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Optimising Lifelong Learning for Adults: A Chatbot-Assisted Samvada Framework for Self-Directed Learning

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ABSTRACT: Samvāda, a concept from the Upanishads and traditional Indian educational practices, represents a dialogic method for exploring complex ideas. In a rapidly changing world, where learners must continually develop new skills, self-directed learning has become a vital skill. This paper reinterprets Samvāda as a tool for self-learning in the digital era through AI chatbots. To harness this potential, the study presents a chatbot-based Samvāda framework with six elements: questioning, cross-questioning, cross-referencing, summarising, validation, and self-assessment. These components aim to transform chatbot interactions from simple exchanges into structured, learner-centred dialogues. This approach also aligns with Knowles' principles of Self-Directed Learning (SDL), where learners identify their needs, set goals, locate resources, and evaluate outcomes as active participants in their own learning journey. The study employed a pre-test–post-test control group design. This design enabled an evaluation of whether a guided conversational model could provide more meaningful learning experiences than unstructured approaches. By bridging ancient methods of inquiry with modern technologies, the study highlights the potential of Samvāda to promote the self-directed learning abilities of students in higher education.

KEYWORDS: Samvāda, Upaniṣhads, Gurukula, self-directed learning, chatbots, dialogic pedagogy, prompt engineering,

I. INTRODUCTION

Regarded as one of the cradles of human civilisation, India, since ancient times, has developed a distinctive knowledge imparting tradition characterised by its Gurukul and home-tutoring systems(Altekar, 2009). 'Guru', a scholar and a revered mentor, led the learning process that simultaneously shaped the intellectual and moral growth of the student. In the ancient Indian education system, a guru was not merely a transmitter of knowledge, but a highly revered person of wisdom and virtue. Even though the pedagogy was predominantly of an oral tradition, comprising of 'shravan', 'manthan', and 'chintan', another oral method of question and answer is evident in the Upanishad Literature. (Chaube & Chaube, 1999). Several Upanishads are written in a question-and-answer format, including the Brihadaranyaka Upanishad, Aitareya Upanishad, Kaushitaki Upanishad, Kathopanishad, and Kena Upanishad. These Upanishads contain dialogues between a scholar and a person seeking knowledge, where the former imparts knowledge and the latter asks questions and cross-questions to clarify doubt.

This method, through dialogue and discussion, employed a variety of tools, including stories, fables, examples, and cases. The Samvāda method of teaching, embedded within the Gurukula and Upanisadic traditions, which primarily focuses on student engagement and interaction, was also adopted by the famous Greek philosopher, Socrates. The goal of this approach is to create an interactive learning environment that enables students to engage in critical thinking, problem-solving, and reflection, allowing them to actively participate in constructing their own understanding of the material. This reciprocal dialogue—not mere didactic instruction—fostered both intellectual rigor and emotional insight (Menon, 2010).

Samvāda allowed students to inquire, reflect, and articulate their understanding to nurture critical thinking, ethical discernment, and integrated comprehension through the use of illustration, reason, and metaphor rather than rote memorisation (Radhakrishnan, 2011). In addition to this, through iterative interaction, learners internalise knowledge deeply and experience the learning process as transformative, connecting intellectual insight with expected outcomes (Rastogi, 2024). However, the Samvāda method was not devoid of limitations. In ancient India, education was restricted to a specific section of society, excluding marginalised sections. Hence, the kind of questions asked by the learner lacked a diverse perspective. The lack of student diversity and established societal norms regarding education and social life perspectives influenced the dialogue process. It was not a standardised method containing structured documentation of teaching practice and assessment criteria (Mukherjee, 1951).

