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Contextualizing Engineering Education by incorporating Indigenous Knowledge Systems (IKS) in the Curriculum Design

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Contextualizing Engineering Education by Crafting IKS in the Curriculum Design for a Broader Learning Experience

Abstract

This full paper discusses the need to contextualise Indigenous Knowledge Systems (IKS) into engineering education, particularly in non-Western countries such as India. Engineering education, historically based on Western curricula, often fails to equip non-Western engineers with the skills needed to address local problems due to a disjunction between the curriculum and the local context. The paper argues that integrating Indigenous knowledge systems into engineering education can improve the problem-solving skills of students by contextualising engineering practices, thereby providing a more comprehensive learning experience. Despite India's substantial contribution to global engineering, its institutions lack original innovation and research. This is attributed to its dependency on Western-developed theoretical knowledge and the pedagogy of rote learning, with little emphasis on practical application in the local context. This study is significant because engineering problems often arise from local contexts. Without incorporating the study of these local contexts into engineering curricula, even skilled engineers may struggle to solve local challenges effectively.

The paper critically engages with various global initiatives that aim to incorporate Indigenous knowledge into engineering education in order to adopt a similar approach to the Indian context. One way forward could be to integrate the study of *Pramanas* - traditional Indian epistemological tools - into the engineering curriculum, thus bridging the gap between engineering education and the local Indian context.

This study demonstrates how integrating local knowledge systems into engineering education can enhance students' learning outcomes and improve their capacity to apply engineering skills in local, real-world contexts. It highlights the necessity of adapting engineering education to local environments, positing that this approach can encourage and promote more innovative and contextually appropriate solutions. This paper argues that incorporating Indigenous Knowledge Systems into engineering education can not only improve problem-solving skills but also create a stronger connection between students and their communities, leading to the generation of sustainable engineering solutions which are equally sensitive to local cultures.

Keywords: Indigenous Knowledge Systems, Engineering Education, Curriculum Development, *Pramanas*, Traditional Knowledge

Introduction

The modern engineering curriculum taught globally, based on Western frameworks, does not align with the local problems encountered by engineering students in other parts of the world. This disjunction faced by the engineering students between their local contexts and the educational experience of the Western engineering curriculum hinders their ability to solve local problems. This study stresses the understanding that engineering problems come from a local context, and if the study of the local context is excluded from the curriculum, then the engineers may struggle to solve their local problems. Matindike and Ramdhany argue that STEM education needs to be framed through the Indigenous knowledge system (IKS) lens, and we must find out how the teaching and learning of STEM subjects can be enhanced with the incorporation of IKS [1]. Incorporating a local knowledge system within engineering education will not only help engineering students from non-Western societies to learn engineering better, but they will also be able to use their engineering skills in the local context more efficiently.

Background of Engineering Education in India

The origin of engineering education in India dates back to the British, majorly for infrastructural development [2]. During the colonial rule, 'the superintending engineers were mostly recruited from Britain from the Cooper's Hill College, and this applied as well to foremen and artificers; but this could not be done in the case of lower grades - craftsmen, artisans and sub-overseers who were recruited locally. As they were mostly illiterate, efficiency was low [3]. To address the issue of low efficiency and improve skilled workers, industrial schools attached to the Ordinance Factories and other engineering establishments were established and elementary lessons in reading, writing, arithmetic, geometry, and mechanics, etc were provided. Following independence, Indian leaders recognized the importance of engineering and founded national, state/regional, and divisional engineering institutions. For instance, the prestigious 'Indian Institute of Technology, Roorkee has its roots in the Roorkee College established in 1847 as the first engineering college in India, which was soon rechristened as Thomason College of Civil Engineering in 1854 after its mentor James Thomason' [4].

As of 2020, India ranks second, following China (3.57 million), with 2.55 million STEM graduates, making it one of the top 11 countries with the number of STEM graduates [5]. Despite this fact, Indian education institutions do not find top places in the world ranking [2]. This could be because of the emphasis on imparting theoretical knowledge with little practical application and extensive practice of memory-based assessments [2]. Some key issues in the teaching and learning process include a shortage of qualified faculty, outdated instructional methods, and inflexible curricula and pedagogies. Theoretical knowledge alone is not sufficient 'the learning experience of the students should be enhanced through methods such as experiential learning, participative learning, project-based learning, industrial visits, guest lectures, and problem-solving methodologies [2]. This pedagogy, with a focus on practical application in local contexts, would enable engineering students to create solutions for the local society, and for this to be effective, engineering students must also be taught courses on local knowledge systems.

