Economic Sciences
https://economic-sciences.com
ES(2026) 22, 2 (2) , 134-145 | ISSN:1505-4683

Exploring the Impact of Deep Tech Tools in Education: Teachers' Perspectives

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Abstract

This research paper examines the effect of deep tech tools on learning and teaching from the faculty members' point of view in Pune, India. The research investigates how technology affects the teaching methodology, student motivation, and institutional support mechanisms. A qualitative approach was used with a sample size of 30 faculty members from higher education institutions. Sentiment analysis was done using VADER, Rule-Based, and Random Forest algorithms to evaluate teacher responses. The study indicates a widespread positive attitude toward technology adoption with considerable advantages documented in teaching strategies, student interaction, and application of smart boards and AI-powered tools. However, difficulties involving poor infrastructure, technical problems, and lack of formal training still exist. Actionable suggestions for improving technology incorporation are made through the paper and include thorough training programs, technological infrastructure improvements, and improved institutional support.

Keywords

Deep tech tools, AI in education, Sentiment analysis, Sentiments algorithm, Teachers' perspectives

1.0 INTRODUCTION

Nowadays, teachers are more inclined to change how they teach by integrating the latest technologies, popularly known as deep tech tools. These modern-day digital technologies like smart boards, projectors, computers, and AI-based tools. The AI-based tools have transformed the classroom teaching-learning process by enhancing the availability of content, productivity, and learning and teaching processes (Baballe,2023). By adopting such tools, instructors can design vibrant learning spaces that support teamwork, analytical thinking, and tailored learning in accordance with contemporary education standards (Mthembu, 2023). Not only does digital technology add value to classroom learning through accessibility aids and automation but also supports students learning at their own pace with tailored content while making it possible for teachers to monitor progress effectively. The use of computers and the internet revolutionizes the conventional classroom into a dynamic digital environment for enhanced student participation and performance (Haleem, 2022). Apart from education, technology also enables sustainable development by providing support for data analysis in responding to environmental and social problems, reducing ecological footprint, and preferring long-term development. The advent of artificial intelligence (AI) also enhances pedagogy, especially in open and distance learning. AI has the power to revolutionize teaching and learning but needs cautious handling to meet possible risks. A systematic approach is necessary to evaluate AI's influence on learner performance and promote effective integration (Adewale, 2024). Still, there are loopholes in AI policies, training, and sensitization. To fill these gaps, educators require extensive AI training, ongoing professional development, and greater sensitization through workshops. Secure technology access and responsible AI policies are equally necessary to secure student data and promote teaching while equipping students for an AI-powered future (Woodruff, 2023).

Though the apparent advantages are clear, the effective implementation of deep tools is highly dependent on faculty uptake, institutional support, and strong infrastructure. In developing nations such as India, there is scarce qualitative research documenting teachers' actual experiences with technology integration. This research fills this void by examining the influence of deep tools on teaching practices from the point of view of faculty members in India. It examines teacher attitudes, determines effective technologies, and emphasizes challenges that prevent smooth uptake.

Through the use of sentiment analysis with VADER, Rule-Based, and Random Forest algorithms, this study presents an in-depth portrayal of how professors view technology in their classrooms. From the results, positive developments and aspects that need to be improved are shown, providing useful lessons for schools to further streamline their tech initiatives and prepare teachers better for the digital world.

Although deep tech tools are increasingly employed in education, scarce qualitative research documents faculty experience, especially in emerging contexts such as India. Previous studies tend to look at student outcomes rather than explore how teachers cope with technology integration in their instructional processes. This research fills this gap by investigating how faculty members view the adoption of deep tools in tertiary education, the challenges they face, and what they expect from institutional support.