The beginning of colonial rule in India brought a significant overhaul in the Indian Education System. From opening its doors to all sections of society and replacing the traditional 'gurukula' system and curriculum with a modern Western education,

Macaulay implemented an English-based, exam-driven model to produce compliant servants to the colonial administration (Nurullah & Naik, 1951). This led to the waning of holistic, value-based and dialogic learning, which had emphasised comprehension, ethical development, and critical inquiry (Chaube & Chaube, 1999). Missionary and state schools also undermined local curricula, eroding continuity with India's intellectual traditions (J Krishnamurti, 2017). The colonial system promoted rote memorisation and conformity over creativity, self-directed inquiry, creating generations of students lacking independent thinking and innovation (K. Kumar, 2005). Subsequently, while the new system increased literacy in Western knowledge, it not only marginalised indigenous pedagogical methods but also failed to encourage self-directed learning or the co-creation of knowledge (Chandra et al., 2016). This led to the alienation of people from their own native practices and ancient wisdom in various fields, such as agriculture, art, craft, cottage industry, and others.

However, the Western education also brought significant benefits to Indian society by introducing modern sciences, new professions, democratic ideas, and global intellectual traditions. Political activists and social reformers like Gandhi and Ambedkar drew upon the democratic ideals, the ethos of social justice and equality from the tenets of Western education, utilising them to liberate their countrymen from foreign rule and social evils. (Chandra et al., 2016). Exam-oriented education system, adopted after Independence on the lines curated by Macaulay, emphasised memorisation of the content rather than inquiry-based, student-centric learning and did not give importance to involve students in the co-creation process of knowledge. (K. Kumar, 2005).

Pedagogical practices in Indian higher education are still largely dominated by traditional lecture-based methods that focus on content delivery instead of active learning. Although this approach may help cover the syllabus, it often causes students to become passive recipients of knowledge rather than active participants. The continued reliance on rote memorisation and exam-focused assessment restricts intellectual engagement, limiting opportunities for creativity, problem-solving, or critical thinking. Efforts to integrate technology into teaching have been inconsistent. While initiatives like MOOCs, online platforms, and digital classrooms gained popularity during the COVID-19 pandemic, they often serve as supplementary tools rather than fully integrated teaching strategies. Challenges such as the digital divide, inadequate teacher training, and lack of institutional preparedness have further constrained their effectiveness.This document is a template. An electronic copy can be downloaded from the conference website. For questions on paper guidelines, please contact the conference publications committee as indicated on the conference website. Information about final paper submission is available from the conference website.

A. Shortfalls in 21st-Century Competencies

Several studies have revealed worrying deficits in foundational learning and employability skills among Indian working-age youth. The National Achievement Survey (NAS) 2021, covering 3.4 million students from 1.18 lakh schools, reported that the national average per cent-correct scores fell to 38% in Class 10 from 59% in Class 3, with mathematics proficiency declining to just 32% in Class 10 from 57% in Class 3 (2021). Similarly, the Annual Status of Education Report (ASER) 2024 highlights persistent learning gaps in rural India, where students at the secondary level and below are found to be struggling with basic reading and arithmetic skills (ASER Centre, 2025). These deficiencies in foundational learning severely limit students' ability to pursue advanced or self-directed learning pathways.

Gaps in the employability skills and Self-learning skills become more evident at the higher education level. The India Skills Report (ISR) 2024 estimated overall employability among graduates at 51.25%, with ISR 2025 confirming improvement but highlighting wide disparities across disciplines and states (India Skills Report, 2025). In terms of vocational skilling, only 3.8% of the workforce reported having received formal vocational training according to the Periodic Labour Force Survey (PLFS) 2022–23, underscoring India's very low base of job-ready technical skills (MOSPI, 2023). This figure tends to be very low for a country like India where about 82% of its workers are still associated with the informal sector that demands marketable skills. Employers also note deficiencies in higher-order skills such as problem-solving, teamwork, and communication, which remain underemphasized in traditional pedagogy (ILO, 2024).

