

IMPLEMENTING FLIPPED CLASSROOM IN AYURVEDA MEDICAL EDUCATION

Abstract

The flipped classroom model represents a transformative approach to medical education, where traditional lecture-based instruction is inverted. This monograph explores its application within Ayurveda medical education, an area deeply rooted in traditional learning methods. In this model, students engage with learning materials before class—through videos, readings, or case studies—allowing in-class time to be dedicated to interactive discussions, problem-solving, and hands-on activities.

This work outlines the theoretical foundations of the flipped classroom and adapts these principles to the context of Ayurveda. It investigates how this pedagogical shift can enhance student engagement, deepen understanding of complex topics, and foster critical thinking—skills crucial for the practice of Ayurveda. By focusing on the active learning component, this monograph also examines the role of faculty as facilitators rather than mere providers of knowledge, creating a dynamic learning environment.

The impact of flipped learning is assessed through case studies and feedback from both faculty and students. The challenges of implementing this model, including technological barriers and the need for curriculum restructuring, are addressed with practical solutions. Ultimately, this monograph positions the flipped classroom as a progressive tool that can bridge the gap between ancient wisdom and modern educational methodologies in Ayurveda, enriching the future of healthcare education.

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I. INTRODUCTION

As with many aspects of human life, educational activities are impacted by developing technology. Teachers attempt to introduce novel concepts and methods all over the world in an effort to implement successful instructional activities that adapt to the demands and circumstances that change throughout time. The Flipped Classroom Model is one of the practices that educators have proposed in recent years as a result of advancements in educational technologies. The FC Model, defined as the fusion of online and in-person instruction, is acknowledged as one of the blended learning models.

Students feel that the most worthless thing for them, is to have lengthy lectures in class and then send them home to complete actual homework on their own¹. This creates a gap between the individual learning capabilities especially looking at the diversity in the classroom. The demands, objectives, and performance of learners have evolved over the past few years; they frequently have quick and simple access to information and favor being present in cooperative learning settings with learner-centered activities^{2,3}. Looking at the modern transformation that has happened in education, Information is now easily accessible to all the learners easily, thanks to the increasing use of mobile computers and the internet. The use of and access to smart gadgets have transformed education in such a way that It is no longer required to have their data on hand in form of books. Although there is such rapid impact the traditional classroom still exists, despite changes in the outside world^{4,5,6,7}.

In modern medical teaching, the flipped classroom method has become a groundbreaking approach, shifting away from the usual way of teaching and learning. This method turns the typical classroom around by giving out study materials outside the classroom and doing classroom activities that used to be done at home. This is a great way to teach Ayurveda medicine because it covers a lot of different things and changes all the time.

Ayurveda, India's ancient medical system, has valuable knowledge that has been passed down for centuries. But to keep up with modern education, we need to change how we share this wisdom. The flipped classroom model is a great way to do this. It gives students a chance to learn deeply about Ayurveda while also letting them take an active role in their education and giving them more control over their learning.

In Ayurveda medical education, the flipped classroom model has not yet been explored as a dominant teaching methodology. Looking at the strength of flipped classroom and its application in Ayurveda education we thought this area should be explored. Flipped classroom model mirrors Ayurveda's emphasis on experiential learning, where knowledge is not merely theoretical but actively applied and experienced by students. Therefore to explore the feasibility of FC this monograph was planned.

This monograph examines the complexities of the flipped classroom model, particularly in teaching Ayurveda. It defines the concept, explores its pros and cons, and outlines strategies for success. The study investigates selecting appropriate topics, engaging students and faculty, and evaluating both the learning process and content. It also examines the feasibility of this model in Ayurveda education, considering student preparedness, topic-specific challenges, and broader obstacles to adopting this innovative approach.

By delving into the core concepts of flipped classrooms in Ayurveda medical education, this monograph aims to empower educators with knowledge and practical strategies. This will create a supportive learning environment that stimulates critical thinking in aspiring Ayurvedic teachers, ensuring the preservation and modernization of this ancient medical system.

Benefits of Implementing Flipped Classroom Method in Ayurvedic Education

According to Ayurveda Education viewpoint, the Flipped classroom model presents numerous benefits. Here are some of them: Original:

Active Learning: Active Learning involves Ayurvedic students engaging with materials before class so they can actively engage in their education rather than just passively receiving information. This will allow students to engage in productive conversations and tasks.

In classroom interactions, students work together to apply their learning outside of class in solving problems and participating in group discussions. This promotes a deeper understanding and interaction between peers.

Immediate Responses: Students receive prompt feedback on their understanding of concepts from teachers present during the entire class. This enhances understanding and facilitates prompt resolution of any misunderstandings or comprehension issues.

Interacting with students as a teacher can be more personalized by providing support and help tailored to their specific learning requirements, thus enhancing the connection between educators and learners in a flipped classroom setting. The results of the experiment confirmed the hypothesis.

Increased Involvement: Students who are actively engaged in their learning may feel more motivated and engaged. This would ensure that students can have better discussions.

Since students have different pace of learning, they can study the resource material at their own pace. They can also go through the materials as many number times as they want.

Prepared for the Real World: Students learning about Ayurveda may be ready for the real world scenarios.

Objective

1. Exploring existing knowledge of flipped classroom
2. Planning strategies for implementing flipped classroom in Ayurveda Education

Methodology

1. Various textbooks and various publications will be referred to explore the existing knowledge on Flipped class room.
2. A strategy will be framed for implementing the same in Ayurveda

History of Flipped Classroom

The present teaching paradigm, known as the Flipped Classroom (FC) paradigm, has been developing throughout time. Though it is acknowledged in the literature that the model's recognition was influenced by Jonathan Bergmann and Aaron Sams, who were chemistry teachers at a US high school in 2007, ¹⁴ it is well known that earlier periods saw the manifestation of thoughts and conceptions that helped to give rise to the FC Model¹⁵. Over time, the concept of FC has been articulated in various ways according to the model's historical growth.

