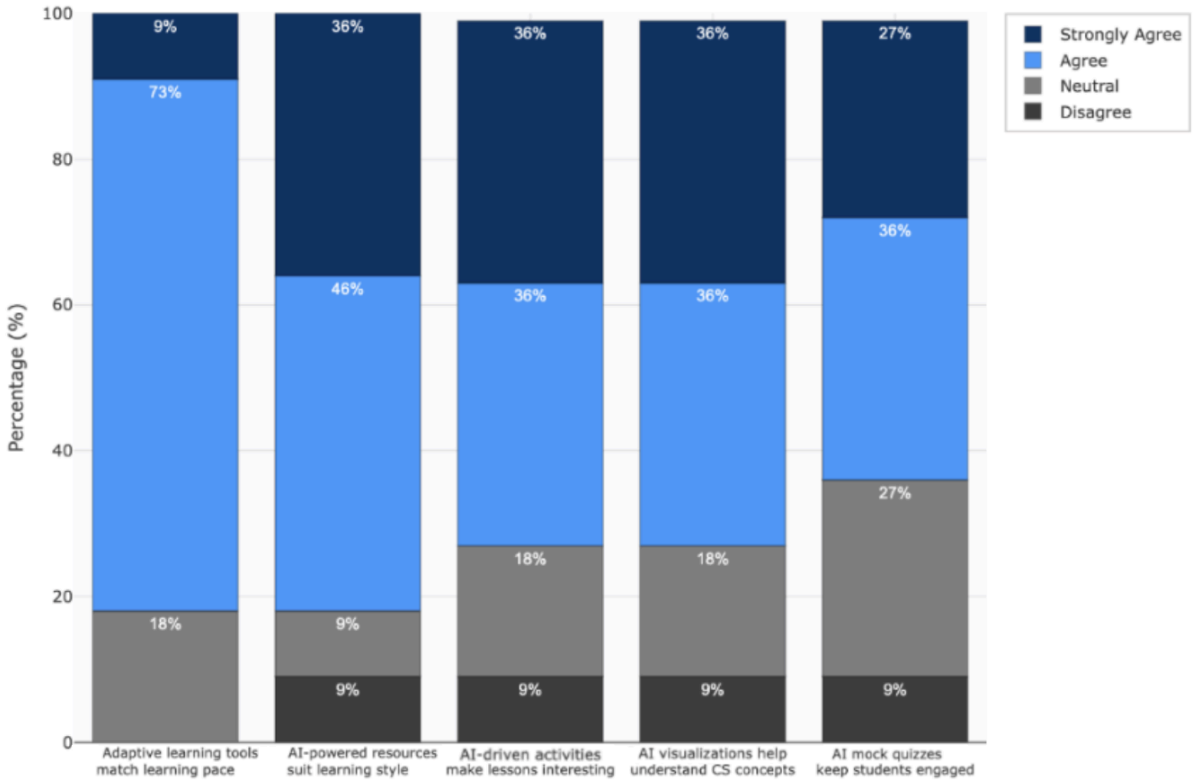

Figure 4. *Adaptive Learning Features in CS Courses*

There has been a difference in opinion regarding whether AI platforms provide practice problems that match students' current coding skill level. 58% agreed, 17% were neutral, and 8% disagreed. While a majority see value in personalized practice, a minority may feel tasks are too easy, too hard, or lack variety. Similarly, opinions varied on whether code completion AI features (e.g., IntelliJ IDEA) hinder students' understanding. 42% agreed, likely feeling that automation interferes with learning. 25% were neutral, and 17% disagreed, suggesting some students appreciate code completion as a learning aid while others do not. The usability of AI tools also drew mixed responses; 25% strongly agreed, 42% agreed that AI systems were easy to navigate without requiring extensive instructions. 25% were neutral, and 8% strongly disagreed, this implies most students feel confident using AI, though a few find the tools difficult or unintuitive. Comfort with sharing learning data with AI systems also revealed varying perspectives; 42% strongly agreed, 25% agreed, 17% were neutral, and 17% disagreed. The discomfort for some may arise from data privacy concerns or a lack of clarity on how their information is used. Despite these differing views, all respondents, 100%, agreed that they accept AI as a regular part of their CS learning experience, suggesting AI is now normalized in their educational environment.

