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Flipped Learning Approach in India: A Systematic Literature Review

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Abstract:
This study presents a systematic literature review of research studies conducted on the Flipped Learning Approach (FLA) in India from 2020 to 2024. 4 databases were used to review the research work and findings show that FLA has been well received by the faculty and students after implementation. The research review shows the growing adoption of FLA in the Indian education scenario, efforts of pedagogical application, and the related educational technology to access. A significant research gap is identified in the implementation of FLA at school level, indicating a need for further studies exploring FLA's applicability in primary and secondary education in India. The study concludes that FLA in Indian institutions is growing and being well-received at Higher Education Institutions however needs to be expanded and explored at the school level as well.

Keywords: Flipped Learning Approach, India, Technology in instruction

1. Introduction:

The Flipped Learning Approach (FLA) has developed as a transformative instructional model, shifting traditional teaching paradigms by reversing the conventional lecture and homework elements of a course. In this model, students engage with educational content outside the classroom, frequently through videos or reading materials, and then use class time for interactive, application-based learning activities. This approach fosters a more student-centered learning environment, encouraging active participation, critical thinking, and collaborative learning. Globally, the adoption of FLA has shown promising results in enhancing student engagement and improving learning outcomes across various educational levels and subject areas. However, despite its potential, the implementation and research on FLA in India remain limited and fragmented. The unique socio-cultural and educational landscape of India presents both opportunities and challenges for the effective integration of flipped learning into mainstream education. This study seeks to address the knowledge gap by providing a comprehensive analysis of the research trends and practical applications of FLA within the Indian education system. By examining the existing literature, research designs, data collection methods, and geographic distribution of FLA studies in India, this research seeks to uncover patterns and identify gaps that can inform future studies and practices. Furthermore, the study explores the adoption of FLA across different education levels, subject areas, and study groups, highlighting its versatility and adaptability. Special attention is given to the state-wise distribution of research, the impact of FLA in school settings, and the extent of faculty training before implementing FLA. These aspects are critical for understanding the current state and potential of flipped learning in India. The findings and recommendations from This study presents useful data for educators,

academics, and policymakers, offering practical guidelines and best practices for integrating FLA in Indian classrooms. Ultimately, this study aims to contribute to the advancement of educational methodologies in India, fostering more engaging, effective, and student-centered learning environments.

1.2 Problem Statement:

Despite the increased worldwide interest and established effectiveness of the Flipped Learning Approach (FLA), its adoption and implementation in India remain uneven and under-researched. Furthermore, most of the research works and literature reviews are in understanding the objective nature of FLA in Higher Education with limited work done to understand its applicability in Indian school. This gap in knowledge poses significant challenges for educators, policymakers, and researchers aiming to promote and optimize FLA in Indian classrooms. Without a detailed insight into the existing state of FLA research and practice in India, it is difficult to identify best practices, tailor professional development programs for educators, and implement strategies that effectively address the diverse needs of students in the Indian education scenario. Therefore, this review study aims to report these critical gaps by systematically analyzing the research trends of FLA in India. By doing so, it aims to provide valuable insights and recommendations that can inform and enhance the implementation of FLA, ultimately improving the quality of education and fostering more engaging and effective learning environments for students. The primary research questions guiding this study are:

1.3 Research Questions:

1. What are the general research trends related to FLA in India?
2. What are the research trends of FLA in the Indian education system?
3. What are the pedagogical activities adopted for implementing FLA?
4. What Edtech applications have been used in instruction for implementing FLA?

This study on the Flipped Learning Approach (FLA) in India offers a comprehensive examination of current research trends and practical applications within the Indian education system. By analyzing trends in research design, data collection methods, education levels, subject areas, and geographic distribution, the study identifies gaps and areas for future research. This analysis is crucial for educators and policymakers to develop tailored strategies that address the diverse needs of various educational contexts. The study also explores state-wise research on FLA, providing insights into regional adoption and effectiveness. This geographic perspective informs targeted interventions to promote FLA in underrepresented areas. Additionally, the study investigates the impact of FLA in K-12 education and examines whether faculty receive training before implementation, highlighting the importance of professional development. Finally, the study compiles researchers' recommendations for integrating FLA in Indian classrooms, offering practical guidelines to enhance instructional strategies, student engagement, and learning outcomes. Overall, this study significantly contributes to the development of FLA investigations, policy development, and educational practice in India.

2. Flipped Learning Approach

Flipped learning is a novel educational technique that challenges the established concept of classroom instruction. In this paradigm, students first interact with new subject outside of class, usually through online lectures, videos, or reading materials, before returning to class to participate in active learning activities. This shift allows classroom time to be used for discussions, problem-solving, and collaborative projects, thereby promoting deeper understanding and engagement with the material.