The concepts that preceded the FC Model's introduction, which has been around for roughly 20 myears, are older. Alison King through her 1993 study, titled "From sage on stage to Guide by side: mentioned that the university professors were practically a central figure in the classroom, imparting their knowledge and imparting lessons without motivating the students to think too deeply about the material. She attempted to convey with her concept that a teacher was merely a conduit for information. The teacher's role should shift from being the wise person at the center of the class to that of a guide who assists in the process. She stressed this in relation to the constructivist approach, emphasizing that knowledge should be created by the individual and that new perspectives, knowledge, products, ways, and methods should be put forward based on the knowledge at hand. Although King's (1993) study does not explicitly articulate the concept of FC, it is widely acknowledged in the literature that it provides a significant context.¹⁶

Following King (1993), Harvard University professor Eric Mazur created the peer teaching technique known as peer instruction in 1997. Once the fundamental ideas were understood, this approach—which involved conducting the lesson through peer teaching—played a significant part in the development of the ideas that had an impact on the FC Model.¹⁷

That was the year that the FC Model started to take shape conceptually. In the same year, two investigations were published on the topic. Dr. J. Wesley Baker highlighted in 2000 at the University of Cedarville the need for a model that linked pedagogy with technology, based on shifts in educational philosophy and technological advancements. He gave the following explanation of the goals of this model, which he named Classroom Flip¹⁵

- To apply the lesson's conceptual and factual components outside of the classroom so that students can engage in active learning activities.
- To offer pupils greater autonomy over their education.
- To provide pupils additional chances to pick up knowledge from their peers.
- Change the role of faculties to that of a guide rather than an information hub.

Academicians Maureen J. Lage, Glenn J. Platt, and Michael Treglia of the University of Miami employed the FC Model that same year to accommodate students with varying learning styles and insufficient class time for in-depth material. The following is how they implemented the process they called "Inverted Classroom"¹⁸

"The topics of the course were organized in accordance with class schedule and followed the FC Model for 75-minute sessions twice weekly. The students read, watched videos or voice presentations before attending the classes. The materials were accessed through different

ways among them internet and home viewing options. There was a point where worksheets with activities and questions were used to enhance group discussions in class, at which time lecturer clarified any doubts and conducted economic experiments. More advanced practice quizzes completed the lesson along with extra resources shared on the course page.”

Initially The Flipped Classroom (FC) Model did not receive much attention despite being accepted by both students and instructors. About seven years later, chemistry teachers Jonathan Bergmann and Aaron Sams from Woodland Park High School in the USA took a unique approach to the model. They began sharing PowerPoint presentations and teaching videos online so that students who were unable to attend class for various reasons could still receive a complete lesson. Bergmann and Sams recognized the benefits of this method over traditional teaching and eventually extended it to all students. This new approach allowed students who were struggling in class to pause videos, take notes, and review the material at their own pace.¹⁹

The Figure provides a summary of the FC Model's emerging process.

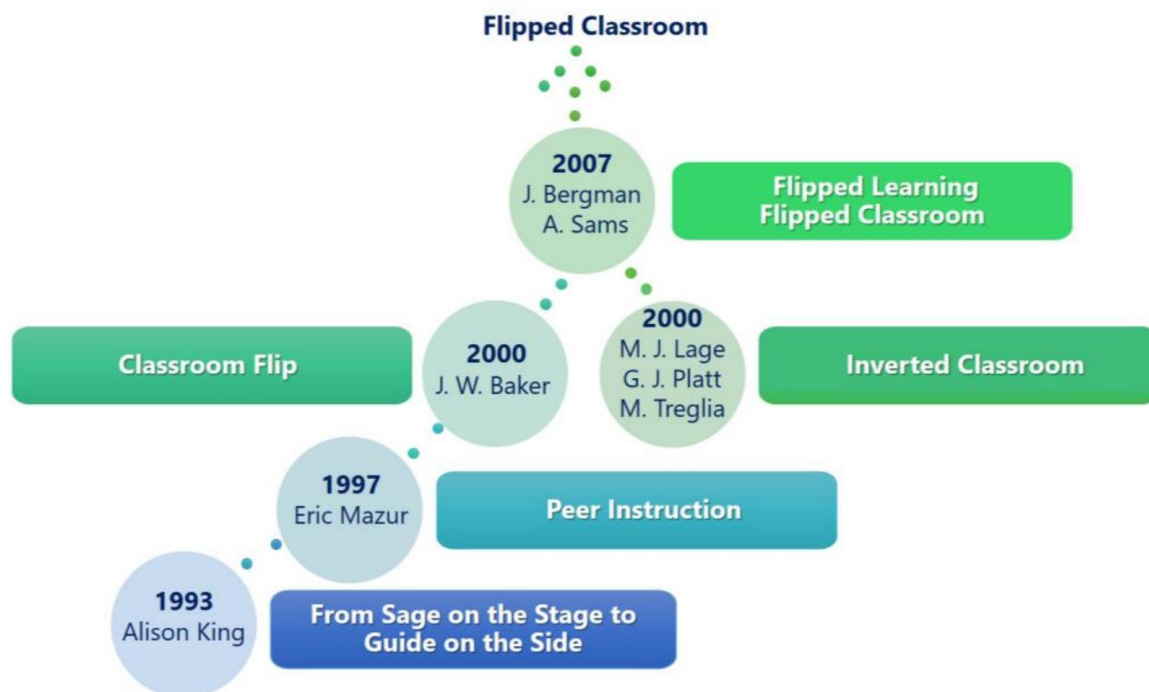


Figure 1: The Emergence Process of the FC Model

When face-to-face instruction is not possible, as in the case of the coronavirus (Covid-19) pandemic that began in China in 2019 and spread to the entire world, the FC Model has been suggested as a combination with online learning to maximize the effectiveness of distance education.²⁰ In conclusion, it can be claimed that even in situations when in-person instruction is not accessible, the FC Model is still being used widely.

Flipped Classroom

An explanation of the flipped classroom as a brilliant teaching methodology: Teachers in traditional classrooms are limited to using the lecture technique to teach cognitive skills up to the level of memorization and understanding. The fundamental cognitive skills (applying, analyzing, evaluating, and synthesizing) are then left up to the students when they are given homework.²¹ In the meantime, achieving the same four high knowledge levels is a requirement of deep learning. The student completes the assignments on their own, sometimes with the assistance of manuals and exercise solutions, without conducting analysis or evaluation or having access to a creative or innovative environment. A week later, they submit their work to the teacher in the classroom.^{22,23}

For undergraduate students, the sciences are a challenging and difficult field of study, especially in the early years when they are transitioning to a new educational phase. Especially Ayurveda, as a student enters into a completely different stream than what he has learnt in primary, secondary or higher secondary education. To enhance learning, the use of innovative teaching strategies is advised. One such strategy is the flipped classroom, which aims to increase student participation and foster more meaningful and productive learning.²⁴ However, the teacher's teaching flow is reversed in the reverse teaching approach. Using educational content production and recording software or the Internet, the teacher first prepares the information that will be lectured in class and distributes it to the students²⁵ Pupils view, hear, and take notes at their own convenience. Indeed, this is how they learn the necessary levels of information and comprehension. They enter the classroom under the instructor's assistance and guidance, engage in group discussions and interaction with their peers, and take on difficult assignments to advance to higher cognitive domains²⁶ Stated differently, there are two types of teaching-learning methods: passive and active.