Therefore, this paper explores the argument that the IKS bridges the gap between academia and real-world applications, and in this context, we will explore the teaching of the concept of the *Pramanas* to first-year students at Plaksha University in India.

Before we look into the Indian context, it is essential to acknowledge that IKS has been adapted to address unique local challenges in various regions of our world. We will critically explore how IKS has been implemented in different contexts, thereby setting the background for our research in India.

Implementation of Indigenous Knowledge Systems

While the global engineering model has traditionally been Western-oriented, there is growing recognition that Indigenous knowledge can improve more sustainable and contextually appropriate problem-solving approaches [16].

This is evident from the three global examples of IKS that have been reviewed in this paper to learn valuable lessons for engineering education in India, specifically for incorporating Indian Indigenous epistemology, *Pramanas*, within the engineering curricula.

The Integrated Sustainable Indigenous Knowledge (ISIK) system in Haikou village, China, has been successful in demonstrating the relevance of Indigenous knowledge in the context of disaster risk reduction (DRR) [17]. Grassroots communities are involved in collaborations with the government and scientific institutions, utilizing traditional knowledge for the prediction of natural disasters, for example, reading the behaviour of animals as an early warning system [6]. This system highlights the imperative of recognising Indigenous wisdom in the context of modern scientific paradigms. Likewise, Canada's shift towards integrating Indigenous Ways of Knowing into engineering curricula highlights the imperative of relational knowledge and sustainability in engineering solutions [18]. The emphasis on 'Two-Eyed Seeing,' which facilitates the integration of Indigenous and Western perspectives, ensures Indigenous ways of knowing are recognized and integrated into modern engineering education [19].

The University of Hawai'i has established the 'Indigenous Knowledge in Engineering' (IKE) program to support Native Hawaiian students in completing Baccalaureate degrees in engineering. This initiative integrates Indigenous perspectives into the engineering curriculum, promoting a culturally relevant educational experience. The program emphasized the importance of community engagement and the application of traditional knowledge in engineering projects by indigenizing STEM education in IKE alliance institutions. Among its core objectives, the program aims to 'take full advantage of both Indigenous and traditional academic knowledge systems to tackle grand challenges and weave Indigenous science, culture, and community into best practices in STEM education' [21].

A study conducted at the University of Manitoba also emphasized the importance of incorporating Indigenous perspectives into engineering education. The research outlined ten action points to integrate Indigenous knowledge and perspectives into the Biosystems Engineering program, aiming to create a more inclusive and culturally responsive curriculum [22].

It emphasized the need for engineering programs to adapt to diverse cultural contexts to better serve Indigenous communities. 'In Western engineering and science, students are often taught to evaluate and solve problems through a purely technical and objective lens' [23]. However, real problems are never constrained by only technical factors and include social, political, and non-technical aspects alone, and engineers should be equipped to effectively address diverse problems in their fields [24]. The linear progression model from teaching technical and theoretical information to an applied project in the final year may not be the most effective method in preparing students to navigate the complexity and constant evolution of engineering practice in the ever-changing and complex environment [25]. Enabling engineering students to learn about and from Indigenous Peoples and local Indigenous communities will help develop 'a new generation of well-rounded, culturally competent professionals better equipped to work with Indigenous Peoples and tackle today's complex problems' [22].

Indigenous Knowledge System in India

The colonial educational system actively suppressed native traditions and knowledge systems leading to the marginalization of Indian indigenous technical knowledge systems. The socio-economic and political realities during the colonial period also hindered the integration of these systems into mainstream education. 'As a result, the latent potential of the traditional technical knowledge systems remains untapped' [9]. Even after independence, the Indian educational framework excluded traditional Indigenous knowledge systems and did not prioritize an integrated curriculum. The National Mission for Manuscripts (NAMAMI), set up in 2003, has listed 3.5 million manuscripts out of the estimated 40 million in India. Two-thirds of these are in Sanskrit and 95% are yet to be translated [10]. As a result, India is still at the tip of its ancient knowledge iceberg as a large part of its ancient literature is in Sanskrit [9]. According to Kaul and Bharadwaj, 'India needs a strategic plan with focused interventions to establish science and technology as a continuation of the legacy of the past, instead of an import from the West', and they acknowledge that 'the establishment of the Indian Traditional Knowledge Systems Division in the Ministry of Education at All India Council for Technical Education in October 2020 is a welcome step in this direction' [9].