Apart from shortcomings in pedagogical initiatives, the rigidity of the curriculum is another primary concern in Indian higher education. The sector is yet to fully adopt outcome-based curriculum models, which emphasise the development of 21st-century skills such as critical thinking, problem-solving, and collaboration (V. Kumar & Rewari, 2022). State universities, which cater to the majority of students, have been particularly slow in updating curricula to meet contemporary demands (Borah, 2020). As a result, students are often required to study outdated courses that fall short of equipping them with the competencies necessary for employability and lifelong learning (UGC, 2019). To address this gap, value-added courses and certificate programs are increasingly seen as vital supplements to formal curricula. In this context, AI chatbots can play an important role by enabling students to access flexible, personalised learning resources that help them acquire skills not offered within traditional syllabi (Holmes & Tuomi, 2022).

B. AI Chatbots and the Dialogic Turn

Generative AI chatbots, exemplified by OpenAI's ChatGPT, Google's Gemini (formerly Bard), Anthropic's Claude, and other commercial systems, have emerged from rapid advancements in large language models (LLMs) and multimodal modelling. Initially released for broad public use between 2022 and 2024, these systems have quickly transitioned from experimental demos

to integrated productivity tools. Vendors have embedded chat agents in browsers, search, office suites, and learning platform s, enabling the models to summarise web pages, draft and revise text, generate practice problems, explain code, and create multimodal outputs (text, images, short audio) on demand (Reuters, 2025; OpenAI, 2024). The shift to productisation has been rapid: companies are now advertising education-tailored offerings (e.g., ChatGPT Edu) and building features such as code interpretation, data-analysis helpers, and contextual browser assistants that allow students to query across tabs or course materials. These developments have made chatbots widely accessible for both everyday academic tasks as well as for complex, multi-step workflows (Reuters, 2025; OpenAI, 2024; Google, 2024).

Recent systematic reviews and meta-analyses have generally shown positive effects of generative chatbots on short-term academic performance, motivation, and specific higher-order thinking skills, although these effects vary across study designs and subject areas (Deng et al., 2025). Platform-holder analyses and large-scale usage reports – for example, analyses of thousands of educator/student conversations – reveal patterns such as heavy use for drafting, summarising, generating practice questions, debugging code, and clarifying concepts (Anthropic, 2025). For self-study, chatbots can be effectively utilised by generating incremental practice items and offering immediate feedback, providing step-by-step worked examples that students can "debug" by asking follow-up questions, creating personalised study plans and summaries, and scaffolding metacognitive prompts (e.g., "explain this in one sentence; now in three steps; now give a harder example") (Wang & Fan, 2025). To maximise effectiveness, instructors and learners should combine chatbot use with verification habits (such as cross-checking facts, requesting sources), formative assessment strategies (including questions that assess understanding rather than just recall), and clear guidance on academic integrity and prompt design. The current literature shows promise but also highlights the need for more controlled, subject-specific studies and careful measurement of long-term learning outcomes (Wang & Fan, 2025; Anthropic, 2025).

The artificial intelligence (AI) powered chatbots, however, have renewed possibilities of dialogic engagement. Unlike static textbooks or unidirectional lectures, chatbots invite learners into conversation, simulating an exchange that resembles Samvāda. By posing questions, clarifying doubts, and encouraging exploration, chatbots create a two-way interaction where learners exercise agency in shaping the direction of their inquiry (Zawacki-Richter et al., 2019). The emphasis is no longer on passively consuming information but on dialoguing with a responsive system, echoing the interactive spirit of ancient pedagogy.

Recent studies in higher education show that students increasingly perceive AI chatbots as "learning companions" rather than mere tools, utilising them to test hypotheses, generate alternative perspectives, and co-create knowledge (Kim et al., 2025). This mirrors the Samvāda mode, where learners refine their understanding through questioning and dialogue. In India, initiatives such as the "Skill India Assistant" chatbot demonstrate how conversational AI can expand learning beyond rigid curricula, offering learners opportunities to pursue skills and knowledge areas otherwise inaccessible within formal structures (Indian Express, 2025).