2.0 OBJECTIVES

The primary objective of this research is to understand the impact of deep tech tools on teaching and learning from the teacher's perspective. This research aims to Evaluate teacher sentiment- Assess how teachers feel about the use of technology in education which includes their satisfaction with the tools, challenges faced and perceived impact on teaching and student engagement. Identify key trends- This research tries to determine which technologies are most useful which are underutilized and what challenges hinder effective technology integrations.Provide actionable recommendation- Based on the sentiment analysis researcher tries to offer practical recommendations for improving technology adoption infrastructure training and support systems in educational institutions.

3.0 SCOPE & LIMITATIONS: -

This study focuses on understanding the impact of deep tech tools on teaching and learning from the perspective of faculty members in higher education institutions across India. The research investigates faculty opinion, determines useful technologies, surveys challenges during technology implementation, and analyses the necessity for institutional training and support.

1. Self-Reported Data: The study is based on self-reported answers, which can result in biases from personal perceptions and experiences.
2. Focus on Faculty: Although the study incorporates teacher views, it does not feature student experiences, which may be more holistic in understanding the effect of technology.
3. Technology-Specific Findings: The findings are derived from currently existing deep tech tools and would not necessarily work for future technological developments.

In spite of these constraints, the research provides valuable insights for enhancing technology integration plans in higher education, especially in environments with limited resources.

4.0 LITERATURE REVIEW-

Applying intelligence in learning has both opportunities and challenges that must be carefully weighed by learning institutions to ensure the benefits outweigh the disadvantages while maintaining student privacy and equity. Careful application of AI can improve learning through customized and effective learning opportunities for all students. (Harry, A.2023). The majority of instructors still adhere to conventional methods, neglecting the utilization of project-based and problem-based learning. In response, it is vital to promote innovative teaching environments that stimulate teamwork and critical thinking. Effective use of resources, support from stakeholders, new rules and regulations, and ongoing professional growth are significant to successful technology integration in education (Mthembu, 2023).

Smart boards promote student engagement and teamwork through activities and discussions while incorporating at the same time video and audio

lessons, for a more dynamic learning experience. Teachers can effectively deliver content using PowerPoint presentations seamlessly without the need for tools like chalk and board cleaners. This shift eliminates the use of paper. Promotes sustainability, in classrooms. (Baballe M. A., 2023) AI also enhances student-teacher interactions in online learning, making it an essential component of online education. Knowing factors such as gender and geographic variations aids in overcoming issues in AI implementation. In summary, the role of AI in ODL is increasing, and research is needed to create predictive models that maximize its effect. A well-planned strategy will ensure maximum benefits from AI while minimizing risks, leading to improved student outcomes. (Adewale, 2024)This research analyses the hindrances to AI, IoT, and Blockchain adoption in Bangladesh's maritime industry with prominent obstacles being Da ta Security and Privacy, Interoperability, and Education and Awareness. (Tahsin, 2024) Educational technology faces issues in implementation in the form of screen time issues, teacher readiness, and access problems. While online education is advantageous for some students, others fail because they lack support or resources. Teachers also need improved training and motivation, technology can assist in professional development. Low-tech solutions might be more feasible in resource-poor settings, as high-tech approaches are expensive and out of reach. Moreover, online learning is not always as effective as classroom instruction, especially for younger
students. Solving these issues needs meticulous plann ing, training, and equal access to technology. (Haleem, 2022) Studies have used qualitative, quantitative, and mixed-method studies, making use of literature reviews, interviews, and questionnaires. ChatGPT has been known to increase personalized learning, automate testing, assist research, and enhance student engagement. Pedagogical uses include personalized learning, content generation,
and automatic testing. Excessive dependency on AI could slow down critical thinking development. Researchers apply ChatGPT for writing and summarizing, yet accuracy and bias concerns require human monitoring. Other ethical issues like bias, disinformation, privacy issues, and
plagiarism threats underscore the need for ethical AI use in education. (Al-Jahwari, 2025)