"Everything that was traditionally done in the classroom is now done outside the classroom and vice versa" is the definition of the flipped classroom method²⁷ But merely switching up the sequence in which lessons are taught and learned is insufficient to characterize this teaching strategy. Thus, in order to comprehensively describe the flipped classroom approach, Bergman and Sams^{28,29,30} defined the flipped classroom approach as a technology-supported educational approach with two components:

1. Individual and direct computer-centered education outside the classroom through video lectures and
2. Group interactive activities inside the classroom.

This definition specifically highlights the importance of using instructional videos to support learning outside of the classroom. Nonetheless, there have been accounts of the flipped classroom approach using media other than video, including electronic books, social media, presentation files, and even physical books.^{31,32}

By the use of flipped classroom, students acquire a thorough comprehension of the subject matter and have a deeper learning experience. This method of instruction is more dynamic and student-centered than traditional lecture methods³³. Flipped classrooms can cut down on lecture time, give students practical experience, and increase their motivation and readiness for learning (Jiang et al., 2022).³⁴ Thus, it can also improve students' comprehension, self-

assurance, and critical thinking skills in addition to their academic achievement (Mortaza Mardiha et al., 2023)³⁵

Students with limited time can benefit from studying at their own speed by adopting a flipped classroom approach (Torío, 2019)³⁶. Students can modify their learning speed and duration according to their degree of skill by watching pre-recorded films that teachers grant them access to. Both educators and learners could acquire greater technological literacy (Huang et al., 2023)³⁷ Furthermore, according to Güler et al. (2023), a flipped classroom promotes student participation and provides more opportunities for teacher-student interaction throughout the teaching and learning process.³⁸

Flipped Classroom Background and Method

Education Theories Supporting Flipped Class

A methodical and evidence-based strategy to de-signing instruction is necessary for the flipped classroom. This approach should begin with a clear definition of learning objectives and ensure that all activities are coordinated to meet these objectives. In the 1980s, Cohen introduced the concept of instructional alignment.³⁹ Biggs expanded on it by applying constructivist learning theory to instructional design.^{40,41}

A course's or lesson's design and implementation can be supported by a framework known as constructive alignment, which starts with the objectives (i.e., what students should be able to do or know as a result of this course). Assessments should be created to track student progress and ascertain the degree to which students have attained or are attaining the goals after the objectives have been established. Then, it is important to decide on and create in-class, pre-class, and post-class learning activities that will help students progress toward their goals. Fink's (2003) integrated course design, which suggests assessing course content and higher-order thinking in six taxa: foundational knowledge, application, integration, human dimension, caring, and learning how to learn, is one of the models and taxonomies that incorporate alignment principles.⁴²

A more nuanced grasp of educational theories that explain how and why students learn may be necessary for a successful flipped design, even while constructive alignment will guide the synchronicity of the aims of course materials and activities. A flipped classroom can be specifically designed, operationalized, and evaluated using a variety of learning theories and educational models, such as constructivism⁴³, Connectivism⁴⁴ and andragogy⁴⁵ among others. For the sake of space and time, the following describes three prominent and frequently quoted models that are directly relevant to course design:

1. Cognitive apprenticeship,
2. Deliberate practice, and
3. Mastery learning

Benjamin Bloom⁴⁶ was the one who originally proposed mastery learning, a competency-based teaching strategy that can help students retain and transfer their information and abilities across time.⁴⁷ Practice, whether it is clinical practice, academic research, or other skills related to pharmacy or health care, should benefit from the mastery activities. Transfer

to practice demonstrates how knowledge and abilities learned in flipped classrooms apply to actual clinical situations. Among the seven, characteristics of master learning are:

1. Baseline tests;
2. Well-defined learning goals, arranged in units of increasing difficulty;
3. Participation in instructional activities (such as skill practice, data interpretation, and reading) aimed at achieving the goals;
4. Setting a minimal passing score (such as a test score or checklist score) for every educational unit.⁴⁸
5. Formative assessment to determine whether a unit has been completed at a predetermined minimum passing mastery standard;
6. Progression to the next unit of study if achievement at or above the mastery standard is measured; or
7. Continuous practice or study on a unit of study until the mastery standard is attained.

Participating in structured activities designed expressly to enhance performance in an area is known as deliberate practice. For intentional practice to be effective, a few requirements must be satisfied. These factors, which are based on simulation literature, include: highly motivated learners with good concentration (such as student pharmacists); engagement with a well-defined learning objective or task, at an appropriate level of difficulty; focused, repetitive practice, that results in rigorous, precise measurements, that yield informative feedback from educational sources (such as instructors, activities); and where trainees also keep track of their learning experiences and adjust strategies, errors, and levels of understanding; engage in more deliberate practice and continue with evaluation to reach a mastery standard, and then move on to a new task or unit.⁴⁹

Though theory-based approaches to the design and implementation of the flipped classroom differ, they are all based on the idea that learners should be engaged in progressively complicated problems through progressive problem-solving. According to Kuhlmann The flipped classroom makes this method easily adaptable and is essential to the development of expertise⁵⁰. Simplified tasks can be moved to pre-class study to achieve increased complexity, and more complicated tasks can be assigned during class time through applied active learning. Prince M. stated that the gap between pre-class learning (e.g., acquiring basic knowledge) and in-class learning (e.g., developing strategic knowledge) can also be filled by incorporating sequencing and scaffolding techniques. Additionally, a variety of in-class active learning techniques can help students advance to increasingly difficult problem-solving during class.⁵¹

II. IMPLEMENTATION OF THE FLIPPED CLASS NEEDS THE FOLLOWING STRATEGY AND STRUCTURE

Objectives of Flipped Classroom

Emery M, Bush C, Bounds R, in their work stated that the objectives and goals of the course need to be informed to the students of what is expected of them and direct the structure of the lesson. To attain optimal motivation, goals should be challenging but attainable. They should also meet the SMART criteria, which stands for precise, measurable, actionable, relevant, and timely.⁵² A learner's knowledge or skill state determines how challenging a given term is. It

can reflect higher order learning (e.g., the upper level of Bloom's Cognitive Taxonomy), competency level (e.g., the requirement to achieve 85% correct on multiple occasions), skill or attitude level, or depth or breadth of processing. Even if pharmacy practice involves fundamental science, objectives should be framed to make it relevant (e.g., include a patient at the end of each class).