2.1 Understanding the Flipped Learning Approach (FLA)

The flipped learning approach has in recent times acquired prominence as an educational breakthrough in instructional technology, particularly when applied to higher education (Divjak et al., 2022). The flipped classroom (FC) is an innovative pedagogical technique that has garnered a lot of interest. It entails relocating the information transfer component of a conventional face-to-face (f2f) lecture beyond class time (Abeysekera & Dawson, 2014), which may engage learners and enhance their educational experience in face-to-face, hybrid, and online settings. According to Torío (2019), flipping the classroom allows students to learn at their own speed, which is beneficial for those with limited time. Teachers make previously recorded videos accessible to students, encouraging them to study at their individual pace and length depending on their proficiency level. Teachers and pupils may become more technologically savvy (Huang et al., 2023). Furthermore, a flipped classroom promotes student cooperation and increases opportunities for teacher-student involvement throughout the teaching and learning process (Güler et al., 2022). Flipped Learning involves reimagining the traditional classroom setup (Güler et al., 2022). FLA empowers students with the 21st-century skills necessary for addressing global issues (Zhao et al., 2021) as well as the information required to fulfill current market demand (Ng & Lo, 2022). FLA encourages students to learn independently at home, using all available and diverse learning tools (Lopes & Soares, 2018). In this way, The student takes on a bigger role and responsibility of the individual's educational process, and it is critical for learners to remember and assess instructional content (Bachiller & Badía, 2020). This approach provides a more comprehensive learning experience by enabling students to develop a deep understanding of the subject matter. The structure promotes increased engagement and critical thinking, transforming the conventional educational model into a more dynamic, student-centered process (Karjanto & Acelajado, 2022). Studies comparing traditional and flipped classrooms (DeLozier & Rhodes, 2016; Lo and Hew, 2017) have found that the flipped model offers several benefits, including (1) enhanced educational outcomes, (2) higher levels of academic achievement, self-determination, and motivation, (3) improved self-confidence and performance, and (4) better strategies for organizing and utilizing study time. Teachers do not lecture as in strictly scheduled sessions in the past, but instead emphasize teacher-student interaction. In this kind of teaching, plenty of time is set aside for group discussions, homework supervision, and critical thinking in class; also, adaptive education might be used to guide slow learners Chou et al. (2021).

3. Methodology

3.1 Data Search Process

This work assumes a Systematic Literature Review design exploring and analysing the research work done on FLA in India. An SLR is a rigorous research process for collecting, categorizing, and evaluating current research materials (such as books, papers, conference proceedings, and dissertations) (Pati and Lorusso (2017). A systematic literature review (SLR) tries to contribute to the synthesis of current academic literature in a reliable and accurate manner (Utami et al., 2024). An SLR selects, highlights, and assesses research in order to answer a clearly defined research question. It examines key aspects of current literature on a topic linked to the research question to pinpoint topics for further exploration (Kitchenham et al. 2009). This SLR utilised the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) 2020 criteria while employing a four-phase structure that was developed and suggested by Moher et al. (2009). The technique for identifying the most relevant literature emphasized on the database that would be searched for relevant literature leading to conduct search on widely used four databases of

Scopus, Web of Science, ERIC and EBCSOhost as they contain Conference proceedings, Journals articles, book chapters, review articles, patents, editorials and short surveys as some of the academic literature. These databases are especially well-suited for multidisciplinary and transdisciplinary research, which is frequent in scientific education, due to their extensive indexing coverage.

3.2 Search Method

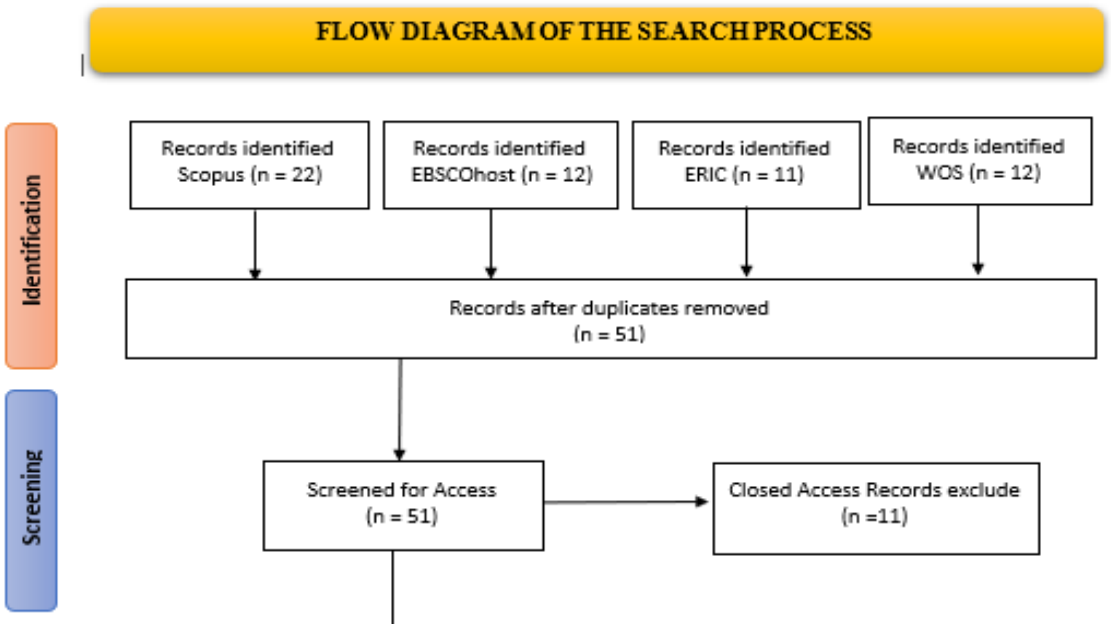
Boolean operators (Grewal et al., 2016) were used inside each database to search for relevant literature, with particular search keywords and limiters specified in Table 1. The search terms of "Flipped" AND "Learning" were used. The search parameters were set as follows. Document types: Research Article; Language: English; Year range between 2020 – 2024, keyword of "Flipped classroom", Territory: India and All Open Access and Published document were reviewed. Search included article titles, abstract and keywords.