Taking the above possibilities into account, this paper suggests that students affected by outdated syllabi or in need of additional skills or knowledge can use chatbots to fill these gaps without incurring significant additional costs. In India, access to mobile devices and the internet is now widespread. As of 2023, approximately 85% of Indian adults (age 15 and above) reported that they had used a mobile phone with an active SIM in the past three months, and about 80%–90% of households were connected to the internet (Waghmare, 2024). This level of connectivity provides higher education students with an unprecedented opportunity to leverage chatbots as learning companions, enabling them to pursue flexible, personalised learning experiences beyond the limitations of rigid curricula.

C. Self-Directed Learning as a Bridge

Nevertheless, for the re-emergence of Samvāda through chatbots to be meaningful, students require self-directed learning (SDL) skills. Knowles (1975) describes SDL as learners' capacity to take initiative in diagnosing needs, selecting strategies, and evaluating learning outcomes. Without such readiness, chatbot-based dialogue risks degenerating into superficial interaction rather than deep inquiry. Research in India indicates that many students still lack SDL readiness, struggling particularly with plan ning and independent problem-solving (Premkumar et al., 2018). Thus, while chatbots can technologically enable dialogic engagement, educational institutions must simultaneously cultivate SDL competencies to ensure that students use these tools in the spirit of authentic dialogue (Chametzky, 2014).

Students who feel that the classroom syllabus or lectures are insufficient can follow Knowles' idea of self-directed learning by diagnosing their learning gaps (e.g., difficulty grasping a concept) and setting personal goals for improvement. They can then use chatbots as a learning resource to clarify doubts, access explanations, and explore beyond the prescribed curriculum at their own pace. Finally, they can evaluate their progress by applying the knowledge in assignments, practice tests, or real-life problem-solving (Wang & Fan, 2025).

II. RE-SITUATING SAMVĀDA IN CONTEMPORARY EDUCATION

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The reemergence of Samvāda through AI is not a mere coincidence, but rather reflects a more profound shift in pedagogical

paradigms. Scholars of educational technology note that conversational AI is pushing higher education towards more interactive and learner-centred approaches (Holmes & Tuomi, 2022). In the Indian context, this offers an opportunity to reconnect with indigenous traditions of dialogic pedagogy while also addressing modern challenges of employability, flexibility, and lifelong learning. By embracing chatbots as facilitators of dialogue, institutions can re-situate Samvāda in contemporary classrooms, transforming education from a rigid, exam-centric model to one that values inquiry, reflection, and collaborative meaning-making (Labadze et al., 2023).

For learners to tap into the educational potential of chatbots, they need a set of key skills. First, digital literacy is crucial for using conversational interfaces, evaluating information, and making the most of technological tools effectively (Ng, 2012). Second, information literacy – the ability to critically assess sources, spot AI bias, and verify knowledge – ensures learners do not passively accept responses but actively question them (Head et al., 2020). Third, self-directed learning (SDL) skills, such as setting goals, managing time, and being motivated from within, are vital for turning chatbot interactions into meaningful learning experiences (Robinson & Persky, 2020). Fourth, critical thinking and reflective inquiry enable learners to challenge assumptions, test their understanding through dialogue, and connect new insights with existing knowledge (Brookfield, 2012). Finally, communication and prompt engineering skills – the ability to ask clear, specific, and contextually relevant questions – are essential for obtaining relevant, accurate, and personalised responses from AI systems (Mourabit et al., 2025). Together, these skills ensure learners engage in chatbot-based learning in a two-way manner, much like the ancient Samvāda tradition, while developing lifelong learning competencies.

This paper aims to provide students with a practical, step-by-step framework for using chatbots effectively as a supplementary learning tool in their formal higher education. By drawing on the ancient Samvāda tradition of dialogic learning and aligning it with modern principles of self-directed learning, the framework will guide learners on how to initiate dialogue with AI, structure topics into sub-units, identify biases, and verify their own understanding. Such an approach not only empowers students to take control of their additional learning but also equips them with a structured process for using chatbots to improve comprehension, skills, and overall learning outcomes.

