



Ayurveda Meets Mathematics: Pre-Service Teachers' Path to Appreciating Indian Knowledge Systems

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Abstract

Integrating Indian Knowledge Systems into Mathematics education is crucial for cultivating an appreciation for India's rich intellectual heritage. Mathematics often induces anxiety and negative emotions in students, overshadowing its potential to foster positive attitudes. This study advocates for an approach in Mathematics which focuses on the affective domain of learning by applying Krathwohl's framework, that stresses on engaging students' emotions, attitudes, and values to promote a deeper connection with the subject. Ayurveda, a significant element of Indian Knowledge System, offers a unique opportunity to interweave health solutions with mathematical principles such as ratios, proportions, and geometric patterns, thereby demonstrating the practical applications of Mathematics in real-life contexts. This research examines how first-year B.Ed. pre-service teachers can be trained to incorporate Ayurvedic principles into Mathematics instruction, fostering a culturally relevant understanding. By engaging pre-service teachers in Design Thinking activities that involve Math embedded Ayurvedic concepts for addressing health-related issues, this study provides firsthand experience of Indian Knowledge Systems' applicability and relevance. A one-shot case study method is used, drawing qualitative insights from 16 pre-service teachers' perceptions on integrating Ayurveda into Mathematics to solve real-world problems. The findings aim to show that, by framing Ayurveda as a Mathematical model for real-life problem-solving, teachers can inspire an appreciation for India's Mathematical contributions and cultural heritage. Through this approach, the study emphasizes the importance of integrating affective learning with cognitive understanding, offering a pathway for Mathematics education that resonates emotionally and culturally, while cultivating positive attitudes toward both mathematics and IKS.

Keywords: Indian knowledge system, mathematics education, sense of appreciation in Ayurveda

1. Introduction

The National Education Policy (NEP) 2020 stresses on infusing Indian Knowledge Systems with mainstream education in addition to development of interdisciplinary learning that links ancient wisdom with contemporary fields. This is because it aimed at fostering holistic education through the promotion of cultural heritage long with the necessary scientific insights from traditional Indian systems. One of the ways is through Ayurveda. Through the blending of Ayurveda as a part of Indian Knowledge Systems along with Maths, NEP 2020 predicts the development of skills beyond the cognitive domain of learning through the affective domain of learning. Specifically

the concept of Ayurveda is a time-tested part of the Indian Knowledge system of holistic health that provides insights for linking to a variety of Mathematical concepts like ratios, proportions, and classifications. eg the principles of Ayurveda through which one focuses on balance through the concept of doshas further relates to proportion and equilibrium. We need pre-service teachers to identify the interconnected of knowledge across discipline through the use of Ayurveda. This would need to focus on cognitive skills of thinking, reasoning and analytical thinking. To make this possible we need to understand how to connect Mathematics and IKS in a classroom



setting is possible through the engagement of students in activities focusing on the affective domain of learning Math is not just about numbers and formulas, it is also connected to art, architecture, and philosophy. When students see these connections, they understand how math is used in everyday life, which makes learning more meaningful. We can achieve this if we make students go beyond intellectual connection with IKS and form a deeper personal connection with cultural wisdom so as to achieve a sense of appreciation as well as respect toward IKS. The aim of NEP 2020 in achieving well rounded individuals can be possible through development of a sense of appreciation for IKS in Mathematics classrooms as it could focus on balancing intellectual, physical and emotional growth. We need to first start working for this cause at teacher education institutions. The major focus needs to be on training pre-service teachers to make use of IKS in classrooms so that they develop respect and appreciation towards the contributions of our ancient cultures. If pre-service teachers can learn to link the different disciplines to IKS they can promote the ancient cultural heritage by further enabling the students to imbibe the same values of respect and appreciation among the students. Indian mathematics also teaches us new ways to solve problems, helping students think clearly and find smart solutions. These ideas prepare them to face challenges and succeed in the future. Adding these lessons to today's education brings more creativity and fresh ideas, helping students think in new ways. By promoting our mathematical heritage and indian knowledge system, we honor the past, take pride in our culture, and help students to develop the skills they need to do well in life.

1.1.Rationale for the Study

There are limited research studies on Integration of Ayurveda into Mathematics for achieving a sense of appreciation among pre-service teachers. This study intends to explore pre-service teachers' perceptions of incorporating Ayurveda into Mathematics curriculum so as to foster appreciation for IKS. Through the perceived benefits and challenges faced by the pre-

service teachers, the present study seeks to comprehend how the universal language of Mathematics aims to connect modern thinking with ancient cultural knowledge thereby upholding cultural pride as well as holistic learning. This insight is vital for producing curriculum strategies that successfully enables to create an engaging climate in class in addition to touching their affective domain, ultimately attempting to achieve the integration of IKS in Mathematics classrooms.