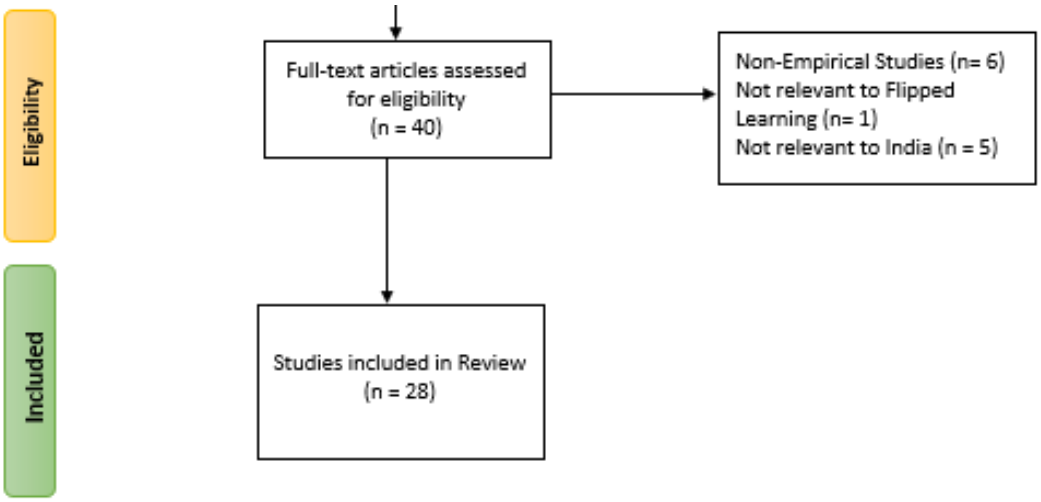
Table 1 Primary search results

Search terms*		Search Limiters	Database	Primary Results
("Flipped") ("Learning")	AND	1. Document type – Research Article 2. Language - English 3. Year range - 2020 to 2024 4. Keyword – Flipped Classroom 5. Country/Territory – India 6. Access Type – All Open Access 7. Publication stage - Published	Scopus WOS EBSCOhost ERIC Total	22 12 12 11 51

*Search includes Article titles, abstracts, and keywords

Figure 1 Flow diagram of the search process





3.3 Eligibility, Inclusion, and Exclusion Criteria:

An important part of an SLR is to define what will and what will not be included in the review of the research papers selected. It is incumbent to define for this study as well criteria for inclusion, exclusion and determine the eligibility of the papers for review. Since the study is specific to Flipped Learning Approach and to ensure the relevance of data is maintained in the study, only papers that identify themselves as being related to Flipped Learning in their title, abstract, and keywords are considered eligible. Adding on papers that are full-published, all open access, written in English language were deemed suitable for this review study. Boolean search "flipped" AND "learning" was used and the limiters were set to papers published between 2020 and 2024, language as English, country/territory as India, and the papers which had keyword of "flipped classroom" and All open access research papers. From the initial search applying the Boolean search operators, a total of 51 journal articles were retrieved after removing the duplicates from the databases. The same Boolean search operators were used in all the four databases of Scopus, Web of science, EBSCOhost and ERIC. At the next stage the articles were screened based on the inclusion/ exclusion criteria as mentioned below. To address the main purpose of an SLR, studies were considered relevant if (1) Were open access so that the study can be read in its entirety, (2) Contained evidence of empirical research, (3) Were relevant to flipped learning as a teaching approach, (4) Studies conducted within the geographic location of India, (5) Were published from 2020 to 2024, (6) Studies that provide sufficient information for answering the research question. Studies were excluded from the analysis if they had no information on flipped learning, were conceptual papers or theoretical papers. Figure 1 shows the screening process which removed duplicates and non-relevant articles reaching to filter out the most relevant articles only to be used in this study. Finally, after screening the pool of 51 articles, 40 articles were identified to suit the purpose of the study which were further screened and excluded the papers that were unrelated to the scope of the study. 6 articles were eliminated as they were non-empirical in research design, 1 article was not relevant to flipped learning and 5 articles were not conducted in Indian institutions. Finally, a total of 28 articles were chosen to be reviewed for this study. The papers are examined as per the set research questions and analysed to gather the findings as discussed in section 4 of this paper.

