**Theme: Pedagogical Leadership for Enhancing Student Learning Competencies**


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**Academic Leadership /pedagogical Leadership for Enhancing Student Learning Competencies**

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The National Education Policy (NEP) highlights the critical role of the foundational stage of education, encompassing pre-primary and primary levels, as the cornerstone of lifelong learning and holistic development. Science, a discipline that profoundly shapes every aspect of life—from the cradle to the grave—finds its roots in primary education. This stage represents a pivotal time when curiosity is at its peak, and the foundational understanding of scientific concepts begins to take shape.

The Vigyan Setu initiative is a science education outreach program designed to ignite curiosity and connect young minds with science in their everyday lives. It serves as a bridge linking Government High Schools with all Government Primary Schools and Apna Ghar in Tiswadi Taluka, Goa. Apna Ghar, a Juvenile Justice State-Run Children's Home, operates under the Directorate of Women and Child Development. This initiative fosters a sense of wonder and exploration, encouraging young learners to ask questions, seek answers, and experience the joy of discovery.

Through Vigyan Setu, modern science is seamlessly blended with an awareness of the Indian Knowledge System, cultivating a love for nature and instilling pride in India's rich heritage. The program aims to empower the next generation of thinkers and innovators, building a bridge that connects curiosity to knowledge.

"You can be that Change"

**Objectives**

1. Facilitate gradual exposure by introducing basic scientific facts, concepts, and skills to primary school students in an engaging and relatable manner.
2. Foster creativity, curiosity, observation, critical thinking, and inquiry among students to encourage a scientific approach to understanding their environment.
3. Incorporate hands-on activities and experiments to make science interactive and experiential for young minds.
4. Leverage locally available materials and examples in teaching science to make learning contextual and directly applicable to students' surroundings.
5. Act as a science bridge between high schools and primary schools, ensuring continuity in the quality and delivery of science education, especially in rural and underserved areas.
6. Help students recognize the relevance of science in daily life, enabling them to connect classroom learning with real-world applications.
7. Incorporate elements of the Indian Knowledge System (IKS) into science education to create awareness of traditional Indian scientific and technological contributions, as envisioned by the National Education Policy (NEP).

8. To preserve and promote India's rich knowledge heritage, instilling pride and cultural identity among students by highlighting the nation's contributions to science.
9. Integrate science education with other subjects, fostering a multidisciplinary approach to learning that contributes to the overall intellectual and social development of students.
10. Raising awareness among students about India's rich cultural and scientific heritage.
11. Make learning science entertaining and to develop scientific attitude among students.

**Geographical Context**

Tiswadi Taluka, located in North Goa, features a mix of urban hubs, semi-urban township and rural landscapes, with some areas posing accessibility challenges due to uneven terrain. The taluka comprises 18 plus villages, each with unique characteristics and infrastructural setup. The region is home to all together 33 government primary schools, majority of which operate independently with minimal connection to nearby high schools. Some of these schools are isolated, scattered across remote settlements with limited infrastructure, making it difficult for students and teachers to access resources and support. Additionally, Apna Ghar, situated in Merces under the Directorate of Women and Child Development, provides shelter and rehabilitation for juveniles in conflict with the law and children in need of care and protection which further emphasizes the need or inclusive and targeted educational outreach.


**Socio Economic Context**

Tiswadi Taluka, with its government primary schools and Apna Ghar in Merces, serves a predominantly migrant population where most parents depend on day labor and daily menial work for survival. Additionally, Apna Ghar, a specialized care facility under the Directorate of Women and Child Development, provides shelter and rehabilitation for juveniles in conflict with the law and children in need of care and protection. Many of the children residing in Apna Ghar come from vulnerable socio-economic backgrounds, where poverty and unstable family situations often hinder their access to basic education and support. Hence, these socio-economic challenges are evident in primary schools and Apna

Ghar, where many students are first-generation learners who often lack academic support and resources at home, and mostly belong to socially and economically disadvantaged groups.

**Challenges**

Leading the Vigyan Setu initiative came with several implementation challenges:

a. Building Cohesion Among Teachers: As a science initiative, it required collaboration among both science and non-science teachers within the same school, as well as between teachers from two different government high schools, making it difficult to foster a cohesive and synergistic working environment. Continuous efforts were necessary to promote mutual understanding, align goals, and ensure effective teamwork.
b. Addressing Fear of Science: Many non-science teachers exhibited apprehension toward science, often perceiving it as complex and unrelated to their daily lives. Overcoming this fear and helping them appreciate the relevance of science in everyday activities were essential to securing their active participation in the program.
c. Training Non-Science Teachers: A significant number of teachers had non-science backgrounds, which required equipping them with a clear understanding of basic scientific concepts before they could engage with primary school students. Training these teachers and ensuring their confidence in science instruction was a critical preparatory step.
d. Geographical and Logistical Constraints: Some government primary schools were located in remote and rural areas with challenging terrain, creating accessibility issues. The distances and logistical challenges added complexity to the implementation of the initiative, requiring meticulous planning to ensure all schools were included.
e. Permissions and Administrative Coordination: Securing permission to conduct activities in all primary schools under the Directorate of Education, also Apna Ghar which falls under the jurisdiction of the Directorate of Women and Child Development, necessitating coordination with and convincing of multiple stakeholders across departments as a significant challenge.
f. Varied School Timings: Primary schools in Tiswadi operated on varying schedules, with some running morning shifts and others in the evening. A teacher had to adjust their routines and schedules to accommodate these differences, often balancing multiple responsibilities simultaneously.
g. Balancing Workload: Teachers participating in the initiative had to manage the additional responsibilities of Vigyan Setu alongside their regular school duties, including morning teaching sessions & activities, evening remedial classes, and home visits. This demanded significant effort in planning and time management to prevent burnout.
h. Promoting Awareness of Heritage and the Indian Knowledge System: Raising awareness among teachers about India's rich cultural and scientific heritage was another challenge. The headmaster had to motivate teachers to take pride in the Indian knowledge system and inspire them to introduce this awareness to primary school students in a meaningful way.
i. Financial implications: Teachers faced challenges related to travel costs for reaching different schools, as well as the development and acquisition of educational materials.
j. Addressing Student Diversity: A primary challenge is addressing the varying educational levels and emotional backgrounds of the children. Many children in Apna Ghar may have faced trauma or disruptions in their schooling, which could affect their ability to focus or engage fully in structured activities. The school visited revealed many first-generation learners with limited support and resources, often from disadvantaged backgrounds.