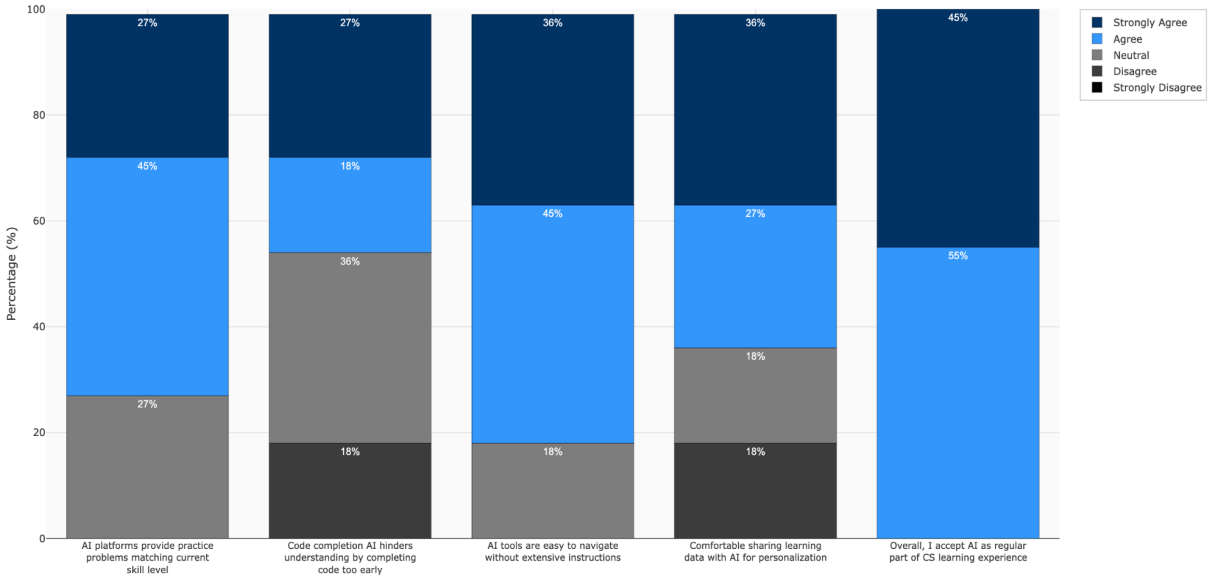

Figure 5. *Problem Solving Skills*

There is a general agreement about whether instructors clearly explain how and why they use AI tools. A notable 58% strongly agreed, while 42% agreed. This indicates strong communication between teachers and students regarding AI use and its purpose. There was also no difference in views on the usefulness of AI-generated hints or tips for faster error correction. Fifty percent of respondents strongly agreed, and the other half agreed, showing a shared recognition of the value of real-time guidance and error detection in improving learning efficiency. However, opinions varied on access to AI resources in the classroom, while the majority of students feel supported, some are unclear or have uneven access. Opinions on whether or not ethical concerns pertaining to AI tools are openly discussed in the classroom also differed, here 42% were neutral and without a strong opinion but 50% agreed. These findings suggest that while ethics are occasionally discussed, students could benefit more from structured discussions to gain a deeper understanding of the moral implications of AI.