4. Results and Discussion

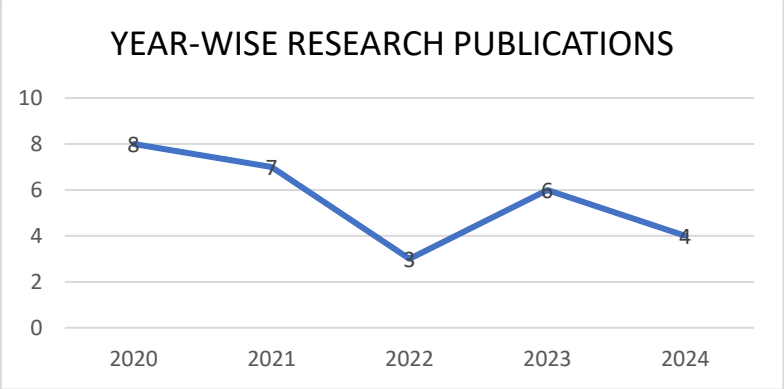
4.1 General Research Trends

To explore the general trends answering Research Question 1: "What are the general research trends rela-

ted to FLA in India?", the research articles are reviewed for year-wise publications, research design adopted, data collection methods utilized, and the following are the findings:

4.1.1 Year-wise Publications: Research studies in FLA show a consistent distribution of research work. Although a peak in the year 2020 (n=8, 13.7%) is notices, the interest of researchers was maintained closely in 2021 (n=7, 12%) and in 2023 (n=6, 10%). However, for the research seemed to have decreased in 2020 (n=3, 5.1%) and until this study was published in 2024 (n=4, 6.8%). Findings suggest that there has been consistent interest of research in understanding the effectiveness of implementing FLA in teaching and learning in India. It shows that there is a growing awareness of FLA as an Innovative method to be adopted in the Indian context.

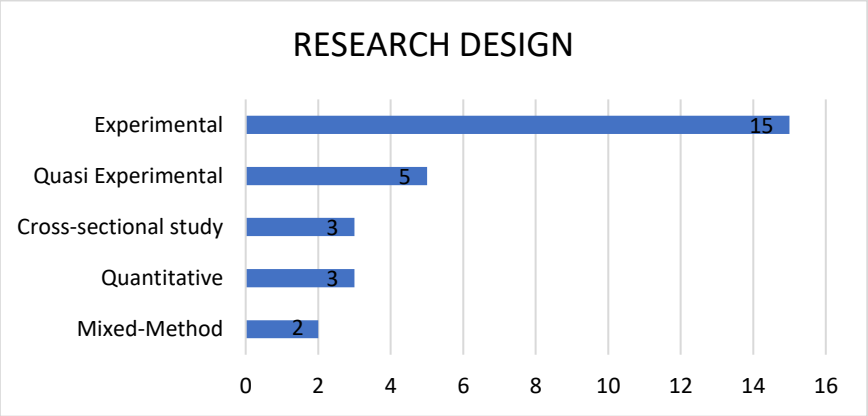
Figure 2 Year-Wise Research Publications



4.1.2 Research Design

The articles reviewed show that research has been mostly Experimental (n=15, 53.5%) which emphasises on exploring the implementation of FLA on one group for a given amount of time. Following this is the Quasi experimental design (n=5, 17.8%) which investigates the difference between a controlled group and an experimental group. Following the experimental and quasi experimental design, the cross-sectional research design (n=3, 10.7%) was also adopted providing for greater emphasis on the adaptation of FLA. The articles also include Quantitative (n=3, 10.7%) and mixed method (n=2, 7.1%) research designs. The emphasis on experimenting the implementation and adaption of FLA shows that there has been serious testing of FLA in not just theoretical on conceptual manner, but has been practical in implementation giving it more validity for being adopted by Policy makers, curriculum designers and teachers at all levels. The findings suggest that most of the suggests that efforts have been made to experiment and quantify the findings exploring FLA by adopting Experimental and Quasi experimental Studies. It also suggests that very little emphasis has been made on in-depth study on the post implementation effectiveness of FLA via case-study or qualitative design which can capture the experience of teachers and students descriptively. A holistic approach is required which should include case-study design to get an in-depth understanding on the implementation of FLA in the Indian classrooms.