1.2.Context of the study

The context of the present study lies in the Indian Knowledge Systems (IKS) framework, wherein we expect to infuse ancient Indian knowledge, specifically Ayurveda, into the current education system. Ayurveda as a part of IKS is a traditional system to achieve holistic healing. It has not yet been explored in the setting of Mathematics education however it still has rich potential for promotion of deeper sense of appreciation for our cultural heritage. The present study strives for bridging this by exploring pre-service teachers' perceptions of including content of Ayurveda into the Mathematics curriculum. With the lens of Krathwohl's framework of the affective domain, the study aims to explore pre-service teachers perception of this interdisciplinary approach to teaching Mathematics .We aim to have a better understanding the pedagogical, conceptual, and emotional barriers in integrating concepts of Ayurveda into the Maths curriculum.the researcher aims to provide valuable understandings of linking IKS with Mathematics which would further guide in teacher training, curriculum designing and pedagogical innovations so as to create an emotionally enriching classroom experience. [1-3]

1.3.Theoretical Framework

Krathwohl's Taxonomy of the Affective Domain provides an organized framework which helps to understand the influence of emotions, attitudes, and values influence learning. The framework focuses on five hierarchical levels: Receiving, Responding, Valuing, Organizing, and Characterizing. With reference to the Receiving level, students show

willingness to attend certain stimuli in the form of Mathematical concepts or classroom discussions. at the Responding level students engage in the learning experiences with a lot of interest which can be seen through their participation in discussions or problem-solving. The next dimension in this framework i.e. Valuing focuses on a student's motivation and attitude toward Mathematics that can be witnessed through their habit of attaching worth to certain concepts or experiences. The Organizing level needs students to build up on their values into a coherent system by giving priority to the beliefs or attitudes, such as finding the relevance of Math in day to day life.

Finally, at the Characterizing level, students demonstrate a consistent set of values as well as behaviors that present their attitudes, thereby focusing on making math a fundamental part of their identity. This taxonomy stresses the importance of encouraging emotional connections to enhance learning outcomes, particularly in subjects like Mathematics. By addressing each level of Krathwohl's Taxonomy, teachers can create more engaging & meaningful learning experiences that match with students' feelings and values, ultimately leading to a more positive attitude toward mathematics. Figure 1 Krathwohl's Taxonomy of the Affective Domain.

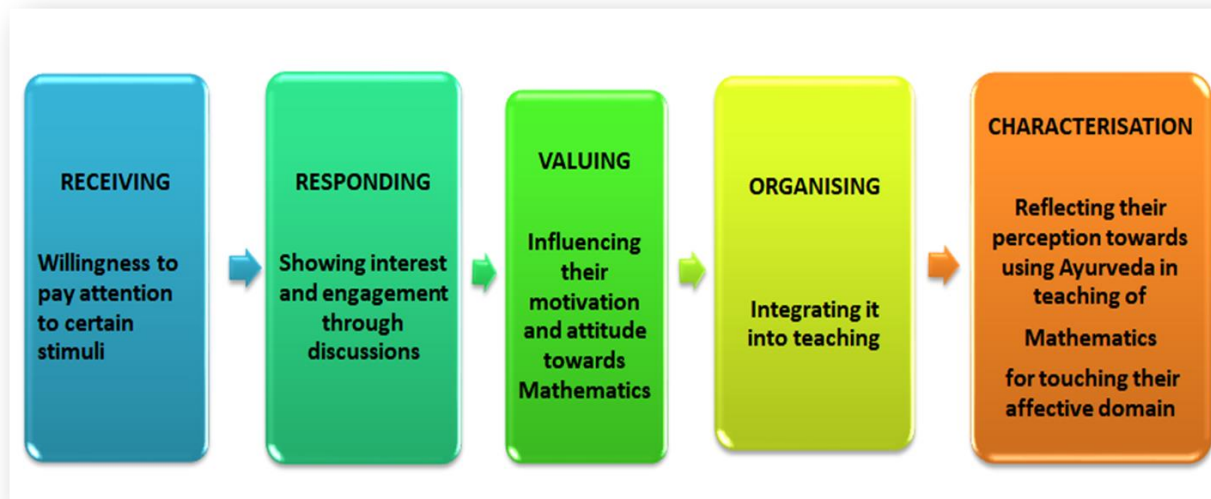


Figure 1 Krathwohl's Taxonomy of the Affective Domain

2. Literature Review

Gaur S.(2024) suggests that Indian knowledge System needs to be integrated into the mainstream education system so that the repositories of traditional knowledge is preserved and transmitted to the future generations.The researcher justifies the purpose of integrating Indian knowledge System into education for deepening students connection to the cultural roots and for fostering sense of pride in our cultural heritage .Not only this the researcher also stresses the that there is a need for conducting training programs for teachers to equip them with the skills and