The goal of the course is to develop skills that transfer to real-world settings, and students need to see the relevance of what they are learning because this is important for their motivation. In addition, because professional development is becoming more and more important in light of the rapidly changing health care system, the objectives should cover modern workforce skills like problem-solving, teamwork, communication, adaptability, and learning how to learn in addition to content knowledge.

Pre Class Assignments

According to Nelson TO, Leonesio RJ., in a flipped classroom, students are required to complete prerequisite readings outside of class in order to be ready for in-class activities. This has been referred to as self-paced, self-directed, and occasionally self-regulated learning in the literature. In general, self-paced learning means that students manage their own study schedule as opposed to having it dictated by someone else (such as an instructor).⁵³ Rehder B, Hoffman AB recommended that, Allowing students to choose the knowledge they wish to encounter is known as self-directed learning. Even while the instructor often controls and limits the extent of the information selection, students are still free to respond to various environmental cues⁵⁴ and actively assess what has been presented as well as what more information is necessary.⁵⁵

Option for pre-class work: The facilitator's creativity is the sole restriction. Researchers discovered that incorporating integrative questions into the pre-class exercises helped students perform better in the short- and long-term (Taylor AT, Olofson EL, Novak WR.)⁵⁶ The phrase "Learn before Lecture" was coined by biology class professors who, unaware of the method, discovered that introducing content prior to class using worksheets or narrated PowerPoint presentations significantly increased learning gains in a large introductory biology class⁵⁷ A summary of such low-tech tools can be found in Table I. For pre-class assignments, tech-savvy people can also substitute high-tech tools for low-tech ones (Table II)^{58,59}.

Table 1: Examples of Low-tech Tools for Pre-Class Work in Flipped Classroom

Tool	Remarks
Encourage reading	Instructions given to students to acquire basic knowledge before coming to Physiology class.
Teacher prepared conceptual notes as pre-class assignment or recitation	Using the pre-class exercises in combination with integrative questions was effective at improving student performance in both the short and long term.
Conceptual notes through PowerPoint	PowerPoint can be distributed as handouts along with notes.
Problem triggers	Student felt out of their comfort zone initially but quickly adapted to new technology.

Table 2: Converting Low-tech into High-Tech Tools for Pre-class Assignment

Low-tech tools	High-tech tools
Paper based MCQs/quizzes	Online quiz
Comments/questions before class	Google form for survey
Reflective writing or summarie	Moodle based interactive modules
Attendance in the classes	Online presence
Self-report of completion	Using informatics and analytical tools to evaluate completion of assignment

Several methodologies have been employed for online learning, such as: commercial textbooks, reading materials created by instructors, videos created by instructors (such as lecture capture or narrated PowerPoint), or animations.(Persky AM, McLaughlin JE)⁶⁰

When switching to a flipped paradigm, for example, Dupuis and Persky used a range of media. Students stated that their favorite resources were annotated PowerPoint slides, followed by narrated PowerPoint presentations and commercial textbook readings with guided questions.⁶¹

In summary, we need to understand that, students are capable of learning basic material (such as definitions and concepts) independently before class, and that communication of expectations, preparation through accountability, engaging and interactive activities, and efficient and student-friendly instruction can all promote student engagement.

Since there are no ready made authentic materials available to be given as a pre-class material for assignment for most of the Ayurveda topics, it would be required to be generated. Some of the ways in which it can be achieved is by making videos, creating presentations, sharing manuscripts etc.

Activities In-class.

A flipped classroom's in-class activities are regarded as its core. Unlike in a standard didactic lecture, this time is used for interaction with students to answer their questions. As a result, students are inspired to learn deeply and develop a lifetime habit of self-directed learning. The facilitator chooses the kind, quantity, and caliber of in-class activities. The facilitator's main responsibility is to keep an eye on, direct, and assist the students' learning. Pupils' comprehension and understanding will vary widely. After finishing their homework outside of class and evaluating how well they understood it, students can participate in either (a) independent or (b) group-based activities during class.

Kuldeep Singh et al (2024) in their work stated “Before group activities, solo activities can be utilized to help students negotiate a "higher-risk" group activity. They can also be beneficial for students who require more time to reflect alone in order to learn. Through group activities, students can contribute their unique perspectives on the material to small-group discussions and build on one another's expertise to create fresh insights and applications of the ideas.”⁶² Students can use class time to reinforce and extend learning through application and problem- solving once they have a foundational understanding of important definitions and ideas. An increasing amount of research is showing how effective active learning is

(Prince M. 2004).⁶³ Research generally indicates that intentional active learning can promote self-awareness, teamwork, and higher order cognitive abilities (Freeman S, Eddy SL, McDonough M, et al, 2014).⁶⁴ The literature describes a wide variety of active learning exercises. When choosing or creating an activity for a flipped classroom, one should consider how well it aligns with pre-class learning and the course objectives—a concept known as constructive alignment Biggs J. (1996)⁶⁵

Table No 3 shows the list in Class activities that can be executed (Barkley EF, Cross KP, Major CH., 2014)⁶⁶.

Table 3: In-class Activities for Flipped Classroom

Table 3: In-class Activities for Flipped Classroom
1. Personal assignments: Coming up with concept maps and finding solutions on their own using clickers, the audience responds
2. Teachers use Plickers on their smartphones, and students use cards.
3. Individual remarks
4. Working one-on-one with kids who could not grasp
5. polling with colored sheets and hands
6. Activities for groups
7. Consider, pair, and share.
8. Inverted brainstorming
9. Asking and prompting
10. Decimal group exercise for prioritization
11. The mapping of affinity
12. Changed Round robin, fishbowl, etc.
13. Cards using the Instant Feedback and Assessment Technique (IFAT)

For students to move from basic concepts they studied before class to more complicated ideas and applications in class, they might require scaffolding or intellectual support. During class, instructors will be vital as subject matter experts, assisting students in understanding the topic, answering inquiries and offering comments regarding advancement (such as clicker questions). Iterative procedures that let students create, test, and refine their own solutions and ideas in light of regular input from peers or instructors can be necessary for this. The best way to achieve this is for instructors to receive facilitation skills training. Workshops, one-on-one consultations with specialists, literature supporting the growth of instructional and interpretive abilities, flipped pedagogy, creating higher level learning objectives, and course design are some of the strategies for developing instructors.