Future of AI in Education- AI has a very promising future in education, offering new means of making learning in dividualized, efficient, and effective. In the future, AI systems can become more intelligent, comprehending human emotions and offering improved feedback to students. AI can assist in developing personalized lesson plans based
on every student's requirements and performance. It also has the potential to make learning more interactive
and interactive, allowing for teachers to save time and deliver better quality of education. With challenges such as privacy and fairness to be catered to, AI is well-positioned to make education both more accessible and student-centered in the future. (Harry, 2023)

University educators experience constraints in using digital
technology, the strongest among them being professi onal constraints. The teachers reported most major barriers in the form of a lack of incentives, evaluation, training, time, and digital teaching know-how, in addition to a heavy workload and technophobia. Of these, insufficient training is the
most recurrent constraint. Allowing the breaking of s uch constraints is institution-based through a strategy plan and participation by the faculty. (Gairín, 2020)

AI in
education is very promising but yet underexploited. The question of the day is whether AI should replace educators or complement teaching and learning. Although some nations utilize educational data to offer customized learning, issues of data accuracy and implementation of AI still exist. Education systems must continually improve to get future employees ready with AI-driven skills. AI is innovation and global competitiveness enhancer, but cooperation through sh

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ES(2026) 22, 2 (2) , 134-133 | ISSN:1505-4683

aring
of knowledge plays a central role in influencing the r ole of AI in education. (Akinwalere, 2022).

(Wankhede & Kulkarni 2022) This piece describes sentiment analysis, how it works, its applications, and the techniques that are most frequently used. It then contrasts the techniques, highlighting the strengths and limitations of each. The article concludes by examining its limitations and indicating avenues for improvement in the future. (Tan Lee & Lim 2023). This is the overview of what has been newly developed in sentiment analysis, for instance, data pre-processing, feature engineering, techniques used for classification, common data sets utilized, and experimental performance. It further examines the setbacks encountered in empl oying sentiment analysis datasets and briefly speaks on existing shortcomings and aven ues of future research.

The papers reviewed are grouped according to their contribution to various SA techniques. It also touches on related topics that have recently been of interest, including transfer learning, emotion detection, and resource development. The primary aim of this survey is to provide a general overview of SA techniques and their fields of interest with concise but effective definitions. The ma jor contributions are to place recent research papers in relevant categories and emphasize ongoing trends in sentiment analysis and its related fields. (Medhat, W., Hassan, A., & Korashy, H. 2014).

Birjali,,Kasri, & Beni-Hssane (2021) This paper presents an in-depth analysis of sentiment analysis, its methods, challenges, and trends, and provides researchers with a complete understanding of the discipline. It indicates several applications of sentiment analysis and describes the overall process involved. It also discusses, compares, and contrasts various methods and presents a clear idea of their advantages and limitations.

Pandey, A., & Vishwakarma, D. K. (2023). This article presents a comprehensive overvie w of recent advances in multimodal sentiment analysis based on deep learning models for various data types such as text, audio, image, and video. It also discusses the types of multimodal data, application domains, crucial processes, deep learning architectures, fusion strategies, challenges, benchmark datasets, and state-of-the-art methods. The final goal of this survey is to describe how deep learning efficiently conquers the challenges of multimodal sentiment analysis.

Deep tech learning tools, a subset of artificial intelligence (AI), are increasingly influencing education by enhancing personalized learning, automating administrative tasks, and providing real-time feedback. Some scholarly articles that explore the impact of deep learning tools in education: A Teacher Perspective are reviewed; these articles offer valuable insights into teachers' perspectives on integrating deep learning tools in education, emphasizing the importance of professional development, ethical considerations, and collaborative approaches to AI integration.