knowledge necessary to teach about Indian knowledge System.This makes it very clear that teacher education colleges need to take initiative for conducting trainings towards use of Indian knowledge System into their classroom teaching . Aithal & Ramanathan (2024) recommended gratitude exercises under principles of Sanatana Dharma so as to develop Santosha i.e. contentment. It is mentioned that we need to inculcate gratitude through our curriculum for mental well being of students. Not only this it is also suggested that we need to teach children to appreciate what we have as it



will help in inculcating a positive attitude among our children. To add to this the researcher also focussed on the principle of Vidya ie Knowledge by recommending that children need to be introduced to diverse sources of knowledge including what we have in our traditional Indian scriptures .Also it was suggested that children need to develop a source of inspiration through the introduction of spiritual leaders and their contributions in the field of traditional Indian knowledge. Kumarlal et al. (2024) highlight the benefits of integrating the Indian knowledge System into higher education. They argue that Indian knowledge System enhances sustainability literacy, preserves cultural heritage, and develops interdisciplinary skills. To add to this the researcher stresses on the need for ensuring that the students appreciate and understand IKS in today's context. Thus the present study focuses on development of a sense of appreciation towards IKS. Kumar M.(2024) mentions that empirical research and scientific inquiry has validated the Indian Knowledge Systems. Specifically the researcher mentions of Ayurveda as useful for

giving a holistic approach to healthcare focusing on lifestyle modifications as well as customized treatment strategies. This aspect of customized treatment needs precision of medicines that is a skill developed through learning Maths. Clearly this points out towards bringing out the connections of Ayurveda in Maths classrooms to show how customized treatments could help in healthcare sphere. From the literature review it can be seen that there is a need for linking Ayurveda & Maths so as to develop appreciation towards Ayurveda as a part of Indian Knowledge Systems. To add to this it makes sense to say that gratitude is needed in our students to develop mental well being in them. We can do that by introducing contributions of Indian Knowledge Systems as it is by our spiritual leaders .The idea here is that the students may develop inspiration from such contributions .Also we can say that it is the responsibility of teacher education colleges to train the teachers in using Indian Knowledge Systems in classroom teaching .

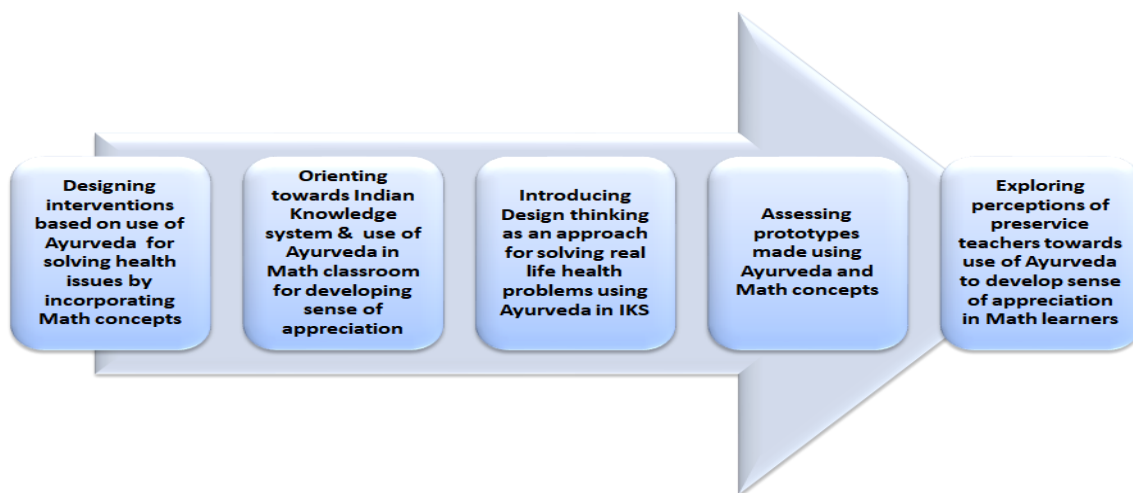


Figure 2 Flow Chart

3. Research Questions

This study is centered on the following research questions RQ1. How do the Pre-service teachers perceive the potential benefits of using Ayurveda towards developing a sense of appreciation for IKS

through teaching of Mathematics? RQ2. How do the Pre-service teachers perceive the challenges of using Ayurveda for developing a sense of appreciation for IKS through teaching of Mathematics?