Notably, throughout class, teachers ought to follow the flipped approach. Double lecturing reduces opportunities for student engagement and directly contradicts the flipped paradigm. It happens when pre-class content is repeated during class or when fresh material is delivered. Long and passive lectures should be avoided, even when a "time for telling" (micro or mini lectures) may be required to correct misconceptions or explain difficult subjects. Students have very little reason to prepare for or attend class if the material covered in class is repetitious and redundant from their pre-class learning.

While pre-class preparation has always been expected of students in lecture-based courses, in the flipped classroom, it is essential for in-class practical learning.

In Ayurveda classroom set ups, one of the best ways of doing in class activities would be to divide the class into small groups preferably in a group of 8 to 10. Then the groups can be allotted an activity in a sequential order of the topic which may include a MCQ, a table, a question, a scenario, a diagram etc to discuss and elaborately understand by 360 degree analysis. During the inclass activity students can be allowed to access the resources like internet, books, manuscripts etc. During this time the facilitators can keep moving and facilitating the students ensuring active involvement. When the groups are done with the activity they can present in the same sequence such that the whole topic is discussed in an order. The other groups may then be allowed to interact, ask questions, share opinions etc. Any unanswered queries may now be handled by the faculty.

After Class Work

Most conversations and studies on flipped classrooms have centered on the activities that take place before and during class. It's crucial to keep in mind, though, that practice makes perfect and that learning continues even after classes are over. Work completed after class that is in line with the goals of the course can encourage intrinsic drive and self-determination. Teachers can maximize student motivation by providing flexible learning options, such as choosing their own practice activities or imposing different deadlines on practice tasks. These assignments should give them feedback on how well they are doing in meeting the course objectives and can increase the relevance of what they are learning. Additionally, students should receive comments on their areas of strength and progress as well as opportunity for additional practice through after-class activities.

For after-class work, complexity, spacing, and time limits are essential design elements. Developing mastery can be aided by beginning with easier or more direct exercises and gradually increasing in complexity. The process of solving new problems in the same topic (e.g., dosing Guduci choorna in two patients with different indications), the same problem in a different topic domain (e.g., adjusting therapy for two patients on different drugs), or both can be facilitated by focused, repetitive practice. This is known as transfer of learning⁶⁷. In order to aid students in generalizing their skill sets and applying them to various situations and courses, after-class activity should be sufficiently varied.

As per Barkley EF, Cross KP, Major CH. (2014) After-class work is typically utilized to reinforce earlier learning in an organized manner through supplementary programs that assist students in practicing near transfer problems—problems that are more distinct from the original—or far transfer problems—problems that are closer in structure to the original⁶⁶. Additional possibilities include self-directed exercises or inquiry-based approaches (like problem-based learning), which can both assist students in exploring facets of the material outside of the classroom (Onyon C.2012).⁶⁸ These exploration activities can be more student-driven, as in SDL, where students are setting their learning goals, or more instructor-driven, as in more inquiry-based models, where the instructor provides more compelling cases to be investigated.

Evaluation Process

In a flipped class room setting, Feedback to teachers and students can be given through a variety of formative and summative assessment techniques. Assessments can be used, for example, to show competency and facilitate self-assessment of mastery during interactions with peers, teachers, and other educationally important individuals (e.g., standardized patients). Furthermore, pre-class online learning modules that include self-assessments can assist students in determining their level of material comprehension before class. Active learning activities can be made to give students instant feedback on their understanding of concepts and misconceptions, as well as real-time formative evaluations to identify areas of muddiest point or minute paper. Since the goal of the flipped classroom is to help students develop higher order thinking, graded assessments should give students the chance to show what abilities they have learned (such as essays, papers, open text, etc.).

In the flipped classroom setting, we as educators might have to reconsider conventional methods of evaluating student learning. Optimizing student results requires matching assessment methodologies to pre- and in-class learning objectives and activities. Assessments should be used to keep students accountable for their pre-class learning, according to a newly developed flipped learning guideline^{69,70,71} (Table below).

Common Assessment Approaches in the Flipped Classroom. Most Activities Can be Completed Individually, in Pairs or small Groups

Table 4

	Format		Location		Grading		
	Computer Based	Pen & Paper	Pre-class	In class	For Accuracy	For Completion	At Random (for Accuracy or Completion)
Quizzes	X	X	X	X	X	X	X
Cases	X	X	X	X	X	X	X
Clickers/Audience Responses	X			X	X	X	
Guided Questions For pre-class material	X	X	X	X	X	X	X
Exams	X	X		X	X	X	
Projects	X		X	X	X	X	

Karpicke JD, Roediger HL (2008) stated that The effectiveness of the flipped classroom can be significantly reduced by underprepared pupils, and assessment can be used as a tool to motivate students to study foundational content before class. Frequent low-stakes assessments of student knowledge (i.e., retrieval or testing effects)⁷² have the added advantage of enabling teachers to stay up to date on which concepts or abilities are most difficult for students to grasp (Ambrose SA. 2010)⁷³. The frequency of quizzes within a single course and during a semester should be taken into account, though, as they have the potential to change students' motivation (making them more focused on grades) and divert attention from other in-class activities (Jarmolowicz DP, Hayashi Y, St. Peter Pipkin C, 2010).⁷⁴

Because evaluations frequently serve as a signal to students about what is essential in the classroom, their nature and weight can have a significant impact on how well students learn. Student assessments should be connected to the main ideas and goals of the course and give teachers and students feedback. It could be important to note that conventional exams using paper and ink may not accurately reflect the completion of all learning objectives. For instance, a paper-and-pen exam cannot adequately evaluate cooperation or communication skills; as a result, alternative methods that are precisely aligned with learning objectives are needed. At the time of assignment, instructors ought to make explicit the expectations and the manner in which the assessment will be assessed.

When administered appropriately, assessments can yield continuous quality improvement feedback for the iterative process of course development as well as input regarding student learning and instructional design. The gathering, evaluating, and application of data should be carefully considered in order to choose pertinent content, guide instructional design, oversee classroom activities, and enhance student learning.

III. CHALLENGES OF FLIPPED CLASSROOM

While flipped classrooms offer numerous advantages for educational environments, there are certain drawbacks to this approach as well.