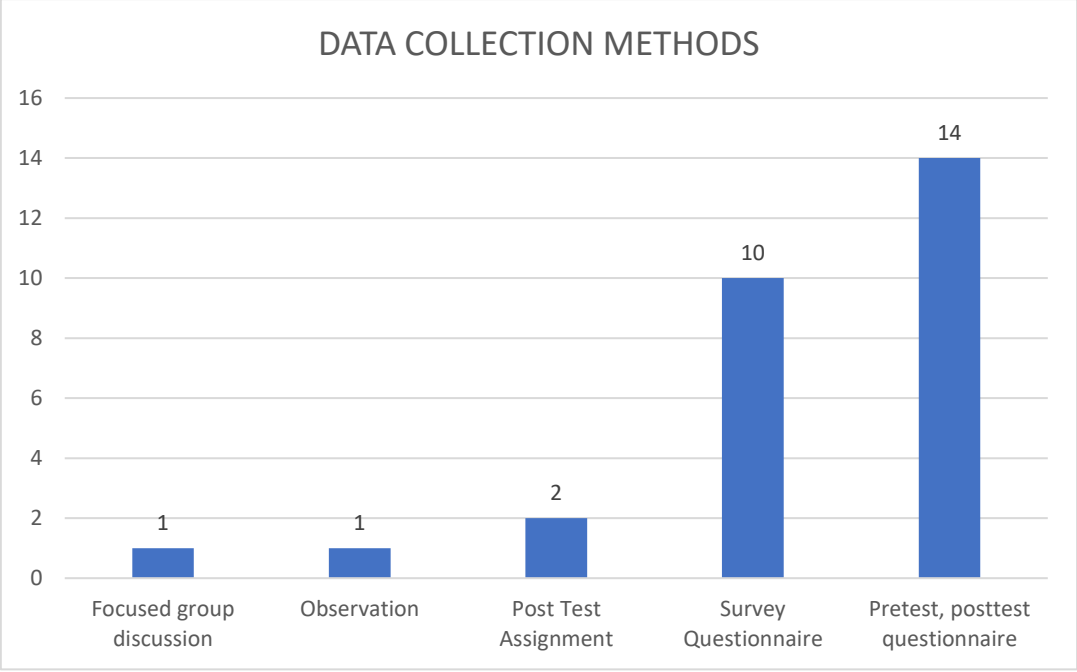
Figure 3 Research Design



4.1.3 Data Collection Methods

The data collections methods were reviewed in the research articles of this study. Following the research design with mostly experimental design, most of the data collection was by way of conducting pretest and post-test questionnaire (n=14, 50%), followed by survey questionnaire (n=10, 35.7%). This shows that researchers have taken efforts is not just understanding the after effect but also made a comparison of the before and after implementation of the FLA in research. Along with collecting quantitative data, researchers have also collected qualitative data in form of Post-test assignment (n= 2, 7.1%), Observation (n=1, 3.5%) and Focused group discussion (n=1, 3.5%). The data collection methods adopted in the studies on FLA show that the focus was on collecting quantitative data providing for statistical evidence for the research being conducted. However, very little effort has been made towards collecting descriptive and qualitative data which provides for in-depth information and analysis of the effectiveness of the research being conducted particularly in an experimental study which has employed pretest and post-test.

Figure 4 Data collection methods



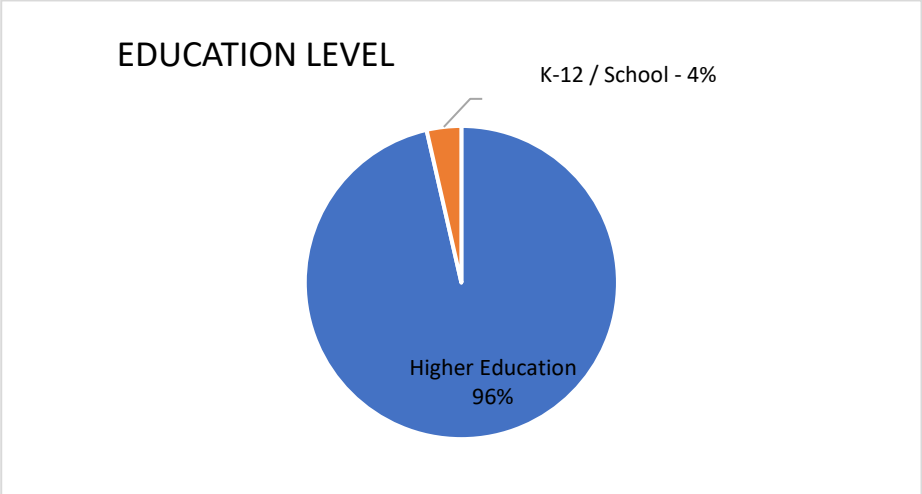
4.2 Trends in FL approach in the Indian Education context: To explore the research trends answering Research Question 2: "What are the research trends of FLA in the Indian education system?", the research articles are reviewed for state-wise research publications, Education settings, subject area and Population of study and following are the findings:

4.2.1 State-Wise Research Publications: The data from the research papers reveals the geographic distribution of research conducted and the same has been analysed to get information of the state-wise research publications in India. The articles suggest that from a total of 28 states and 8 Union territories, 10 (35%) states and 2 (25%) union territories have conducted research on FLA between 2020 and 2024. Mostly research is conducted at institutions in the state of Tamil Nadu (n=7, 25%) and followed by state of Maharashtra (n=5, 17.8%) and then by Institutions in New Delhi (n=4, 14.2%). There have been some studies conducted in the state of Karnataka (n=2, 7.1%), Chandigarh (n=2, 7.1%) and Telangana (n=2, 7.1%). Some other states such as Puducherry (n=1, 3.5%), Punjab (n=1, 3.5%), Rajasthan (n=1, 3.5%), Bihar (n=1, 3.5%), Uttar Pradesh (n=1, 3.5%) and Uttarakhand (n=1, 3.5%) have also made an effort in experimenting with FLA in their institutions. Although institutions in the state of Tamil Nadu and Maharashtra have shown high interest, other states have also started to experiment with FLA. Findings on the state-wise research publications suggests that there is a growing awareness of FLA in institutions across the country.