Wu, X. (2023). The study conducted a meta-analysis of empirical publications examining students'; deep learning outcomes about digital technology, providing clarity on the effectiveness of digital tools in enhancing deep learning. The study further indicates a positive influence of digital technology on students'; deep learning outcomes. Further, a moderator variable analysis revealed several significant findings such as-

1. Different categories of digital technology tools have a favorable impact on deep learning outcomes;

2. The duration of digital technology treatment does not significantly affect deep learning outcomes;

3. Digital technology demonstrates a highly positive influence on deep learning within the humanities and social sciences disciplines;

4. Combining online and offline utilization of digital technology in education leads to a substantially greater enhancement in deep learning compared to relying solely on online methods;

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ES(2026) 22, 2 (2) , 134-133 | ISSN:1505-4683

5. The effectiveness of digital technology on deep learning is enhanced when accompanied by appropriate instructional guidance;

6. Systematically utilizing digital technology produces different outcomes compared to fragmented approaches, highlighting the importance of a cohesive implementation;

7. Integrating digital technology with collaborative learning has a more pronounced effect on deep learning compared to independent learning.

These findings contribute to our understanding of the impact of digital technology on deep learning outcomes and underscore the importance of thoughtful integration and instructional support in educational contexts. Loveless, B. (2025, January). The article discusses the pervasive presence of AI in schools, emphasizing the need for responsible integration to enhance learning experiences and prepare students for a technology-driven future.

Ariel Han et al conducted a workshop with twelve families (parent-child dyads) with hildren ages 8-12 and interviewed sixteen teachers to understand each stakeholder's perspectives and opinions on Generative AI(GAI) systems for learning and teaching writing they found that the GAI systems could be beneficial in generating adaptable teaching materials for teachers, enhancing ideation, and providing students with personalized, timely

feedback. However, there are concerns over authorship, students' agency in learning, and uncertainty concerning bias and misinformation. In the article Teachers, Parents, and Students' Perspectives on Integrating Generative AI into Elementary Literacy Education, they discuss design strategies to mitigate these constraints by implementing an adults-oversight system, balancing AI-role allocation, and facilitating customization to enhance students' agency over writing projects.

Kamalov, F., Calonge, D., & Gurrib, I. (2023). The research investigates the potential impact of AI on education, reviewing applications, advantages, and challenges, and discusses the need for sustainable development and deployment of AI-driven technologies in educational settings. The review focuses on the use of artificial intelligence in collaborative teacher-student learning, intelligent tutoring systems, automated assessment, and personalized learning. They also report on the potential negative aspects, ethical issues, and possible future routes for AI implementation in education. Ultimately, they concluded that the only way forward is to embrace the new technology while implementing guardrails to prevent its abuse.

Mallik, S., & Gangopadhyay, A. (2023, January). The review examines how AI, machine learning, and deep learning methods are utilized to support students, educators, and administrative staff, categorizing their involvement in proactive planning and reactive execution phases of education. The review outlines and analyses the major research directions under the proactive and reactive engagement of AI in education using a representative group of 195 original research articles published in the past two decades.

Pinto, J. D., & Paquette, L. (2024, April). The article provides an introduction to deep learning, surveys its applications in education, and discusses how it shapes the field of educational data science, including advanced knowledge tracing and automatic affect detection. Alwaqdani, M. (2024, August). This study examines Saudi teachers' perceptions of integrating Artificial Intelligence Educational Tools (AIED) into their practices, highlighting both potential benefits and challenges. Kim, J. (2023, September). This research explores how teachers envision collaboration between human educators and AI systems, focusing on curriculum design, teacher-AI interaction, and learning environments. Almuhanna, M. A. (2024). This article investigates K-12 teachers' views on integrating AI-powered technologies, discussing the transformative potential and ethical considerations of AI in education.

Ravi, P., Broski, A., et al (2023, December). This study investigates middle-school teachers' experiences after implementing an AI literacy curriculum, highlighting the need for professional development and support in AI education. The analysis suggests that the AI modules not only expanded our teachers' knowledge in the field, but also prompted them to recognize its daily applications and their ethical and societal implications so that they could better engage with the content they deliver to students. Teachers were able to leverage their own interdisciplinary backgrounds to creatively introduce foundational AI topics to students to maximize engagement and playful learning. The teachers advocated their need for better external support when navigating technological resources, additional time for preparation given the novelty of the curriculum, more flexibility within curriculum timelines, and additional accommodations for students of determination. The findings of the study provide valuable insights for enhancing future iterations of AI literacy curricula and teacher professional development (PD) resources. These above-mentioned articles offer valuable insights into teachers' perspectives on integrating deep learning tools in education, emphasizing the importance of professional development, ethical considerations, and collaborative approaches to AI integration.