In India, the disconnect between the engineering curriculum and the local contexts is an outcome of both colonial and pre-colonial influences on our education system, thus creating a need for a culturally appropriate knowledge base that will help to re-establish the lost links between curriculum and the learner's local identity [11]. To prepare for the future, higher education needs to empower engineers with the skills and knowledge necessary to address rapid change, uncertainty, and complexity. A crucial aspect of this is the ability to adapt engineering solutions to specific social, economic, political, cultural, and environmental contexts, while also considering the broader global implications of local actions [12]. Indian Indigenous knowledge systems (IIKS) encompass a wealth of knowledge, practices, and innovations amassed over ages in India, covering various disciplines, including mathematics, astronomy, medicine, philosophy, and ecology [13]. However, despite having the potential to contribute to modern scientific progress, these local knowledge systems have frequently been overlooked in India's education system.

For generations, Indians have developed a deep understanding of their natural surroundings through keen observation. This relationship has yielded valuable insights into the knowledge and practices in fields such as sustainable agriculture, herbal remedies, ecosystem management, etc. A comprehensive exploration of IKS can empower engineering students to confront the challenges of the twenty-first century with resilience and innovative thinking. For instance, Indian higher education institutes (HEIs) are working on incorporating IKS into higher education. While it necessitates meticulous planning and comprehensive teacher training programs, it also involves the procurement of credible study materials available in various Indian languages [13]. While teaching students the value of IKS is vital, 'the capacity-building of teachers through training in imparting IKS in various disciplines is essential to prevent the dissemination of inaccurate information to students, which could undermine the integrity of IKS education [13]. Integrating Indian Indigenous Knowledge

Systems (IIKS) into mainstream education offers multiple benefits such as 1. Cultural enrichment: Deepens students' understanding of India's heritage 2. Holistic learning: Promotes a comprehensive approach to education beyond traditional subjects 3. Sustainability focus: Emphasizes traditional ecological practices. 4. Values-based education: Cultivates ethical values alongside academic knowledge 5. Research and innovation: Supports research to address contemporary challenges and 6. National development: Contributes to India's overall growth and global standing [14]. However, to promote the inclusion of Indigenous knowledge in Indian engineering curricula, there remains a significant gap in addressing local theories of knowledge. In India particularly, the Government of India under the Ministry of Education is trying currently to implement the Indian Knowledge System into the New Education Policy (NEP, 2020). It has been stated that engineering education has failed to attract students who want to contribute to social development [13].

Therefore, this study seeks to explore the advantages of integrating Indian Indigenous Knowledge Systems into the engineering curriculum. The main research objective of this paper is to evaluate the significance of integrating the local Indian theory of knowledge i.e. *Pramanas* with the course, Art of Thinking, taught to students at Plaksha University, India.

Methodology

The course, *Art of Thinking*, is taught to first-year engineering students as a part of their engagement with humanities subjects in Plaksha University, India. Traditionally, this course addresses foundations of thinking, forms of thinking, and the intersection of thinking with technology. However, in the last iteration of this course, a new section on IKS was added. This course was taught to about 130 first-year engineering students. The section 'Forms of Thinking' provides a critique of Bloom's Taxonomy and gives a revised taxonomy that was relevant to engineering students. However, in this iteration, after the critique of Bloom's taxonomy, the Indian taxonomy of thinking was introduced, focussing on the teaching of *Pramanas*. Therefore, a new revised taxonomy of thinking was developed for engineers based on Bloom's critique and the *Pramanas*. The goal was to incorporate IKS in developing forms of thinking in Indian engineering students.

For this study, we conducted a preliminary survey amongst the 130 students out of which 15 students agreed to join the Focus Group Discussion (FGD). The participants were divided into two focus groups: 9 students in the first discussion group and 6 students in the second discussion group, both the discussions went on for approximately two hours. During the FGD, the moderator facilitated the discussion, fostering open dialogue to ensure equal participation. The FGD led to qualitative data collection: firstly, the session was audio-recorded and subsequently transcribed to ensure the preservation of all the information, enabling a thorough analysis at a later stage. Secondly, in addition to recordings, an observer took detailed notes during the session, capturing both verbal and non-verbal cues. The moderator used a semi-structured questionnaire with open-ended questions allowing participants to share detailed insights.