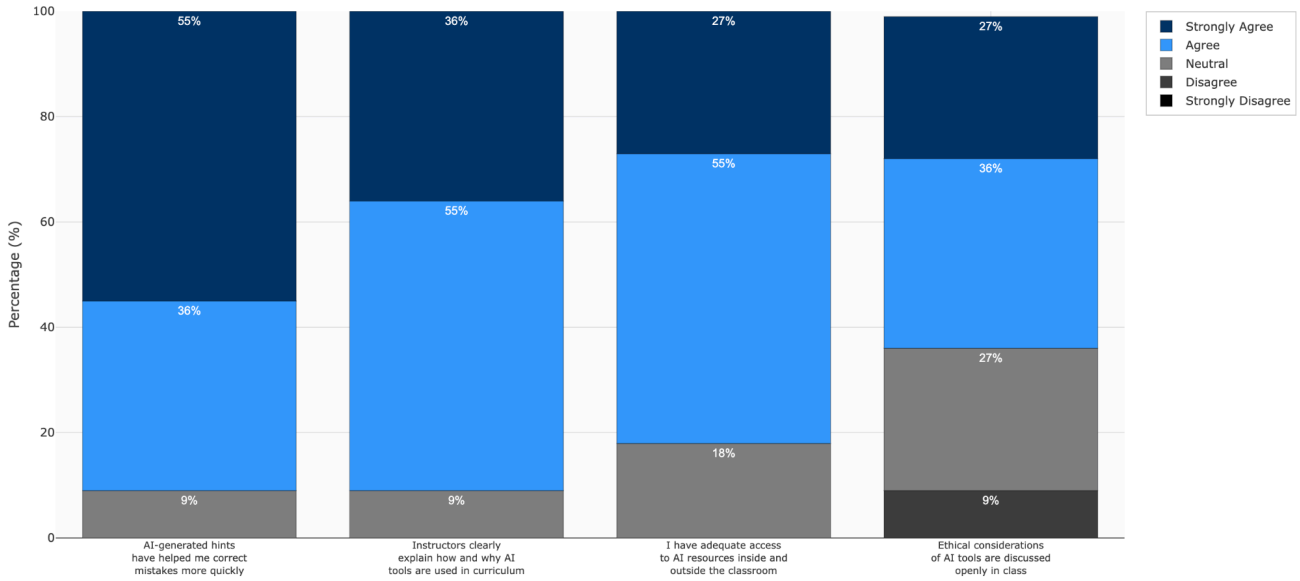

Figure 6. *Responsible Integration and Best Practices*

VI. Findings of the Study

1. This research study highlights the perception among teachers and experts regarding the role of AI in enhancing their role in teaching and assessment. 100% of the respondents agreed that AI has made lesson planning more efficient by saving time to focus on actual teaching and supporting individual students in their learning journey. Teachers agreed that AI assists with content creation and enables them to dig deeper into their subject matter by helping explore creative teaching methods further. However, when it comes to developing learners' practical skills, only 60% of the respondents felt it was beneficial. The others had concerns regarding increased screen time, which may divert students from hands-on learning experience that requires real-world human interaction. Similarly, not all teachers felt that AI reduces their workload; those who have training and support found it helpful, yet the others did not feel much change. These findings suggest that while AI is accepted for planning and preparation, its impact on more experiential teaching and actual workload depends heavily on how it is introduced and supported in a classroom.
2. The study shows students having a positive outlook towards using AI tools in their computer science education. A solid 75% felt that adaptive learning systems match their learning pace, which clearly shows that AI tools can help create a personalised and efficient learning experience. One of the most appreciated AI features is the AI-generated hints; every student in the respondent base has agreed that these AI tools helped them correct mistakes quickly, likely because they gave the students instant feedback. That said, not all AI tools hit the mark regarding practice problems and engagement with mock quizzes, and the results were mixed. Only 58% felt that the practice problems aligned with their coding skills, and only 33% agreed that the AI-generated quizzes kept them engaged. While students value some features, specific elements, like quizzes, received mixed feedback. Similarly, 58% of respondents found AI visualisations helpful in understanding tricky computer science concepts; others did not connect as much, specifically due to the difference in learning styles. Overall, while students are clearly open to using AI, its efficiency depends on the quality and reliability of the AI tools.
3. This research also highlights some concerns that teachers have regarding the ethical implications of the use of AI in Education. A large majority (80%) of the teachers strongly felt that data privacy and algorithmic bias needed specific attention in the curriculum. Only 50% of the student respondents felt that ethics were discussed in class;

the rest of the students were neutral about the same, which indicates that there is inconsistency in how these crucial topics are discussed. Whereas only 40% of the teachers felt that they were confident in AI-based grading systems, the rest showed concern that AI cannot efficiently pick up on subjectivity, emotional nuance, and fairness in grading systems the way a human can. Altogether, these findings highlight the need for integrating discussions on AI ethics into teaching practices with more transparency and human judgment when it comes to using AI for assessments.