5.0 RESEARCH GAPS.

Based on the literature review, several research gaps emerge regarding the integration of deep learning tools in education from teachers' perspectives:

Longitudinal Impact Studies: While existing studies offer valuable insights into teachers' perceptions of AI tools, there is a lack of longitudinal research examining the long-term effects of AI integration on teaching practices and student outcomes. Understanding how AI tools influence education over extended periods is crucial for assessing their sustained impact.

Diverse Educational Contexts: Much of the existing research focuses on specific regions or educational systems. There is a need for studies that explore teachers' perspectives on AI tools across diverse educational contexts, including varying cultural, socioeconomic, and technological environments, to understand the broader applicability and challenges of AI integration in education.

Ethical Considerations and Bias in AI Tools: While some studies touch upon ethical concerns, there is insufficient research addressing the potential biases in AI algorithms andtheir implications for equitable education. Investigating how AI tools may inadvertentlyperpetuate biases and exploring strategies to mitigate these issues is essential for responsible AI integration.

Professional Development and Support: Teachers often express the need for comprehensive training and ongoing support to effectively utilize AI tools. Research exploring the most effective professional development programs and support structures to empower teachers in integrating AI into their classrooms is limited.

Comparative Studies of AI Tools: There is a need for comparative studies evaluating theeffectiveness of different AI tools in various educational settings. Such research can guide educators in selecting the most appropriate tools for their specific teaching contexts. Addressing these research gaps will provide a more comprehensive understanding of the impact of deep learning tools in education from teachers' perspectives, facilitating the development of effective strategies for their integration.

6.0 RESEARCH METHODOLOGY

The research methodology employed in this paper is a qualitative approach. Researcher investigate the impact of deep tools in education from the perspective of faculty members in India. The sampling consisted of faculty members teaching in Higher Education. Since the study is in exploratory in nature the focus is on in depth understanding of experiences and perceptions. Purpose of sampling was deemed the most appropriate method since it allows the selection of participants based on specific criteria relevant to the research question this method ensures that the sample is reaching information and diverse in perspectives related to technology integration in education. The faculty members were having varying level of experience and different subject matter expertise within the Higher Educational institutes. A structured questionnaire was prepared to collect the responses. Though standard questionnaires and surveys exist for some aspects of technology integration in education but a comprehensive set like these questions are used and are tailored to deep tools and the teacher's perspective. The questions are aligned with the research objectives. The questions are informed by the technology acceptance model that perceived usefulness and perceived use are key determinants of technology adoption. The questions where pilot tested with a small group of faculty members to assess their clarity and relevance. Based on the pilot test results minor revisions were made to improve the wording and ensure that the questions were easily understood. All the 10 questions were open-ended questions that allowed the respondents for a more in-depth exploration of experiences and perspectives. A sample of 30 faculty members was selected strategically to provide a comprehensive and Nuanced view. The qualitative data collected was then analyzed by using orange and open source data mining software this allows the researcher to identify pattern's themes and sentiments related to the adoption challenges and impact of deep tech tools in their teaching practices. This methodological approach aimed to provide a holistic understanding of the research problem generating valuable insights for improving technology integration strategies in higher education.

6.0 FINDINGS & DISCUSSIONS: -

SENTIMENT ANALYSIS

Sentiment analysis is highly appropriate for this research paper. Sentiment analysis aims to understand teachers' perspective on the impact of deep tools in the education sector. Teachers opinion, experiences, and attitude towards technology are inherently subjective and qualitative sentiment analysis provides a systematic way to quantify these subjective responses by allowing researcher to identify the upcoming trends patterns and areas of concerns by analysing the sentiment of teachers' response the research can easily identify positive and negative trends highlight key areas for improvement measure the impact of Technology. By analysing the sentiments associated with different aspects of technology integration the researcher can identify recurring positive and negative themes this will help to pinpoint what's working well and what needs improvement.