FGDs offer several advantages as a research tool. The FGD as a qualitative research methodology is designed to gather in-depth insights through group interaction. It involves a small, purposively selected group of participants (typically 6 to 10 individuals) who share similar backgrounds or experiences relevant to the research topic. The discussion is guided by a skilled moderator using a semi-structured format, allowing for both directed inquiry and organic dialogue. The process is dynamic, with participants influencing each other's responses through shared ideas and contributions, which fosters deeper exploration of the topic. Data collection typically includes audio recordings, transcripts of discussions, and the moderator's reflective notes. This multi-layered approach aligns with Clifford Geertz's concept of "thick description," which emphasizes capturing not just actions but their cultural and social contexts to provide a nuanced understanding of participants' perspectives [28].

The rationale for employing FGDs lies in their ability to generate rich qualitative data that captures not only individual opinions but also the dynamics of group interaction. Compared to surveys or individual interviews, FGDs provide a more nuanced understanding of how participants construct meaning collectively, making them ideal for exploring complex topics. The discussions are structured yet flexible, allowing unexpected insights to emerge while ensuring all key themes are addressed. During the sessions, moderators encourage open dialogue while managing group dynamics to avoid dominance or conformity bias. The qualitative data is analyzed thematically, with findings presented through recurring patterns and illustrative quotes that highlight participants' shared and divergent perspectives. However, we begin by giving a summary of how *Pramanas* were integrated into the 'Art of Thinking' course.

Understanding the Indian Knowledge System of *Pramanas*

In the Indian epistemological tradition, *Pramanas* serve as the means of obtaining valid knowledge (*prama*). The six major *Pramanas* recognized in Indian philosophy are – 1. *Pratyaksha* (perception) 2. *Anumana* (inference) 3. *Upamana* (comparison/analogy) 4. *Arthapatti* (postulation) 5. *Anupalabdhi* (non-perception) and 6. *Sabda* (verbal testimony) - These offer diverse ways of understanding engineering concepts beyond the rigid frameworks of Western methodologies [26], [27].

By embedding *Pramanas* into engineering curricula, students can develop a more holistic approach to obtaining socially relevant knowledge, blending empirical analysis with culturally attuned reasonings. Adapting this approach to India's engineering education can create a paradigm shift, ensuring that knowledge systems align with the socio-cultural fabric of the country, leading to sustainable and inclusive technological advancements. *Pramanas* form the basis for acquiring valid knowledge and it provides an indigenous problem-solving system that is most similar to the engineering principles. For instance, *Pratyaksha*, which is founded on observation and empirical evidence, is similar to China's experience-based learning model in disaster relief planning.