4. While AI is widely recognised as a helpful tool in delivering content, its role in bringing meaningful connectivity between students and teachers appears to be limited. Only 40% of the teachers agreed that AI supports collaborative interactions between teachers and students, with a large number of respondents remaining neutral, suggesting uncertainty. This suggests that AI tools focus more on solo learning tasks rather than encouraging real conversations or relationship building between peers in a classroom. Many teachers still prefer the traditional way of face-to-face learning, rather than using AI tools for collaborative learning. For complete utilization of AI's potential in education, future tools must be designed to actively support communication, teamwork, and build student-teacher relationships.

In closing, the findings of this study reveal a complex but insightful picture of how AI is perceived in computer science education. Both sides of the respondent base recognise its value in improving content delivery and offering real-time support. Teachers are optimistic but wary, with concerns over workload, collaboration, evaluation, and ethics. Students, on the other hand, are more accepting of AI tools in their day-to-day learning. As AI continues to evolve, a balanced approach that combines human interaction will be essential in shaping an inclusive and ethical education experience.

VII. Limitations of the Study

This research study offers valuable insights into the impact of AI on computer science in transforming education in India. However, the study provides strong foundational insights, yet it is important to recognize some limitations, which may include challenges related to the scope and methodology of the study. These limitations are, in fact, growth points that set the stage for further exploration in refining the role of AI in education around the world.

1. This research study is limited to the Indian context since the researcher, a student of computer science, resides in the country and is passionate about the subject and its direct impact on the Indian education system. This regional focus has allowed for a deeper understanding of how AI is being adopted within Indian classrooms. Further research can be conducted on countries or demographics with different economic, cultural, and educational environments.
2. A simple random sampling technique has been utilized to target young adults in the age group of 17–18 years learning Computer Science. The respondent base was kept to a minimum so that the study could examine each response in detail. This small sample size has produced meaningful findings while minimizing the burden of expenditure on resources.
3. This research study focuses on students and teachers. Although this respondent base has derived pertinent insights, it opens exciting avenues for further research, which can involve potential students and teachers from all other fields of study who use AI tools for their educational needs.
4. Lastly, the tools mentioned in this study include ChatGPT, AI Quizzes, and IntelliJ IDEA. In this fast-paced technological era, these tools may get outdated, and other updated systems may take their place. This fast-paced change makes research crucial since it will help document new developments, trends, and long-term effects of integrating AI in education.

VIII. Recommendations

Based on the findings of the study, several key recommendations have been suggested to enhance the effectiveness of AI in computer science education. The below-mentioned suggestions are directed towards students, teachers, and curriculum developers (government) bodies to ensure meaningful integration of AI tools. By addressing gaps in the system, stakeholders can work together to create a learning environment where AI supports human interaction and critical thinking. The following recommendations aim to suggest steps for each group to maximize the benefits of AI while minimizing its challenges.

8.1 Recommendations for Students

1. Students are urged to view AI platforms as learning partners rather than merely as shortcuts. They can use AI-generated hints, visualizations, and coding feedback as supplementary tools to help increase confidence by not replacing the learning process.
2. Students should take the initiative to actively explore these tools, ask questions, and go over explanations because adaptive platforms modify content based on performance, particularly when dealing with challenging concepts.
3. Students should strive to comprehend the reasoning behind suggestions, even though features like code completion and error suggestions are useful. Students must steer clear of over-reliance and attempt to resolve issues on their own before requesting AI-generated help.
4. Lastly, concerns about data privacy and the process by which AI makes decisions should not be suppressed by students. This transparency helps promote a secure and courteous learning environment for everyone.
5. Students, who are the most impacted by AI in the classroom, should get their opinions integrated through mediums such as surveys, pilot programs, or school-level feedback systems.