USE OF SENTIMENT ALGORITHMS

In this research three sentiment algorithms are used they are rule-based approach and random forest and VADER. VADER is specifically designed for social media text and short sentences making it more suitable for analysing teachers' short responses. It is also good at handling negations emoticons and slang. A rule-based approach may allow for custom rules and contextual understanding which can be tailored to the specific language used by the teachers. It can also handle nuanced expressions and domain-specific terminologies. Random forest is a machine learning model that can capture complex pattern in the data. It is more flexible and can handle mixed sentiments better than lexicon-based method. It also provides confidence scores which can add a layer of reliability to the sentiment predictions. VADER and Rule-based methods are simple and faster but may lack the sophistication to handle complex or mixed sentiments. Whereas random forest provides a more accurate and nuanced analysis especially for mixed sentiments, but requires more computational efforts and data presentation.

VADER is a lexicon-based rule-based sentiment analysis tool specifically used to sentiments expressed in social media it relies on a dictionary that contains words and their associated sentiments scores namely valence and intensity. The text from each question responses were analysed, and a composite score is calculated ranging from -1 to +1 which indicates most negative to most positive. In rule-based approach it involves creating a custom set of rules and a sentiment lexon the Lexicon contains words and phrases manually assigned with positive negative or neutral sentiment score.

Random forest classifier is a supervised machine learning approach. It involves training a random forest model on a data set of labelled text examples the model learns to associate specific features of the text with different sentiments. The text data was cleaned tokenized and converted into numerical vectors using TF-IDF. The sentiment labels (positive, negative, neutral) were converted into numerical values.

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https://economic-sciences.com
ES(2026) 22, 2 (2) , 134-133 | ISSN:1505-4683

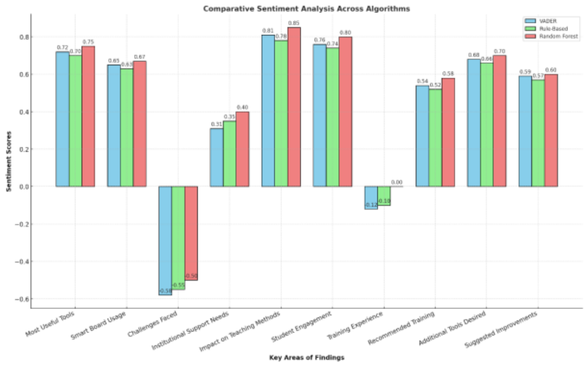

Figure XX

Here is the comparative bar chart of sentiment scores on key findings for VADER, Rule-Based, and Random Forest algorithms.

KEY OBSERVATIONS:

Most Useful Tools & Impact on Teaching Methods: Random Forest always indicates the highest positive sentiment.

Challenges Encountered:

All the algorithms express a strong negative sentiment, with

VADER expressing the highest concern (-0.58). Institutional Support & Training: Random Forest suggests the highest demand for increased support and training initiatives. Student Engagement: Sentiment is very positive in all algorithms, particularly Random Forest (0.80).