Figure 5 State-Wise Research Publications

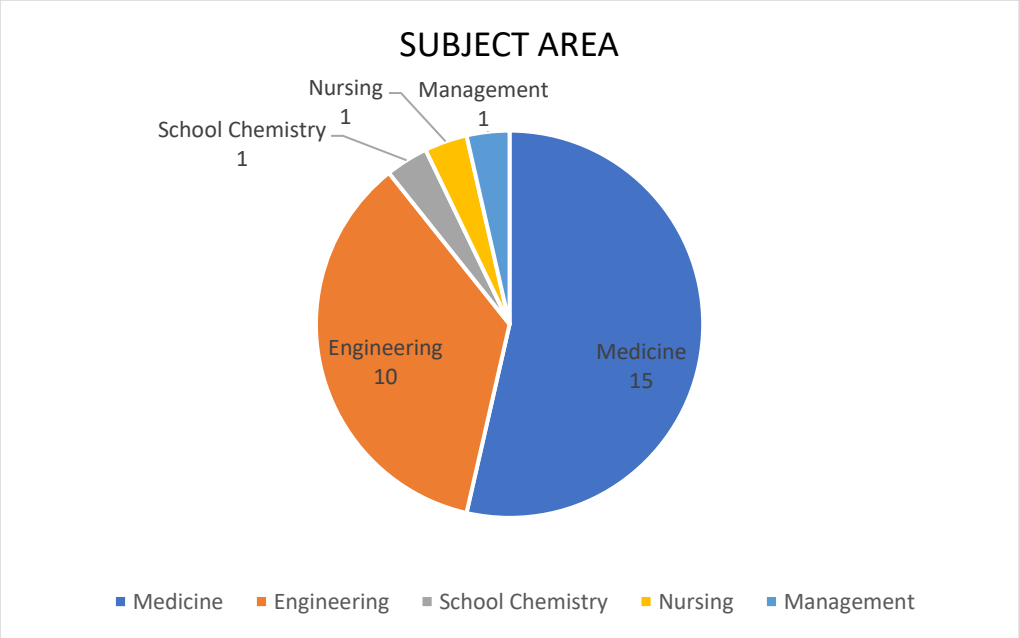
4.2.2 Research at Education Level: The studies reviewed in this SLR reveal that FLA has been widely experimented in Higher Education in India. Of the 28 studies reviewed, Institutions of Higher Education have conducted the most research (n=27, 96%) and negligible research is conducted at the K-12 or School level (n=1, 4%). The only research conducted at the school level is "Effectiveness of Flipped Classroom in Teaching Organic Chemistry at Standard XI" by Birundha (2020). Since 2020 there is no evidence in the databases for research on FLA at the school level. The absence of evidence here shows that there is staggering gap in understanding the level of adoption and implementation of FLA at the school level in India.

Figure 6 FLA Research at the Education Level



4.2.3 Research in Subject Area: From the studies reviewed in this SLR, it is found that majority of research on FLA in India is conducted on Subject area pertaining to Medicine (n=15, 53.5%), followed by Engineering (n=10, 35.7%). Along with this, research has also been conducted in subjects related to Management (n=1, 3.5%), Nursing (n=1, 3.5%) and School Chemistry (n=1, 3.5%). Findings on subject area chosen for research on FLA shows that institutions teaching Professional courses such as Medicine and Engineering are at the forefront. Although very few research has been conducted in other Higher education subjects of Management and Nursing, it was found that there is some scope for experimenting FLA at the school level subjects as well.

Figure 7 FLA research by subject area



4.2.3 Population of study: The research papers in this study were reviewed for the population that was included in the studies conducted in India. Majority of the research was conducted with students as the population (n=25, 89.2%), some of the research included both students and teachers (n=1, 3.5%) and some research was conducted exclusively teachers (n=1, 3.5%). Research also included residents as population

(n=1, 3.5%). Findings from the review shows that importance has been placed on implementation of FLA with involvement of students. While considering training of teachers for implementation, it is found that there are few research articles as mentioned in Table 2 below. It is notable to mention about one research article which conducted a series of Workshop in India Chandran et al. (2020), however no training was conducted for the teachers since 2022.

The findings reveals that there is not much importance given to training the faculty members on planning and facilitation of FLA in their teaching. There is no information provided by the researchers on how the faculty members of these institutions were made aware of the innovative teaching approach and what principles they followed in designing these classes.

Table 2 Research with Training of Faculty

Author	Title	Education Level
Chandran et al. (2020)	IUPS Physiology Education Workshop series in India: Organizational Mechanics, outcomes, and Lessons	Higher Education
Birundha (2020)	Effectiveness of Flipped Classroom in Teaching Organic Chemistry at Standard XI	K-12/ School
Yadav and Nair (2021)	Use of Flipped Classroom for the Teaching of Postgraduate Students: an experience	Higher Education
Kumar et al. (2022)	Comparative study between "case-based learning" and "flipped Classroom" for teaching clinical and applied aspects of physiology in "competency-based UG curriculum"	Higher Education

4.3 Pedagogical Activities Adopted for Implementing FLA

The flipped Learning Approach includes a variety of activities that help students comprehend and collaborate. According to Bachiller and Badía (2020), they enhance knowledge retention and cognitive abilities. Effective implementation requires selecting relevant learning activities based on the area's particular needs (Wang & Zhu, 2019). Designing activities that are relevant to the course material can help inspire and motivate students through activity-based instruction. The following sections contain details answering Research Question 3: “What are the pedagogical activities adopted for implementing FLA?”.