4. Methodology

The present research adopts a qualitative approach using a one-shot case study. The study aims to collect the perceptions of a single group of 16 pre-service teachers towards the end of the intervention-based use of Ayurveda as a part of the Indian knowledge system to develop a sense of Appreciation among Maths learners. [4-6]

- **Participants:** 16 prospective teachers opted for this study which aimed at training them for using IKS for developing sense of appreciation. Ayurveda was used for Mathematical modeling to discover real life solutions thereby developing sense of appreciation among Maths learners.
- **Study setting:** A workshop was conducted so as to make pre-service teachers familiar with the contributions of Ayurveda which can solve health issues like indigestion, cough, fever. The researcher made use of design thinking for encouraging pre-service teachers to make use of Ayurveda to create prototypes for solving health problems.
- **Data Collection:** The present study made use of questionnaires for collecting data from prospective teachers who had volunteered to be a part of this study. The content was validated by one content expert. This questionnaire was shared using a Google form at the end of the workshop.

5. Data Analysis

The responses of the participants collected through the questionnaire were coded to allow themes and patterns naturally from the data.

5.1.RQ1. How do the Pre-service teachers perceive the potential benefits of using Ayurveda towards developing a sense of appreciation for IKS through teaching of Mathematics?

Pre-service teachers believe that using Ayurveda in Math can have more relevance, applicability. not only this the teachers also perceived it to be developing value and respect for contributions through IKS. The responses helped to understand how the pre-service teachers perceived the use of Ayurveda to develop

sense of appreciation among Math learners.

5.1.1. Developing Relevance

Pre-service teachers felt that IKS could make knowledge more relevant to the Math learner in class as the child could connect to own context during teaching learning process. It can be seen through a few responses like, “Bringing Ayurveda into a Maths classroom through Indian Knowledge Systems (IKS) can make learning more meaningful and relevant for the students” “Use of Ayurveda in teaching Maths can make learning more engaging and meaningful in a Maths classroom where students are usually passive”

5.1.2. Applicability

Pre-service teachers felt that learning about proportions through Ayurvedic diet plans, like Sattvic food or Ayurvedic Kadha, can teach students how to stay healthy with simple, affordable meals. Few of the responses were as follows: “Linking Ayurveda to Maths helped to offer practical solutions for everyday health problems by using natural remedies” “By using proper proportion of foods that we learn in Sattvic food by Ayurveda we get a diet plan with simple food which is cheaper, healthy and light to digest”

5.1.3. Respect for IKS

Preservice teachers felt that use of Ayurveda could have the power to develop respect for both math and Ayurveda by showing how math can be useful for health and wellness. A few of the responses were, ‘Teaching math through Ayurveda shows students how math can be applied to health and wellness, fostering a deep respect for both subjects.’ ‘As we connected Maths and Ayurveda children, in Maths classroom if we try this children will understand how important Maths is and even Satvik food from Ayurveda. Through this children will have due regard to the field of Ayurveda even in 21 century and that is needed.’

5.1.4. Valuing Contributions of IKS

Pre-service teachers felt that infusing Ayurveda from IKS into Maths content can encourage children to appreciate the contributions of IKS. Few of the responses were as follows: ‘As we incorporate Ayurveda from Indian Knowledge Systems in Maths, we can highlight valuable contributions of traditional



wisdom and practices.' 'The lesson helped us to appreciate the unique insights and solutions from our cultural heritage for solving health issues'

5.2.RQ2.How do the Pre-service teachers perceive the challenges of using Ayurveda for developing a sense of appreciation for IKS through teaching of Mathematics?

Though the pre-service teachers believed that use of Ayurveda could bring a lot of potential benefits, they also feared that the use of Ayurveda in Maths to develop appreciation could have a lot of challenges as well.