In today's fast-changing context, students are required to continuously re-skill themselves, a need often unmet by the formal curriculum. According to Knowles' framework of self-directed learning (1975) a student must first identify the skills that are not addressed within the curriculum. Once these needs are diagnosed, the learner selects an appropriate learning path. With the advancement of technology, AI tools such as chatbots align well with self-directed learning frameworks, as they enable learners to personalise their learning trajectories. By applying the framework outlined in this paper, students can effectively integrate these tools into their collaborative learning processes.

A. Proposed Chatbot-Assisted Samvāda Framework

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Recommended font sizes are shown in Table 1.

Drawing inspiration from the ancient Indian Samvāda (dialogic) method of learning and integrating insights from Knowles' theory of self-directed learning (1975), this study proposes a structured framework for employing chatbots as partners in higher education learning. The framework comprises six interconnected stages: Question (Prashna), Cross-Questioning, Cross-Referencing, Summarising, Validation and Self-Evaluation.

Within this framework, chatbots act not only as information providers, but as active facilitators of inquiry, fostering criti cal thinking, validation, and iterative learning. Crucially, it enables students to set personalised learning goals, engage critically with knowledge, and receive ongoing feedback, thereby overcoming the rigidity of traditional Indian higher education curricula. By allowing students to practise questioning, reflection, and validation, the framework brings the Samvāda tradition into a digital context, making it accessible and scalable for a diverse range of learners, particularly those from resource-constrained backgrounds.

Praśna (Questioning). The starting point of Samvāda is the act of inquiry. Questioning allows learners to move beyond passive reception of information and engage in curiosity-driven exploration. In chatbot-assisted learning, students can ask unlimited questions without hesitation, enabling the cultivation of critical inquiry. This resonates with Freire's (1970) call for problem-posing education, where learners generate knowledge through active questioning rather than passive acceptance (Freire & Macedo, 2014).

At this stage, learners identify the core topic, decompose it into subtopics, list the outcomes and frame focused prompts for each segment.

Cross-questioning. The spirit of Samvāda resides in dialogic exchange, where each response is scrutinised further. Cross-questioning fosters a deeper engagement with the subject matter, preventing the superficial acceptance of information. Chatbots deliver immediate responses that students can probe repeatedly, mimicking the recursive nature of traditional debates. This process embodies dialogic pedagogy as discussed by Brookfield and Preskill (2012), where critical conversations act as a

powerful learning tool (Brookfield & Preskill, 2012). Here, students will ask supplementary questions to probe further. This helps move from superficial knowledge to a more profound realisation. Supplementary questions encourage students to think critically, make comparisons, or analyse concepts.

At this stage, a learner should ask supplementary questions to the chatbot when they are confused, want to explore a topic more deeply, or want to connect the current lesson to prior knowledge.

Cross-referencing. Authentic Samvāda requires learners to connect diverse perspectives and assess their consistency. In the digital context, cross-referencing involves comparing chatbot-generated responses with authoritative sources such as peer-reviewed articles, textbooks, or official data. Importantly, students should also assess the authenticity of the sources used by chatbots to verify the reliability of information, thereby fostering critical digital literacy (Wineburg & McGrew, 2017).

To cross-verify chatbot answers, fact-check the key points using multiple reputable sources such as academic journals, established news organisations, or official government websites.

Summarizing. In dialogic traditions, summarisation is essential to consolidate learning. By paraphrasing chatbot interactions and distilling key insights, learners strengthen comprehension and memory retention. This practice also encourages them to separate essential arguments from peripheral details, a skill that research shows enhances durable learning (Brown et al., 2014).

Learners can extract and summarise the main points from their chatbot interactions, then upload these summaries along with examples to the chatbot.

Validation. Samvāda is not complete without testing the strength of arguments. In chatbot-assisted learning, validation involves a feedback loop. Students input their summarised content, i.e., what they have derived from the learning, back into the chatb ot. The chatbot, in turn, provides feedback on whether their comprehension is accurate, highlights potential misunderstandings, and suggests refinements. This iterative cycle mirrors the traditional dialogic exchange in Samvāda, where conclusions were tested and challenged until intellectual clarity was achieved. Such validation not only improves conceptual accuracy but also fosters metacognitive awareness of one's learning process (Paul & Elder, 2005).