Time Constraints: Even though there are a lot of instructional videos online, For Ayurveda teachers they can't seem to find them or that the content isn't exactly what they want their pupils to learn. Consequently, many of it takes a lot of time and effort for teachers to try to produce their own materials. As a result, during the initial transition, flipping the classroom requires more instructor preparation time. Instructors are still having difficulty turning a lot of classes and continuing to put in the time and effort required to support students' learning. Instructors who assert that the pre-class effort in flipped classrooms requires more time than in typical courses have come under fire (Sevillano-Monje, V., Martin-Gutierrez, A., & Hervas-Gomez, C. 2022)⁷⁵ Absence of enthusiasm for preparing for class Due to the heavy reliance of teaching strategies on pre-class assignments, flipped classrooms may find it difficult to effectively guide students to participate in pre-class learning activities, which could result in poor preparation and a reduction in effectiveness.

Absence of Direction Outside of the Classroom: In conventional classes, when a student is having trouble with the lecture, they ask questions at the same time. However, in one of our initial experience a number of students voiced complaints during pre-class activities in 2nd BAMS class that they were not allowed to inquire. As most of the content was new to both students as well as teachers this pattern was observed. Students who often apply newly learned content in following class periods may find in-class activities more difficult as a result of unanswered questions that cause misunderstandings or knowledge gaps.

The Caliber of the Lectures that Were Recorded: Poorly produced pre-class instruction videos inadvertently impede learning. It was noted in the materials that some of the teachers had not effectively generated the reference content. It was noted that, some students became disinterested during lectures and quit midway. Some students complained that the teachers in the videos are not relatable to them and that they make them feel uneasy. As a result, they watch indifferently and miss important concepts. This observation was mostly due to the lack

of ideas on making educational videos and was done in a very short time without much preparation. The linguistic proficiency and body language could have been better had there been a good time to prepare for the same.

The Time Moment for Development: From the standpoint of the student, the amount of time needed for learning in a flipped classroom is significant and needs to be carefully handled. According to Table 4, as below, we calculate a ratio of 0.75:1.0 to 1.0:0.5 for pre-class, in-class, and directed post-class activities. This means that for a 3-hour credit course during a 15-week semester, there will be three hours of pre-class preparation, three hours of in-class activities, 1.5 hours of practice after class, and 1.5 hours of study time each week, for a total of 1:2 in-class to out-of-class time. The Summary of Recommendations, Including Proposed Time Allocation Ratios, for the Flipped Classroom. Derived from literature citation in the paper 76 is as below,

Table 5

Course Section	Proposed Time Ratio Allocation	Recommendation
Course Objectives		Course objectives should focus on higher order thinking (eg. Bloom's Cognitive Taxonomy of application and above) and include skills such as critical thinking, communication, and teamwork. These objectives should be aligned with real-world pharmacy situations
Pre-class Activity (can include assessments)	0.5-1.0 (eg, 1.5 to 3 hours per week for 3 credit course)	Pre-class materials should orient student to foundational definitions and concepts that will be built upon during class. This material should be direct, relevant, efficient, experience-level appropriate (eg, novice, advanced beginner), accountability-driven, and provided to students well in advance of the due date.
In-class Activity (can include assessments)	1.0. (eg, 3 hours per week for 3 credit course)	Class time should emphasize active engagement through structured activities guided or facilitated by the instructor. The instructor should provide support for activities that extend pre-class learning to apply concepts, solve complex problems, interpret information, or otherwise engage in real-life practices that develop higher-order skills.
After-class Activity (can include assessments)		After-class work should reinforce the course objectives and be increasing in complexity and integration of material. Topics should be relevant to future course work, spaced appropriately, and diverse in nature to increase transferability,
Assessment	0.25-0.5 (instructor directed) 0.5-0.75 (student-directed) (eg. 1.5 to 3 hours per week for a 3-credit course)	Assessments should be designed to fully reflect the depth and breadth of learning in the flipped classroom. Diverse approaches should be used in an effort to provide formative and summative feedback to students and faculty regarding progress toward achieving course learning objectives.

Overall Course	Included in ratios above	Course objectives, pre-class and in-class activities and assessments should be designed according to sound instructional alignment principles. Resources (eg, time, personnel, training) should be identified and secured prior to implementation of the flipped model. Consideration should be given to how the course and its requirements fit into the larger curriculum and co-curriculum.
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IV. IMPORTANCE AND RELEVANCE

The importance and relevance of utilizing flipped classroom approach in Ayurveda curriculum in contemporary education is not only really high but also very important. Increasingly, the ancient Indian system of medicine Ayurveda, has grown its recognition globally as it provides holistic health solutions. Here's why flipping the classroom in Ayurveda education can be productive:

Activity Based Learning: Flipping classrooms encourages activity-based learning which involves students participating with course content outside class through pre-taped lectures, readings or multimedia resources. This might entail watching videos on herb identification, reading classical texts or reviewing case studies in Ayurveda. Consequently, this method enables learners to take an active role during class time by engaging in further discussions, critical reasoning activities and practical experiences.

Individualized Education: Every student learns at different rate and style. By using this approach teachers can easily solve this challenge by allowing students to learn at their own pace out side the class room. In Ayurveda for instance students can choose to pursue areas they find interesting more deeply or revisit difficult concepts as necessary thereby enhancing a richer understanding of the subject matter.

Discussion and Collaboration Facilitation: The flipped classroom is a situation where the conventional lecture period turns into an interactive one with students being actively engaged in discussions, group activities as well as problem-solving exercises. This promotes collaboration between students and faculty members in Ayurveda, fosters exchange of ideas among them and leads to deeper understanding of principles and practices.

Knowledge Application: In Ayurveda, it focuses on using knowledge practically by means of clinical experiences, herbal preparations, and therapeutic interventions. Flipped classrooms offer more opportunity for hands-on learning situations where learners can use theoretical concepts in real-life contexts such as practicing pulse diagnosis, formulating herbal remedies or doing patient consultations under the guidance of experienced practitioners.

Retention and Comprehension Improvement: According to some research evidence active engagement resulting to better material retention and comprehension happens. Furthermore, flipping the class makes students participants in learning; thus they may also achieve a better understanding of Ayurvedic principles, diagnostic techniques as well as treatment modalities.

Preparation for Professional Practice: In Ayurveda, like any other medical profession, critical thinking, problem-solving and communication skills are fundamental in professional

practice. While this is true, flipped classrooms offer a chance for students to develop these skills within an encouraging learning environment. To sum up the latter part of my discourse then, through interaction with peers and active engagement with the subject matter they are able to adequately prepare themselves for their future careers as Ayurvedic practitioners.