The Table below (see table 3) provides a comprehensive overview of the various pedagogical activities employed in the academic research articles reviewed in this study. The analysis reveals a significant diversity in teaching strategies, reflecting the dynamic nature of instructional design in contemporary education. The pedagogical activities of Discussion (n=8) and Watching Videos (n=8) emerged as the most frequently utilized methods. These activities are widely recognized for their effectiveness in fostering student engagement and enhancing understanding through interactive and visual learning experiences. Research articles have notably employed these methods, indicating a strong preference for interactive and multimedia-based learning environments. Quiz (n=5) and Formative Assessment (n=4) are also prominently featured. These activities underscore the importance of ongoing assessment and feedback in

the learning process, enabling instructors to gauge student understanding and adjust teaching methods accordingly. A variety of other pedagogical strategies were also noted, albeit with less frequency. Activities such as Hands-on Workshop/Practice, Problem-Based Learning, and Group Activity were each cited in 2 to 3 articles. A range of unique pedagogical activities, such as Concept-in-Context Maps (Animated), Virtual Dissection, and Jigsaw Method, were each used in one article. These specialized techniques cater to specific educational needs and contexts, reflecting the evolving landscape of teaching practices. The findings reflect a broad spectrum of pedagogical activities, with a strong emphasis on interactive and multimedia-based methods. The frequent use of discussion, video watching, and quizzes across multiple studies points to their continued relevance in implementing FLA. Overall, it indicates a trend towards more diverse, student-centered pedagogical strategies that cater to different learning styles and preferences.

Table 3 Pedagogical Activities used to implement FLA

Pedagogical Activity	N	Articles Using This Activity
Discussion	8	Kannan et al. (2020), Kumar et al. (2022), Padugupati et al. (2021), Shireesha et al. (2024), A. Singh et al. (2024), Savanur et al. (2021), Farooqi and Naeem (2023), Uppal and Uppal (2020)
Watching Videos	8	N. V. S et al. (2023), Dutta et al. (2023), John et al. (2021), Birundha (2020), Aristotle et al. (2021), Dol (2020), Bhagavanulu (2020), Dutta et al. (2023)
Quiz	5	Padugupati et al. (2021), Shireesha et al. (2024), Khapre et al. (2021), Kannan et al. (2020), Khapre et al. (2021)
Formative Assessment	4	Rao et al. (2020), Kannan et al. (2020), Bhagavanulu (2020), Kaur et al. (2022)
Clarification of Doubts	3	Kaur et al. (2022), Shanmugapriya et al. (2023), Padugupati et al. (2021),
Hands-on Workshop/Practice	3	Chandran et al. (2020b), Chhabra et al. (2021), Yadav and Nair (2021)
Problem-Based Learning	3	Malhotra and Bhagat (2023), Chandran et al. (2020b), S et al. (2022)
Group Activity	2	Kumar et al. (2022), Shireesha et al. (2024)
Summarization	2	Kaur et al. (2022), Bhagavanulu (2020)
Case study	2	Farooqi and Naeem (2023), Uppal and Uppal (2020)
Think-Pair-Share	2	Birundha (2020), Dol (2020)
Peer Instruction and interaction	2	Dol (2020), Kannan et al. (2020), Shanmugapriya et al. (2023), Shireesha et al. (2024)
Active Learning	1	Chandran et al. (2020b)

Assignments	1	John et al. (2021)
Brainstorming	1	Chandran et al. (2020b)
Buzzer Session	1	Birundha (2020b)
Concept-in-Context Maps (Animated)	1	Nighojkar et al. (2021b)
Jigsaw Method	1	Uppal and Uppal (2020)
Laboratory Demonstration	1	Shanmugapriya et al. (2023), Padugupati et al. (2021)
Live-Streamed Classes	1	John et al. (2021)
Memorization	1	N. V. S et al. (2023)
Muddiest Point Concept Mapping	1	Bhagavanulu (2020)
Prepare and Present	1	Joy et al. (2023), Kumar et al. (2022)
Reciprocal Questioning and Reflections	1	A. Singh et al. (2024)
Speaking Activities	1	N. V. S et al. (2023)
Analytical Exercises	1	Kaur et al. (2022)
Team-Based Contest	1	Shireesha et al. (2024)
Virtual Dissection	1	Chhabra et al. (2021)
Visualization	1	Chhabra et al. (2021)
Feedback	1	Kannan et al. (2020)
Reflection	1	Kannan et al. (2020)

These articles have implemented multiple pedagogical strategies, making them stand out in terms of variety and application of teaching methods.

4.4 Technology for instruction in FLA

Flipped learning involves students accessing instructional materials outside of the classroom while in-class time is spent on discussions, exercises, and problem-solving. Flipped learning relies on technology to deliver instructional content outside of the classroom (S. Sumadevi, 2023). Technology is crucial in the output-oriented flipped classroom because it supports learners, improves engagement and cooperation, and allows for information exchange, diverse evaluation, and rapid feedback (Zhang, 2022). The following sections contain details answering Research Question 4: “What Edtech Applications have been used in instruction for implementing FLA?”