Self-evaluation. Finally, learners must reflect on their own understanding, biases, and progress. Chatbots provide a safe environment for iterative self-assessment. Students can explicitly request chatbots to generate practice tests or quizzes based on the topics studied, attempt them, and then receive automated evaluation and feedback. This process encourages learners to monitor their progress, identify areas for improvement, and refine their knowledge. Such practices align with the principles of self-directed learning, where learners take responsibility for diagnosing their own needs, setting goals, and engaging in continuous self-monitoring (Knowles, 1975).

Together, these six components (Figure 1) establish a framework for integrating Samvāda with AI-mediated pedagogy. By grounding technology use in dialogic principles, the framework not only bridges the gap created by rigid curricula but also equips learners with critical, reflective, and self-directed learning skills needed for lifelong learning.

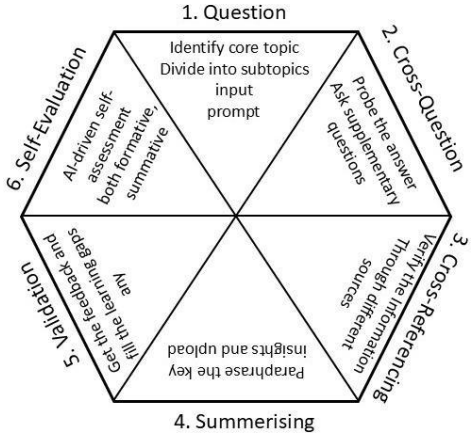

Figure 1. Chatbot-assisted Samvāda Framework

This dialogic framework positions chatbots not just as sources of information but as active facilitators of inquiry, promoting critical thinking, validation, and iterative learning. Significantly, it enables students to personalise learning goals, critically engage with knowledge, and receive ongoing feedback, thereby addressing the rigidity of traditional Indian higher education curricula. By allowing students to practise questioning, reflection, and validation, the framework embodies the Samvāda tradition in a digital setting, making it accessible and scalable for diverse learners, particularly those from resource-limited backgrounds.

III. RESEARCH QUESTIONS

The study aims to explore whether a structured Chatbot-assisted Samvāda Framework can deliver tangible benefits over unstructured chatbot use in higher education. We specifically aim to assess the framework's impact on test performance, average

learning outcomes, and its overall effectiveness in improving student learning.

1. Does the use of a Chatbot-assisted Samvāda Framework lead to higher test performance compared to unstructured chatbot learning?
2. Is there a statistically significant difference in the average scores between students using the framework and those not using it?
3. Can the framework be considered effective in improving overall student learning outcomes?

IV. RESEARCH OBJECTIVES

1. To examine the impact of the chatbot-assisted Samvāda framework on students' test performance.
2. To compare the average learning outcomes of students who used the framework with those who did not.
3. To evaluate the effectiveness of the framework in supporting better learning outcomes.

V. RESEARCH METHODOLOGY

Researchers used a pre-test–post-test control group design to evaluate the effectiveness of the Chatbot-assisted Samvāda Framework. The study involved 60 undergraduate journalism students (BA I–III year) from a government college in Koppal District, Karnataka State, India. All participants took a common pre-test on the Basics of Fact-Checking, and were then divided into two groups with similar mean scores. In the experimental stage, the control group was assigned the topic "The Importance of SEO in digital content writing for independent study". The experimental group received the same topic, plus a structured Chatbot-assisted Samvāda Framework that guided the use of chatbots for self-directed learning. Both groups had six hours of study (six sessions of one hour each), with no interaction between them. After the intervention, a common post-test was administered. A week later, the two groups were given a new topic, Characteristics of Clickbait," and after six hours of study, a standard test was administered. The results were analysed by comparing the mean scores of the two groups using an independent samples t-test to determine whether the Chatbot-assisted Samvāda Framework produced a significant improvement in learning outcomes.