5.3.Child Related Challenges

5.3.1. Lack of Interest

The current school syllabus does not focus much on Indian Knowledge Systems (IKS), so students might not be excited about such activities. Pre-service teachers feared that the use of Ayurveda in teaching of Maths may not be effective in every classroom as children may not be conditioned to study a concept of Ayurveda in related to Maths. This clearly pointed towards teacher stressing lack of interest among the Maths learners. The responses that pointed towards this challenge were. 'Children may not show interest as they are not conditioned towards use of IKS in learning Mathematics' 'As the existing school Mathematics curriculum doesn't give weightage to IKS, children may not be enthusiastic towards the activities like we did today' 'The curiosity with which we engaged when you said of using Ayurveda to cure some diseases, may be student would not develop that curiosity as they never have such discussions'

5.4.Teacher Related Challenges

5.4.1. Lack of precision in connecting Math to Ayurveda

Teachers felt that connecting Ayurveda with Maths could be tricky since both subjects are very different. They expressed that teachers might be unable to align Ayurvedic concepts to the different concepts in Maths. They felt that connecting Maths concepts to Ayurveda may be difficult for pre-service teachers. Few of the responses were. 'Challenges include aligning

Ayurveda's holistic concepts with mathematical rigor and ensuring relevance to Mathematical principles.' ' ' Infusing Ayurveda into the Math curriculum could face several challenges. One major issue is that Ayurveda and Math are seen as separate subjects, making it hard to find clear connections. Teachers may need special training to integrate both effectively, which could take time and effort.'

5.4.2. Need for teacher training

The pre-service teachers expressed the need for getting hands-on experience on the use of Ayurveda or any other component of IKS in teaching of Maths for developing appreciation among learners. One of the responses were "There may be challenges in integrating Ayurveda into the Maths curriculum. One key challenge would be finding clear, logical connections between the two subjects without overwhelming the curriculum or straying from core mathematical principles. Teachers may also need specialized training to effectively merge these different fields."

5.4.3. Resistance to change

Another challenge perceived by the pre-service teachers might show hesitation as they may not be familiar with the concepts of Ayurveda from IKS and they may not be equipped with the special skills required to effectively combine the two subjects. Even some teachers felt that the new expectation of linking IKS to Maths is like adding burden to existing load of teachers work. Some of the responses were, 'Integrating Ayurveda into Maths curriculum may face challenges in the form of potential resistance from educators' unfamiliarity with Ayurvedic principles.' "Teachers may be reluctant enough to integrate both effectively, as it requires special training that could take time and effort." "I think that not all teachers might be inclined to integrate both effectively; they feel overwhelmed by their existing workload."

Conclusion

Prospective teachers realized the benefit of use of Ayurveda in teaching Maths can help in achieve practical value of Indian Knowledge System and a sense of appreciation towards Indian Knowledge



System. However, the responses of prospective teachers pointed towards a call for addressing challenges in developing student's interests and also teacher related challenges in developing precision in connecting Maths & Indian Knowledge System through proper teacher training.

Recommendation

For Teachers

- Mathematics subject experts must collaborate with other colleagues who have expertise in Indian Knowledge Systems so as to co-create interdisciplinary resources for school teachers.
- Mathematics teachers can participate in professional development workshops which focus on infusion of Indian Knowledge Systems into the Mathematics curriculum.
- Teachers need to engage in discussion forums where Mathematics experts may be sharing their innovations. Focus could be on sharing experiences and challenges in using Indian Knowledge Systems in Mathematics classroom.
- Mathematics teachers who design instructional materials based on infusion of Indian Knowledge Systems into Mathematics must publish that for knowledge sharing.

For Administrators

- School principals must provide training opportunities for teachers to be skilled in integrating Ayurveda or any other component of IKS in teaching Maths.
- Principals must foster a culture of collaboration among the teachers so as to get the expertise of teachers from different departments for creating best interdisciplinary lesson plans.
- Principals must allocate funds for library resources that highlight the intersection of Indian Knowledge System and Mathematics. School teachers can be encouraged to use such resources.
- Involvement of the local community in school activities based on traditional Indian knowledge like festivals or architecture can develop appreciation towards rich Indian cultural heritage especially among the teachers and students.

For Curriculum Designers

Curriculum designers can create modules based on infusion of Indian Knowledge System and Mathematics for teachers teaching at all levels. Teacher handbooks with basic lesson plans and co-curricular activities based on connections of Indian Knowledge System and Mathematics can be a priority area for curriculum designers. Curriculum designers can collaborate with subject experts of Mathematics and Indian knowledge systems to create authentic and accurate content which has clear linkages of the two subjects.

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