Flexibility and Accessibility: Flipped classrooms bring flexibility and accessibility which enables students to access learning resources whenever they want. Diverse learning needs can be met and lifelong learning in Ayurveda can be promoted by providing online resources and using interactive materials for instruction.

From the modern understanding perspective, the importance and relevance of Flipped class room can be drawn with reference to the publications and textbooks as below.

The conventional classroom's learning process is inverted in a flipped classroom. Students gain information through activities outside of the classroom, which is then expanded upon and used in class. In this manner, students meet their lower-order learning objectives before to class and their higher-order objectives while being guided by a teacher during class. Recalling facts and comprehending information are examples of lower-order learning objectives, whereas problem-solving and making decisions based on information analysis are examples of higher- order learning objectives⁸ A mixed learning strategy is frequently used in flipped classrooms. Online and in-person instruction are two examples of the various learning formats that are integrated in blended learning⁹

Although there are many teaching methodologies tried and tested, Lectures are still frequently used as a teaching method in health science education. But according to Mehta et al., the majority of health science education provided today is ineffective, rigid, and not student- centered. They also emphasized the fact that performance is frequently the main emphasis of learning rather than the growth of competencies. As a result, they stated that a new paradigm in medical education is needed¹⁰. Van der Vleuten and Driessen also emphasize the necessity of concentrating more on instructional strategies that assist the student in information processing. They view the flipped classroom as an excellent teaching strategy that supports student-centered learning¹¹.

There has been a lot of research done recently on the efficacy of the flipped classroom method in health science education. A meta-analysis on the benefits of flipped classrooms over traditional classrooms for improving student learning in health science education was carried out by Hew and Lo.¹² "The approach of having students come to class during which teachers use a range of pedagogical strategies (e.g., lecture, case discussion, student presentation), and then students complete most of their homework after school" is how they define the traditional classroom. The difference in performance before and after the flipped classroom is how this study defines student learning.¹² This study demonstrated that students prefer flipped classrooms over regular classrooms and that flipped classrooms had a considerable favorable impact on student learning when compared to traditional classrooms. A meta-analysis on the academic results of flipped classroom learning was carried out by Chen et al.¹³ According to this study, flipped classrooms yield higher student accomplishment than lecture-based classrooms. In this study, a student's achievement is measured by their exam or course grades.

While research has been done on the efficacy of the flipped classroom approach in health science education, there is a dearth of qualitative reviews that offer an overview of the characteristics that support the strategy's success and suggest ways to enhance them. As a result, this analysis provides a summary of the mediating factors, treatments that enhance the effectiveness, and elements that support the flipped classroom model. With the help of these realizations, a curriculum can successfully adopt the flipped classroom model.

Results of Previous Studies Abroad

1. Gong, J., Cai, S. & Cheng, M. Exploring the Effectiveness of Flipped Classroom on STEM Student Achievement: A Meta-analysis. *Tech Know Learn* (2023). <https://doi.org/10.1007/s10758-023-09700-7>

According to this study, With a "flipped classroom," foundational knowledge is taught at home and students participate in active learning activities in class, creating a dynamic and productive learning environment. It is frequently utilized in many STEM (Science, Technology, Engineering, and Mathematics) fields. Nevertheless, there aren't many methodical, quantitative evaluations of how well students perform while using the flipped classroom approach.⁵³ research publications on the flipped classroom in STEM higher education were used in this study's meta-analysis. With no indication of publication bias, the results demonstrated an overall significant effect favoring flipped learning over traditional learning models for STEM education (Hedges' $g = 0.263$, 95% [0.190, 0.337], $Z = 7.03$, $p < 0.0001$). A moderator analysis revealed a relationship between student performance and the research control methods and flipped learning implementation tactics. Link activities to assess home learning at the beginning of class, a combination of group and individual activities during class, and setting a combination of quizzes and exercises after class are all suggested to improve student achievement in STEM education by testing the moderating factors link activity, pre-class activity, in-class activity, and post-class activity.

2. Hew KF, Lo CK. Flipped classroom improves student learning in health professions education: a meta-analysis. *BMC Med Educ*. 2018 Mar 15;18(1):³⁸. doi: 10.1186/s12909-018-1144-z. PMID: 29544495; PMCID: PMC5855972.

In this study, In mid-April 2017, seven internet databases were searched for pertinent publications using predetermined research eligibility criteria. The Medical Education Research Study Quality Instrument was used to rate the methodological quality (MERSQI). The Comprehensive Meta-Analysis program was used to calculate effect sizes, heterogeneity estimates, potential moderator analysis, and publication bias. It was found that, There was no evidence of publication bias in the meta-analysis, which included 28 relevant comparative studies with a between-subject design, and it revealed an overall significant effect favoring flipped classrooms over traditional classrooms for health professions education (standardized mean difference, $SMD = 0.33$, 95% confidence interval, $CI = 0.21-0.46$, $p < 0.001$). Furthermore, using exams at the beginning of each in-class session helped instructors implement the flipped classroom strategy more successfully. More participants said they liked flipped learning environments better than traditional ones.

Through the study, it was concluded that, According to available data, student learning in health professions education is significantly improved by the flipped classroom approach when compared to conventional teaching techniques.

3. Persky AM, McLaughlin JE. The Flipped Classroom - From Theory to Practice in Health Professional Education. *Am J Pharm Educ.* 2017 Aug;81⁽⁶⁾:118. doi: 10.5688/ajpe816118. PMID: 28970619; PMCID: PMC5607728.

This study reported that, The use of flipped classrooms in health professional education is becoming more and more common. Because of this, teachers are going through a number of growing pains when it comes to putting this model into practice, from defending the method to managing time both in and out of the classroom to evaluating its impact on student learning. This analysis focuses on a few major ideas that underpin the flipped classroom model and applies those theories to the following essential flipped classroom components: pre-class preparation, in-class activities, post-class activities, and student learning assessment.

4. Naing C, Whittaker MA, Aung HH, Chellappan DK, Riegelman A. The effects of flipped classrooms to improve learning outcomes in undergraduate health professional education: A systematic review. *Campbell Syst Rev.* 2023 Jul 7;19⁽³⁾:e1339. doi: 10.1002/cl2.1339. PMID: 37425620; PMCID: PMC10326838.