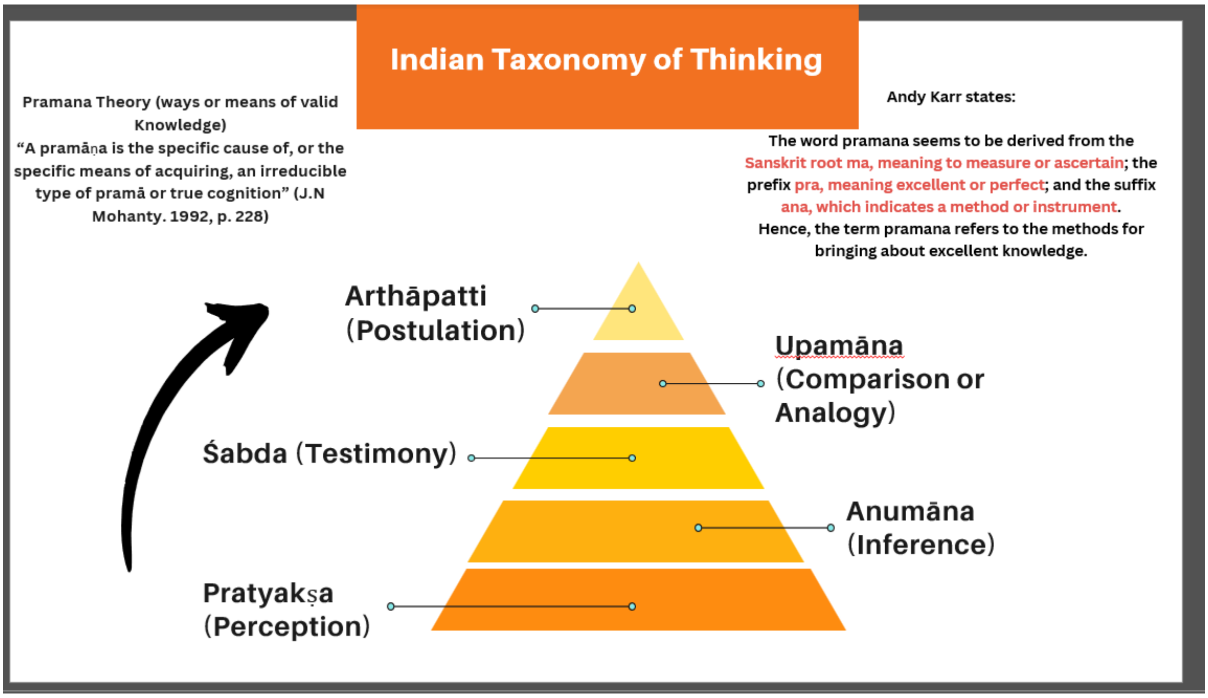

Figure 1: Pramanas - Indian Taxonomy of Thinking

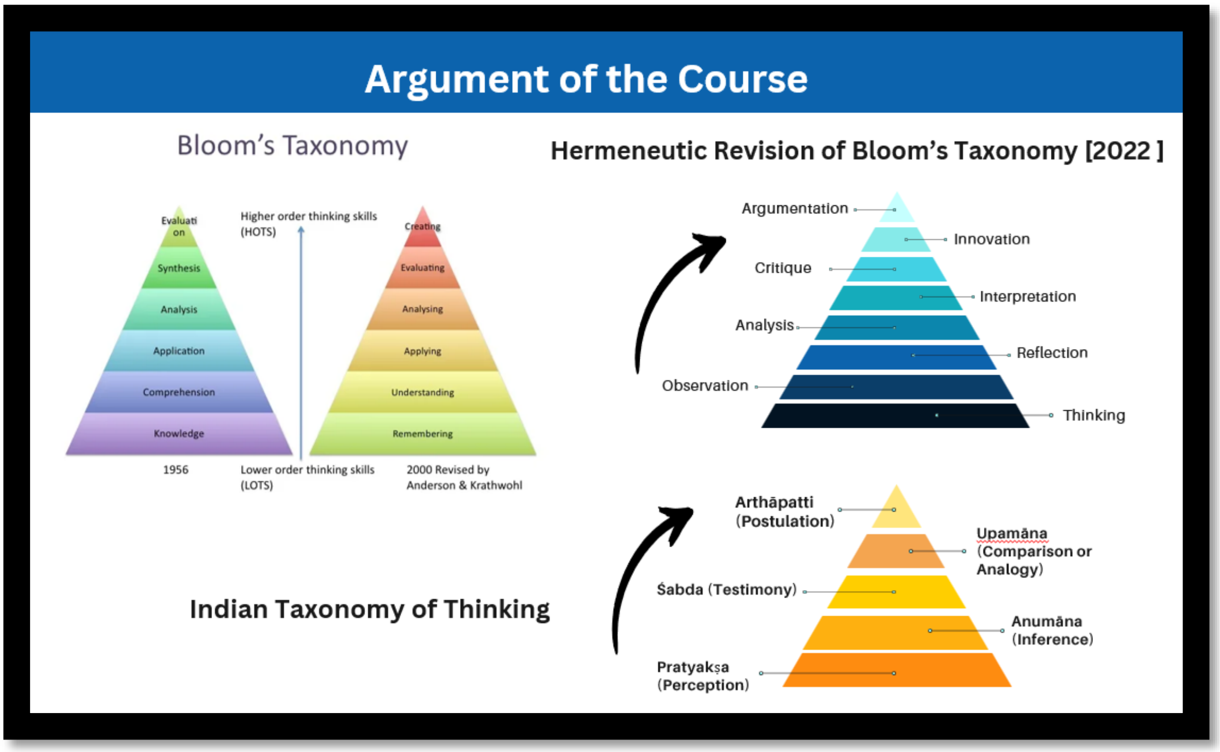

Figure 2: Argument of the Course

Data Analysis and Findings

1. Observations from the first FGD

The first FGD primarily explored students' engagement with *Pramanas* and how these forms of thinking shaped their learning processes. The discussions also highlighted the potential of *Pramanas* to complement and enrich traditional pedagogical models, promoting a deeper connection between theoretical learning and practical and culturally relevant applications. Participants demonstrated varying degrees of engagement with the concept of *Pramanas* with their natural learning and problem-solving processes. Many respondents intuitively identified with elements of *Pramanas*, particularly the starting stages namely, Perception (*Pratyaksha*), Testimony (*Śabda*), and Inference (*Anumana*) which align closely with their real-world experiences and knowledge-making methods.