Table 1. XX

Question	Algorithm	Result	Key Findings	Recommended Actions
1. Most Useful Technologies/Tools	VADER	Strongly Positive (0.72)	Mentions of AI tools, MS Teams, smart boards, and presentation software. Appreciation for practical utilities.	Expand access to well-received tools. Continue supporting and promoting the use of these tools. Provide training and resources to maximize their effectiveness. Leverage highly rated tools, integrate them deeply into curricula, and provide additional support for educators.
	Rule-Based	Predominantly Positive	Teachers find a wide array of tools useful, indicating a diverse and technology-integrated teaching environment. Reasons cite real-time feedback, ease of use, and assistance in teaching and learning.	
	Random Forest	Positive (High Confidence)	Confirms positive sentiment toward tools. The classifier likely identified key terms associated with utility and ease of use.	
2. Smart Board Usage Examples	VADER	Moderately Positive (0.65)	Emphasis on interactive features and visual demonstrations. Appreciation for flexibility in content delivery.	Provide more training on advanced smart board features. Encourage teachers to share innovative uses of technology and create a repository of best practices. Share these best-practice examples across the institution to inspire and inform other educators.
	Rule-Based	Positive	Shows practical applications of smart boards and technology tools to enhance engagement, illustrate complex concepts, and facilitate interactive sessions.	
	Random Forest	Positive (High Confidence)	Examples indicate positive sentiment. The classifier accurately identifies active use cases and successful implementations.	
3. Challenges Faced	VADER	Moderately Negative (-0.58)	Network connectivity issues, technical glitches, and time management concerns.	Invest in robust infrastructure and technical support. Prioritize improving
	Rule-	Negative/Neutral	Connectivity issues, technical	

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ES(2026) 22, 2 (2) , 134-133 | ISSN:1505-4683

	Based		glitches, and lack of training are significant challenges. Some responses indicate no challenges, suggesting varied experiences.	internet infrastructure, provide technical support, and offer training to address these challenges. Address technical challenges by upgrading infrastructure, providing better technical support, and creating contingency plans.
	Random Forest	Negative/Neutral (Moderate Confidence)	Some responses indicate "No problem," but recurring issues such as connectivity and technical glitches lower the overall sentiment. The Random Forest classifier balances these mixed signals.	
4. Technical/Institutional Support Needs	VADER	Slightly Positive (0.31)	Strong desire for training. Need for better infrastructure. Financial support requests. Teachers are optimistic about support but need more.	Develop comprehensive training programs and an infrastructure upgrade plan. Invest in infrastructure upgrades, offer regular training sessions, and create a supportive environment for technology adoption. Invest in comprehensive training programs and support systems to help educators effectively adopt and use technology.
	Rule-Based	Positive	Teachers need infrastructure improvements, training programs, and institutional support to effectively integrate technology.	
	Random Forest	Positive (High Confidence)	Emphasis on training and institutional support leads to a positive sentiment. The Random Forest model confirms the need for proactive support mechanisms.	
5. Impact on Teaching Methods	VADER	Strongly Positive (0.81)	Enhanced engagement, improved content delivery, and more interactive teaching.	Document and share successful teaching methodologies. Continue encouraging the use of technology and supporting teachers in adapting their methods. Recognize and celebrate these positive impacts by sharing success stories and rewarding innovative uses of technology.
	Rule-Based	Positive	Technology has positively transformed teaching methods, making them more engaging, efficient, and relevant.	
	Random Forest	Positive (Very High Confidence)	Overwhelmingly positive language used to describe the impact of technology results in a very high-confidence positive sentiment.	
6. Technology's Impact on Student Engagement	VADER	Strongly Positive (0.76)	Better student participation, improved understanding through multimedia, and enhanced learning outcomes.	Expand successful engagement strategies. Further integrate technology to create more engaging and personalized learning experiences. Continue investing in and expanding the use of technology to enhance student learning experiences.
	Rule-Based	Positive	Technology enhances student engagement through interactive and personalized learning experiences.	
	Random Forest	Positive (Very High Confidence)	The classifier recognizes the significant impact of technology on student engagement and outcomes, further validating its importance.	
7. Training Experience	VADER	Slightly Negative (-0.12)	Limited formal training. Self-learning is predominant. Mixed effectiveness.	Revamp training programs with a focus on practical applications. Increase the availability and quality of formal training programs to ensure all teachers are well equipped. Re-evaluate current training
	Rule-Based	Mixed	While some teachers have received formal training and found it effective, others have not received training or found it not very useful.	
	Random Forest	Neutral (Moderate Confidence)	Given the mixed responses about training effectiveness, the sentiment is neutral. The classifier	