The objective of this study was to evaluate the impact of the flipped classroom intervention on the academic performance and course satisfaction of undergraduate health professional students. As per this study, after screening 118 of the 5873 possibly relevant records in full text, the authors were able to incorporate 45 papers that satisfied the inclusion criteria, including 11 RCTs, 19 QES, and 15 two-group observational studies. A few research evaluated multiple outcomes. In the meta-analysis, eight researches on student satisfaction outcomes and forty-four studies on academic performance were included. Studies that had not used a flipped classroom strategy or whose participants were not undergraduate students enrolled in health professional education programs were the primary grounds for exclusion. 45 studies were found that involved 8426 undergraduate students in total for this study. Students from medical schools (53.3%, 24/45), nursing schools (17.8%, 8/45), and pharmacy schools (15.6%, 7/45) conducted the majority of the studies. Schools of medicine, nursing, and dentistry (2.2%, 1/45), as well as other programs for health professionals in education (11.1%, 5/45). Out of the 45 studies that were found, 16 (35.6%) were carried out in the United States, followed by nine individual studies from Brazil, Germany, Iran, Norway, South Korea, Spain, the United Kingdom, Saudi Arabia, and Turkey. Six studies were conducted in China, four studies in Taiwan, three studies in India, and two studies each in Australia and Canada. Comparing the flipped class method of learning to traditional class learning, overall average effect sizes showed that academic performance was better (standardised mean difference [SMD] = 0.57, 95% confidence interval [CI] = 0.25 to 0.90, τ^2 : 1.16; I²: 98%; $p < 0.00001$, 44 studies, $n = 7813$). Academic performance in the flipped class method was found to be better than traditional class learning (SMD = 0.54, 95% CI = 0.24 to 0.85, τ^2 : 0.76; I²: 97%; $p < 0.00001$, 33 studies, $n = 5924$); all of which were low certainty of evidence. This sensitivity analysis eliminated eleven studies with imputed data from the original analysis of 44 studies. In general, students expressed more satisfaction with flipped learning than with typical classroom instruction (SMD = 0.48, 95% CI = 0.15 to 0.82,

τ 2: 0.19, I 2:89%, $p < 0.00001$, 8 studies, $n = 1696$); nevertheless, the data was largely of low certainty.

Implementation in the Indian Situation

We in our Ayurveda institute made an attempt to adapt flipped classroom. The steps that we followed were.

1. Announced a training program
2. Conducted a training program
3. We helped all departments to finalize a topic pertaining to their departments.
4. Later we helped each department to finalize the out of class activity.
5. Each department then announced the topics and methodology of flipped classroom a week prior to the class and distributed the out of class activity and the resource material.
6. On the day of In-class activity, seating was planned and the entire class was divided into 10 groups with 10 students in each group.
7. Each group was given an activity to ensure the entire topic is covered in fragments.
8. Later each group presented their topics, discussion was done, questions were taken and discussed by the presenting groups and others.
9. Any unanswered question was answered by the faculty member.
10. Later the assessment was executed and evaluated.
11. Oral Feedback was taken.

The experience of conducting the event was for the first time but was full of learning experience. We did a few mistakes initially especially in selecting the in-class activities and out of class resource materials. But as we moved ahead implementing from department to department we could improvise and learn from each other.

The experience was very unique and gave us lot of insights. Students thoroughly enjoyed the class. At one moment we found that the students didn't want to leave the class. They were so much taken into the sessions that they lost the count of the time. The faculty members were initially skeptical, but as the sessions went on they were so involved and were enjoying the process. The event brought in a lot of positive changes in teaching approach and change the negative frowns to positive smiles at the end of flipped classroom. The report of one such event is as below.

V. REPORT ON FC TECHING METHODOLOGY

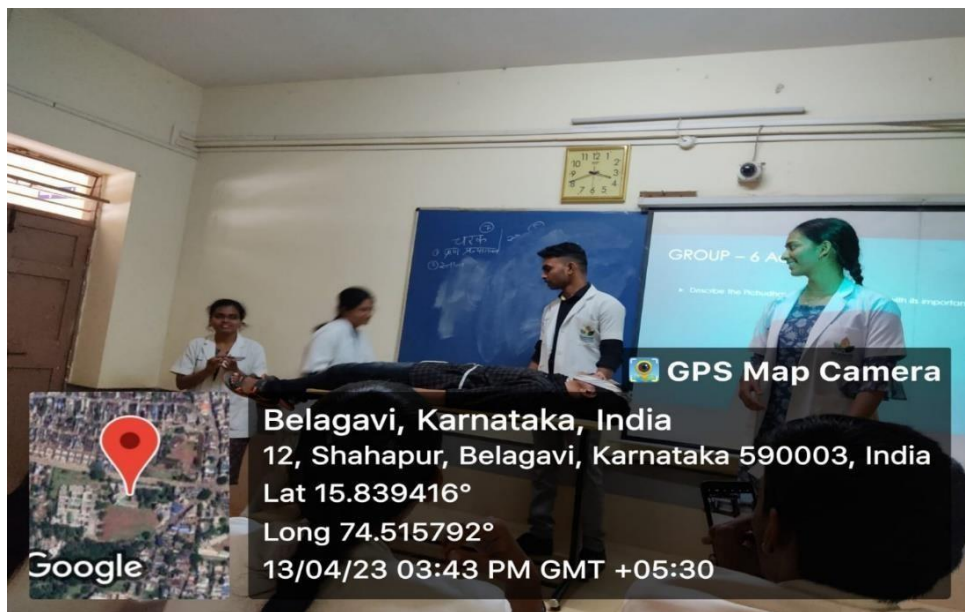
Table 6

Sl.No	Particulars	
1.	Name of the Teaching Methodology	Flipped Classroom
2.	Title / Topic	Navajaat Shishu Paricharya
3.	Program organized by Department	Kaumarabhritya
4.	In Association with / Cell / Unit Involved	Teaching Methodology

5.	Date	13/04/2023
6.	Duration	2 hrs
7.	Location	Third Year Classroom
8.	Objectives of the Program	<ol style="list-style-type: none"> 1. To sensitise the 3rd phase BAMS students on Navajaat shishu paricharya 2. To give a practical approach of navajata shishu paricharya by demonstration 3. To explore the principles of navajata paricharya
9.	No of students/ No of beneficiaries benefitted	91
10.	No of teachers participated	2
11.	Photographs	Enclosed
12.	Brief Report The department of Kaumarabhritya has conducted flipped classroom for BAMS Third -Prof. Students (2020 Batch) on 13/04/2023	

Photographs





VI. CONCLUSION

1. There is vast knowledge that was available upon Exploring various online and offline resources on flipped classroom
2. Flipped classroom can be effectively implemented in Ayurveda Education

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