Despite not being formally trained in Indian philosophical traditions, participants noted a cultural resonance with *Pramanas* when they were taught that as part of their course curriculum. They felt that this epistemological framework gave a name to their intuitive knowledge-making processes. Many participants admitted that, although they did not consciously label their forms of thinking as belonging to Indian epistemology, their cognitive processes naturally aligned with it.

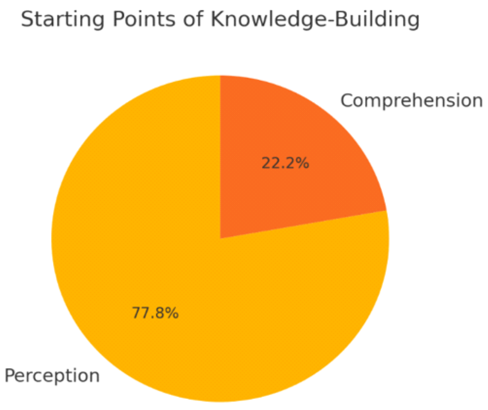

Figure 3: Starting Points of Knowledge Building

77.8% of participants identified *Pratyaksha* (Perception) as their primary starting point for knowledge acquisition, while only 22.2% indicated comprehension as their initial step, aligning with the traditional framework of Bloom's Taxonomy. This suggests that *Pramanas* predominantly serve as a more intuitive and adaptable approach to learning and problem-solving, particularly in contexts that emphasise experience over abstract knowledge.

In the first FGD, all of the nine students in the group said that they resonated with the *Pramanas*. Six said that they shared a strong resonance with IKS while three said that they had partial resonance and appreciated its integration with Bloom's taxonomy. The FGD explored how learning preferences may also vary across cultures. Participants noted that the Indian approach to learning is rooted in direct engagement and exploration and contrasts with the Western emphasis on structured instructions and textual comprehension.

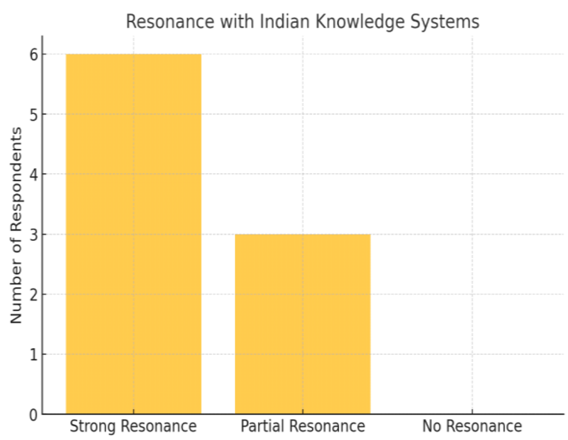

Figure 4: Resonance with Indian Knowledge Systems

The preference for starting with perception was noted by most participants, who felt that hands-on experience provided a richer and more contextual understanding. One participant stated *‘We gather first-hand data, talk to stakeholders, and only then look at research papers for validation,’* emphasizing the value of primary data collection over secondary research. This preference for *Pratyaksha* also reflects a broader cultural tendency to engage directly with the world, experimenting and figuring things out before using theoretical models or written instructions. 77.8% of participants indicated that their natural approach to problem-solving begins with sensory engagement - observing, experiencing, and interacting with the subject matter rather than textual sources. This preference aligns with the Indian tradition of experiential learning, where knowledge is grounded in direct interaction with the environment. Throughout the focus group discussion, participants highlighted the critical role of spoken speech and conversations in their knowledge-formation process.

A recurring theme in the discussion was the contrast between Indian and Western knowledge systems. Participants described Western frameworks, particularly Bloom’s Taxonomy, as linear and text-based and focused on comprehending pre-existing knowledge as the starting point for learning. In contrast, Indian epistemology, through *Pramanas*, prioritises direct engagement with the world through perception and experience.