			balances the positive and negative feedback appropriately.	programs to identify areas for improvement and ensure they meet the needs of all educators.
8. Recommended Training Programs	VADER	Moderately Positive (0.54)	Desire for AI-focused training. Need for hands-on workshops. Interest in peer learning. Teachers are eager for structured, practical training.	Implement suggested training formats. Implement recommended training programs to enhance faculty skills and confidence in using technology. Focus on hands-on workshops and practical applications.
	Rule-Based	Positive	Hands-on workshops, certification programs, and refresher courses are recommended to improve technology integration.	
	Random Forest	Positive (High Confidence)	Specific and actionable suggestions for training programs result in a positive sentiment, indicating a clear understanding of what is needed.	
9. Additional Tools Desired	VADER	Moderately Positive (0.68)	Interest in AI tools. Desire for simulation software. Need for advanced assessment tools. Strong appetite for advanced educational technology.	Evaluate and implement requested tools strategically. Prioritize the implementation of these tools to enhance the learning environment and support faculty and students. Prioritize these tools to create a cutting-edge learning environment.
	Rule-Based	Positive	AI-driven tools, AR/VR, simulation software, and plagiarism-checking tools are highly desired to support teaching and learning.	
	Random Forest	Positive (High Confidence)	Suggestions for advanced tools like AI and VR indicate a forward-looking and positive sentiment toward technological advancement.	
10. Suggested Improvements	VADER	Moderately Positive (0.59)	Focus on AI integration, better infrastructure, and more professional development. Teachers have constructive ideas for improvement.	Create an implementation roadmap for suggested improvements. Focus on implementing AI-driven personalized learning, simulations, and VR tools, along with providing necessary training and support. Ensure adequate training and support systems are in place.
	Rule-Based	Neutral	Suggestions include AI-driven analytics, interactive simulations, VR for case studies, and the need for proper training and support systems.	
	Random Forest	Neutral (Moderate Confidence)	Presence of “Nil” and “No change” responses balances out the positive suggestions, resulting in a neutral sentiment.	

This comprehensive analysis provides a robust foundation for understanding the current state of educational technology implementation and planning future improvements. The multi algorithm approach ensures reliable results while the detailed breakdown of sentiments across different aspects provide actionable insights for educational institutions. The overall positive sentiment comes out to be 0.44 which is the aggregate score with specific areas of concern such as training and infrastructure it also provides a balanced view that can guide strategic planning and implementation of educational technology initiatives.

7.0 CONCLUSION & SUGGESTIONS: -

This research points out the revolutionary role of deep technologies in education, with instructors strongly positive about AI tools, smart boards, and collaborative platforms. These technologies have improved teaching styles, student engagement, and general classroom experiences. Despite this, there are challenges, especially concerning insufficient infrastructure, technical support, and minimal formal training.

To fill these gaps, educational institutions need to prioritize the following:

Detailed Faculty Orientation: Periodic workshops and practice sessions on AI, smart boards, and future technologies. Infrastructure Upgrades: Investing in solid digital infrastructure and technical support.

Strategic Tool Adoption: Widening availability of popular tools wit h friendly guides and ongoing support. By targeting these areas, institutions can establish a more inclusive, effective, and technologically based learning environment, readying teachers and students for education's future.

FUTURE SCOPE

- This study provides a foundation for further research in the following areas:
- Longitudinal Study: Future studies need to explore how faculty attitude and technology adoption change over time, particularly as new technology and training initiatives become available.
- Student Perspectives: While this study focuses on teachers, future research can include student perspectives to gain a holistic understanding of technology's impact on the learning ecosystem.
- Cross-disciplinary Insights: Exploring how technology adoption varies across different disciplines, such as humanities, sciences, and professional courses, can provide valuable insights for tailored technology integration strategies.

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