The findings from this review study categorize various Edtech applications used in instruction to implement Flipped Learning Approach. The analysis reveals the diverse range of digital tools employed in educational settings, highlighting their significance in enhancing teaching and learning processes. Table 4 provides details on the Edtech applications organizing the articles by the specific Edtech applications they utilized. The use of Learning Management Systems (LMS) such as Google Classroom (n=4) and Moodle (n=3) is prominent in several studies. Google Classroom was employed in four studies, underscoring its popularity as a platform for organizing course content, facilitating communication, and managing assignments. Similarly, Moodle was utilized in three studies, demonstrating its effectiveness in providing a comprehensive learning environment that supports both synchronous and asynchronous learning. PowerPoint presentations and Google Forms are extensively used across multiple studies,

highlighting their versatility and ease of use. PowerPoint is featured articles (n=7), is frequently employed for assessments and surveys, allowing for efficient data collection and instant feedback**.**

The integration of multimedia tools, such as YouTube and pre-recorded videos, is also notable. YouTube is cited (n=2), reflecting its use as a resource for providing supplementary instructional content and visual aids. The use of pre-recorded videos (n=2) further emphasizes the value of video-based learning in providing flexible, accessible, and repeatable learning experiences. Additionally, communication tools like WhatsApp (n=4) demonstrating their effectiveness in fostering real-time interaction and collaboration among students. Other digital tools, including Plickers (n=1), Google Groups (n=1) and E-mails (n=1) and web links (n=1), further diversify the range of technologies employed. These applications highlight the adaptability of educational technology in meeting various instructional needs, from interactive polling to collaborative group work and resource sharing. Emerging technologies, such as Augmented Reality (AR) based LMS (n=1) and Technical Assemblage (n=1), illustrate the innovative approaches being explored in educational research, showcasing the potential of immersive technologies in enhancing experiential learning and engagement.

The analysis of Edtech applications used in these studies reveals a strong emphasis on leveraging digital tools in instruction for Flipped Learning. The widespread use of platforms like Google Classroom and Moodle underscores their importance in providing structured and interactive learning environments. At the same time, the integration of multimedia tools and the exploration of emerging technologies reflect a commitment to innovation in educational practices. Overall, the diverse range of Edtech applications employed across these studies illustrates the dynamic and evolving nature of educational technology, offering valuable insights into its role in implementing Flipped Learning Approach.

Table 4 EdTech Applications used in instruction for Flipped Learning

Edtech Applications	
PowerPoint Presentation	Bookroll
Google Forms	LAViEW
Google Classroom	Voice Recording
Whatsapp	Google Groups
Moodle	Technical Assemblage
Youtube	Plickers
E-Mail	Augmented Reality based LMS
PDF	Web Links
Edmodo	

5. Recommendations

There is a critical need for more research on the application of FLA in primary and secondary education. Pilot programs should be conducted to explore the feasibility of FLA in schools, focusing on its impact on younger students and its integration into existing curriculums. Findings from these studies can provide valuable insights into how FLA can be adapted to suit different age groups and educational contexts. Teachers need comprehensive training to effectively implement FLA. This includes learning how to create

engaging online content, manage flipped classrooms, and use digital tools to track student progress. Professional development programs focused on building skills, and addressing the pedagogical shift required from traditional teaching methods to a more student-centered approach are required. Continuous support and mentoring should be provided to help teachers transition smoothly to this new model. Educational policies should support the integration of FLA by promoting innovation in teaching methods. Collaboration between policymakers, educators, and technology providers is essential to create an environment conducive to FLA. This includes providing necessary funding, resources, and incentives to schools and teachers willing to adopt this approach.

6. Conclusion:

The New NEP 2020, encourages teachers at the school level to adopt innovative teaching methods to ensure a student-centered education system. To facilitate this policy implementation there is a need for scholars to conduct research at the K-12 level in India. This systematic literature review on FLA in India offers valuable insights into its adoption and effectiveness in the Indian educational context, particularly in higher education. Between 2020 and 2024, research indicates that FLA is increasingly being embraced due to its ability to enhance student engagement, facilitate deeper understanding, and promote active learning. The method's flexibility allows students to review content at their own pace, leading to improved academic outcomes and a more personalized learning experience. A notable gap in the research is the limited focus on the application of FLA at the school level in India. Most studies have concentrated on higher education, leaving a significant research gap regarding the feasibility and impact of FLA in primary and secondary education. This gap suggests a need for further exploration into how FLA can be adapted to younger students and integrated into school curriculums. Understanding how FLA can be effectively implemented in schools is crucial, as it could help bridge educational disparities and foster a more student-centered learning environment from an early age. In conclusion, while the Flipped Learning Approach holds great promise for transforming education in India, its widespread adoption and success are dependent on addressing the technological, pedagogical, and infrastructural challenges identified in the research. Moreover, there is a pressing need for further studies at the school level to assess the applicability and benefits of FLA in primary and secondary education. By addressing these gaps, FLA could become a cornerstone of educational reform in India, fostering a more interactive and effective learning experience for students across all levels.

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