Although they recognised that some courses like Innovation Lab Grand Challenge (ILGC) or Economics in their engineering curriculum incorporated local engagement, such as projects involving interviews with stakeholders or field observations, these were isolated efforts rather than a systemic part of the curriculum. In the ILGC course, participants were asked to begin with fieldwork in the local context to make observations and arrive at primary inferences about their problems. One participant said, *‘Getting the context of things is really important. It’s very difficult to solve a problem that you yourself have never faced or at least can’t empathize with someone who’s facing it. So, right, putting yourself in the shoes of the people who are facing a particular problem is very essential to solving it’*. This approach is vastly different from getting knowledge through textbooks and research papers, a methodology often emphasised by Western frameworks. This revealed the importance of understanding local customs, traditions, and cultural nuances, which are essential for designing engineering solutions that are both technically robust and socially acceptable.

2. Observations from the second FGD

In the second Focus Group Discussion, all participants unanimously agreed that integrating Indian Knowledge Systems is essential for fostering culturally sensitive and context-based engineering solutions. While 16% of participants believed that incorporating this integration into a single course, such as 'Art of Thinking and Reasoning', was sufficient, the remaining 84% felt that these efforts would be more impactful if applied across the entire engineering core curriculum.

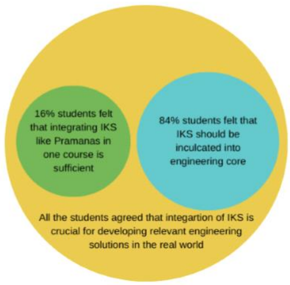

Figure 5: Context-based Engineering Solutions

Participants also pointed out that much of the curriculum relied on Western datasets and case studies, which may not be relevant to the Indian context. One of the students said, *‘You don’t* *get to solve problems on the ground. It is in a very simulated environment, but it is really frustrating...I think it's just that they are giving you a framework till now'.* For example, when developing technological solutions for local problems, students often had to base their designs on American datasets and case studies - resources that were readily available online, particularly for prototyping, as gathering raw data from local communities was often challenging due to regulatory restrictions or a lack of willingness from the locals to contribute.

Many emphasized how verbal exchanges - whether through discussions, interviews, or casual conversations were key to deepening their understanding of complex issues. They shared experiences of engaging with local communities, conducting interviews, and understanding the user's needs. This highlights that *Śabda* (Testimony) is an important and natural method of knowledge acquisition in the Indian context. Participants leveraged verbal exchanges (*Sabda*) to acquire nuanced insights, complementing their observations.

Students valued the training and opportunities they got for engaging with local communities. One student shared that, *'we have to interact with them [local village people] and know about what is the water quality status and how well is the water there and stuff like that, so we needed to pay a lot of attention to the interviews, so they taught us how to interview people…and methods to interview people and how to do it ethically and respectfully for all community…'.* Whether through structured interviews or informal conversations, verbal exchanges enriched their understanding of complex issues. This aligns with the concept of *Śabda* or 'word', which points to conversations or verbal exchanges being means of gaining knowledge within the Indian epistemological system.

Discussion of Results

The discussion was guided by a series of questions that examined participants' engagement with *Pramanas*, its applicability in real-world contexts, how it is embedded in their thinking process, and their reflections on the differences between Indian and Western epistemological frameworks. The initial questions prompted participants to share how they first encountered *Pramanas* and whether its framework resonated with their learning experiences. This line of inquiry led to the emergence of the first major theme: Perception as a starting point of learning. Participants consistently described how their learning often began with direct observation and experience. These were applied in their real life and in their academic projects, which involved engagement with local communities. This aligns with the first stage of *Pramanas,* which is *Pratyaksha,* highlighting that this process is in contrast to Western models such as Bloom's taxonomy, which typically starts with comprehension. The discussion explored participants' preferred modes of gathering information, leading to the second theme: Preference for conversations over reading. Participants expressed a strong preference for learning through dialogues and field-based interactions rather than relying solely on textual resources as their primary evidence, suggesting that conversations provided contextual insights and a deeper understanding of the subject matter. The discussion then focussed on the real-world applications of *Pramanas* in participants' ILGC projects, where questions about practical experiences revealed the third theme: Value in Learning Local Knowledge and Traditions. Participants shared anecdotes about using perception and conversational knowledge to identify community issues, such as water quality problems in rural villages, demonstrating the practical relevance of local knowledge in engineering tasks.