8.2 Recommendations for Teachers and Experts

1. Teachers must think of AI as a tool rather than a replacement, which can improve instruction and tasks. For example, using AI to offer formative feedback and coding assistance can be balanced with productive discussions, and creative instruction.
2. Ongoing training and development are necessary to manage AI tools and for teachers to understand how to incorporate them. Teachers should search for workshops or peer communities where they can share challenges and successes they encounter, as well as AI platforms that are really useful.
3. There has been great concern regarding the moral application of AI, with frequent questions about bias, privacy, and fairness in AI. Incorporating these concerns in the curriculum will help teachers communicate expectations to the students, thereby facilitating clarity in the proper use of AI among students and teachers alike.
4. AI can be extremely useful in providing instant formative feedback for students on assignments or code submissions. In order to make learning better tailored for students, educators can customize their follow-ups and assess AI-generated recommendations.

8.3 Recommendations for Government and Curriculum Designers

1. The government must keep funding dependable internet, accessible devices, and software for both urban and rural schools in order to close the digital divide. AI integration will continue to be unequal in the absence of basic digital access.
2. The government can develop easily accessible training materials or certification courses for educators that emphasize AI integration. AI-enhanced teaching best practices and real-world classroom examples could be added to the content of platforms like SWAYAM and DIKSHA.

3. AI should not just be limited to computer science. Governments should encourage applying AI in different subject matters such as business studies, social sciences, and humanities to understand several perspectives.
4. To better develop students' knowledge and responsibility as digital citizens, curricula should communicate digital responsibility, ethical decision-making, and data privacy as they integrate AI into student learning.
5. In order to work to develop tools that incorporate efficiency, standardized language, curriculum alignment, and student needs, partnering with top AI and edtech firms (such as Google, Intel, and IBM) should be increased.
6. In order to control the misuse of AI by students who generate ready-made essays or entire coding projects, the government and curriculum designers should ensure that plagiarism detection systems evolve simultaneously with AI writing tools.
7. Clear ethical guidelines on the usage of AI should be provided to all stakeholders, along with academic integrity policies and online responsibility training to protect data privacy and academic integrity of all students.

IX Conclusion

This study sets out to understand the impact of Artificial Intelligence on student-centered Computer Science education from the perspectives of both students and teachers. Drawing from a carefully designed dual-questionnaire approach, the research explored real classroom experiences and perceptions around adaptive learning, problem-solving, ethical understanding, and the usability of AI tools. The findings have shown that while AI has brought clear benefits in engagement, personalization, and efficiency, it also presents certain challenges and uncertainties that require thoughtful attention.

For teachers, the integration of AI tools appears to be largely welcomed. Many educators believe AI has helped reduce their workload, improved lesson planning, and enabled more time for student interaction. However, concerns still remain regarding the accuracy of AI-based evaluation systems and whether these tools truly allow for hands-on, practical learning. Some teachers expressed hesitation about fully trusting AI-driven grading or in relying on these tools for collaboration and ethical instruction, signaling the need for more balanced, human-led involvement and better training resources. From the students' perspective, AI has clearly become a regular and accepted part of their learning journey. Most students appreciate how AI tools adapt to their pace, provide visual explanations, and generate engaging quizzes and coding practice. Still, there is a wide range of opinions on whether these tools consistently support deeper learning. Some students expressed concern that overreliance on features like code completion or automated hints could hinder their understanding. Others were uncertain about issues related to privacy and the ethics behind AI decisions, pointing to a need for more clarity and open conversations in the classroom. A key takeaway from the study is that AI works best not as a replacement for traditional learning, but as a powerful supplement. When used thoughtfully, AI enhances personalization, makes learning more interactive, and provides timely feedback that supports both teachers and students. But for AI to reach its full potential in education, especially in a country like India, there must be continued investment in infrastructure, inclusive curriculum development, and teacher training. The study also highlights the importance of building trust, transparency, and ethical awareness into every step of AI integration.

In conclusion, while AI offers exciting opportunities to reshape Computer Science education, its success depends on thoughtful implementation, constant feedback from users, and a balance between innovation and human connection. The future of learning is not just about smarter technology, but about using that technology to create smarter, more engaged, and more empowered learners.

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