VI. RESULTS

Two experimental trials were conducted to assess the effect of a Chatbot-assisted Samvāda Framework on student learning outcomes, compared with traditional topic-only learning.

A. First Test Results

In the first trial, students from Team A (topic only) achieved an average score of 22.20 (SD = 6.59), while Team B (topic + framework) obtained an average score of 25.00 (SD = 6.61). An independent samples t-test revealed a statistically significant difference between the groups ($t(38) = -2.07$, $p = 0.045$), indicating that the framework-supported approach significantly enhanced student performance. These results support the view that structured engagement with content—facilitated by chatbot-guided questioning, reflection, and feedback—leads to improved comprehension and higher-order learning.

B. Second Test Results

In the second trial with a different topic, Team A recorded a mean score of 21.50 (SD = 6.52), while Team B achieved a mean of 24.65 (SD = 6.32). Although Team B once again outperformed Team A, the difference was not statistically significant ($t(38) = -1.55$, $p = 0.129$). The higher average score of Team B, however, demonstrates a positive trend suggesting that repeated application of the framework could yield cumulative benefits.

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VII. DISCUSSION

The two tests taken together highlight an important pattern. While the first test revealed a significant improvement for the framework-supported group, the second test showed only a non-significant positive trend. This divergence may be attributed to differences in topic complexity, prior knowledge, or time constraints across the two trials. Nevertheless, across both tests, Team B consistently outperformed Team A in mean scores, suggesting that the framework may serve as a valuable pedagogical tool to enhance self-directed learning.

These findings resonate with prior research emphasising the role of structured learning scaffolds and metacognitive support in fostering deeper engagement (Knowles, 1975). In contexts like Indian higher education, where curricula are rigid and student autonomy is often limited, chatbots can supplement traditional classroom learning by offering personalised dialogue, immediate feedback, and opportunities for self-assessment.

The comparative performance of the two groups across both tests suggests that the Chatbot-assisted Samvāda Framework provides a measurable advantage in student learning outcomes over conventional topic-only study. In the first test, the difference was

statistically significant, demonstrating that structured engagement with AI-driven scaffolds (questioning, summarising, validation, and feedback) can directly enhance comprehension and retention. Although the second test did not yield a statistically significant difference, Team B consistently outperformed Team A in mean scores. This pattern suggests that the framework offers pedagogical value and may yield greater long-term benefits with repeated exposure and across various topics.

VIII. CONCLUSION

The study finds that incorporating a Chatbot-assisted Samvāda Framework into higher education can enhance student learning experiences, encourage self-directed learning, and help mitigate the limitations of India's rigid, exam-focused system. Unlike traditional approaches, which prioritise rote memorisation, this framework allows students to engage meaningfully with content, think critically, and confirm their understanding—leading to improved performance.

Although based on a small sample and limited trials, the findings suggest that chatbot-supported learning could be a low-cost, scalable, and supplementary tool for skill development, especially in resource-constrained settings. Further studies with larger samples, a range of disciplines, and longer-term designs are needed to strengthen the generalisability of these results.

Research reveals that incorporating the Chatbot-assisted Samvāda Framework led to a modest improvement in students' test results compared to unstructured learning with AI tools. However, the difference was not statistically significant, suggesting that while the framework holds promise, further research with a larger sample size and longer-term interventions may be needed to confirm its effectiveness. The modest increase in mean performance suggests the potential of structured AI-based dialogic learning models in improving understanding and application skills among students in Indian higher education settings.

This study was conducted with a limited sample size, which may restrict the generalizability of the findings to larger or more diverse student populations. The research design focused on short-term academic outcomes; therefore, the long-term impact of the framework on sustained learning and retention was not assessed. Additionally, the study relied on controlled classroom conditions, which may differ from the variability of real-world learning environments. Finally, as the field of generative AI and conversational learning tools is rapidly evolving, the findings should be interpreted within the technological context available at the time of the study.

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