This was further emphasised by the observation that technically efficient engineering solutions can fail to address community needs if they lack cultural sensitivity. Finally, the discussion included questions that encouraged participants to reflect on the broader role of Indian epistemology in engineering education, leading to the fourth theme: Alignment with IKS. Participants noted that the culturally familiar lens of IKS felt intuitive and contextually appropriate, especially when working with communities in India, although they also acknowledged challenges related to the nation's cultural diversity. Through an iterative questioning process, these four themes emerged organically in the discussions, providing insights into how the *Pramanas* framework influenced participants' learning processes and the benefits of integrating Indigenous Knowledge Systems into engineering education.

In the Indian context, learning is often seen as an inquiry-driven, hands-on process, where students engage with the world around them, sometimes even indulge in trial and error, before turning to formal sources. This reflects a cultural preference for intuitive and experiential learning, which aligns closely with the principles of *Pramanas*. Students appreciated how these methods resonated with their cognitive styles and provided a culturally relevant and context-sensitive approach to learning. Beyond developing technologically robust solutions, participants stressed the necessity of considering local laws, customary practices, cultural norms, religious values, and societal taboos to ensure that engineering solutions create meaningful community impacts. They strongly desired the curriculum to prepare them with this contextual knowledge. Moreover, students advocated for expanding courses like *Art of Thinking and Reasoning*, which introduces Indian epistemology. In summary, students found the inclusion of *Pramanas* and IIKS enriching but believe their integration into engineering education needs to be more extensive to foster culturally relevant, context-sensitive, and impactful problem-solving.

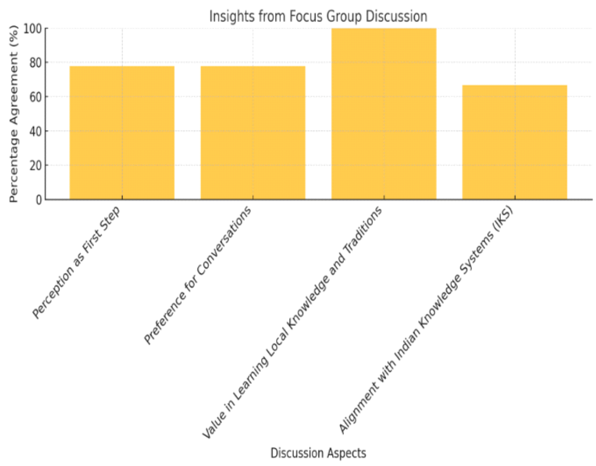

Figure 6: Insights from FGD Findings

In summary, the four main findings of this research are as follows: First, the participants identified *Pratyaksha* (Perception) as their main starting point for gaining knowledge through traditional pedagogical methods, which helps in solving problems, particularly in a cultural context where experience takes precedence over theoretical knowledge. Second, even without formal training in Indian philosophical traditions, participants felt a cultural resonance with *Pramanas* when it was introduced in their curriculum, which is grounded in active engagement and exploration, in contrast to the Western focus on structured instruction and textual understanding. Third, the shared experiences of engaging with local communities, conducting interviews, and in-depth understanding of the local values and traditions underscore that *Śabda* (Testimony) is a fundamental and natural method of knowledge acquisition within the Indian context. Fourth, there was a strong inclination to integrate *Pramanas* into engineering education to foster culturally relevant engineering solutions that take regional contexts into account.

Participants frequently highlighted the differences between Indian and Western epistemologies. Bloom’s Taxonomy emphasises comprehension as the starting point, whereas the *Pramanas* encourage sensory engagement. For example, students shared how they often prefer engaging directly with tasks like experimenting with gadgets or conducting fieldwork before consulting formal instructions or secondary research.

Despite their unfamiliarity with formal Indian philosophical traditions, students expressed a strong cultural resonance with the *Pramanas*. The framework of the *Pramanas* validated their innate learning processes and provided a culturally relevant lens for addressing local problems.

Conclusion

There is an important need to reimagine engineering education, particularly in non-Western contexts such as India, to embrace IKS along with Western methodologies. This means introducing local datasets and community-centred projects and weaving in culturally relevant traditions, histories, and problem-solving processes. It also means broadening the curriculum to include more opportunities for hands-on, field-based work where students can apply their naturally inclined indigenous forms of thinking, like the *Pramanas,* in real-world contexts. Structured discussions and other forms of verbal exchange should be recognised as pedagogical approaches to deepen understanding and encourage collaboration. By thoughtfully blending Indian epistemologies with established Western approaches, we can create a more holistic and empowering learning experience which will be relevant to the local context in India. This approach would not only respect and leverage the cultural realities of Indian students but also equip them to tackle the unique challenges found in their communities.

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