## Methodology

The Vigyan Setu initiative fostered science education through interactive, hands-on learning, bridging the gap between government high schools and primary schools in Tiswadi Taluka, Goa. High school teachers, called Vigyan Mitras, conducted engaging science sessions in 32 primary schools and one juvenile home in Merces, sparking curiosity and active participation among students. The program emphasized real-life applications of science concepts, creating a strong foundation for scientific thinking and exploration.

As part of the program, a science education expert was invited to the school to equip teachers with effective demonstration techniques, enhance their subject knowledge, and offer hands-on experience with scientific experiments. The initiative fostered a culture of teamwork and mutual support, as teachers from different schools collaborated to deliver the sessions.

To manage the high school timetable and ensure that teachers' workloads were not disrupted, groups of two to three teachers were sent out together for each demonstration. At no point would more than one group be away from their high school responsibilities, maintaining a balance between their regular duties and the outreach initiative. After each session, the teachers promptly shared updates on a WhatsApp group, detailing the activities conducted in the primary schools. This real-time communication ensured that all involved in the initiative remained informed and engaged.

The 'Vigyan Mitras' conducted science experiments related to day-to-day life, providing simple yet effective explanations to help students understand scientific concepts through real-life applications. The sessions were structured to promote active learning, with students encouraged to predict outcomes, observe experiments, and draw conclusions. This hands-on methodology not only improved their understanding of science but also fostered critical thinking and problem-solving skills. By participating in experiments, students gained confidence and developed a genuine interest in science, seeing its practical applications in their daily lives.

The initiative integrated modern scientific concepts with traditional Indian knowledge systems. Teachers introduced basic concepts from Yog, Ayurved, and Vedic Mathematics, encouraging students to explore holistic approaches to health, well-being, and problem-solving. Stories from the Panchatantra were used to demonstrate moral lessons, while highlighting the scientific logic embedded in these ancient tales. Teachers also introduced students to the legacies of Indian scientists like Aryabhata, Bhaskara, Sushruta, Chanakya and others, showcasing their contributions to mathematics, medicine, governance and others. This approach aimed to instill a sense of pride in India's rich scientific heritage and its relevance in contemporary times.

Despite logistical hurdles, including the need for permissions from various departments and the challenges posed by remote school locations, the initiative reached its target and succeeded in touching the lives of more than a thousand students across 33 schools. Through the Vigyan Setu program, science education was not only imparted but also celebrated as a tool for empowerment. The inclusion of songs like Vigyan Geet (science song) created an engaging and fun way to learn, while reinforcing key scientific principles. Additionally, teachers narrated & taught the students Vigyan Kodi/Paheli(puzzles), Vigyan Katha (stories), Vigyan Vichar(thoughts), Vigyan Charcha(discussion), Vigyan Khel (games), further enhancing the engagement.

The Vigyan Mitra motivated the primary teachers to set up Vigyan Kopra (science corner) in their school. The Vigyan Kopra was set up in the name of an ancient or modern Indian scientist. In small primary schools with 3-4 classrooms, a single science corner can serve as a shared space for all students. In this special area primary teachers were motivated to showcase models, pictures, and simple experiments, and provide opportunities for hands-on activities, while integrating elements of the Indian knowledge system, such as traditional scientific concepts from Ayurveda, Vedic mathematics, and sustainable practices.

The Vigyan Kopra is designed to be an interactive learning space, similar to high school science labs, where students engage with science through hands-on experiments, models, and displays. Featuring posters of renowned scientists and practical tools, it promotes learning through Vigyan Katha (science stories) that inspire students with tales of great discoveries. Vigyan Paheli (science puzzles) challenge students' problem-solving skills, while Vigyan Khel (science games) make learning enjoyable and engaging. Additionally, Vigyan Charcha (science discussions) fosters open conversations among students, teachers, and parents on critical topics like pollution and climate change, enhancing critical thinking and real-world understanding along with Vigyan Vichar (science thought) to shares a simple science idea and thought each day to spark curiosity and thinking.

The Vigyan Kopra can be the first step in designating the school as a primary Vigyan Kendra (science center). It was proposed that, by gradually expanding its resources, introducing more hands-on experiments, and involving students in scientific projects, the corner can grow into a hub for science learning, connecting students with both modern and ancient scientific knowledge. Over time, the Vigyan Kopra (science corner) can evolve into a larger Vigyan Kendra (science center), inspiring curiosity and promoting a deeper understanding of science. It can become a hub for scientific exploration, benefiting both students and the wider community.
The initiative was a spark for encouraging lifelong learning, critical thinking, and respect for Indian scientific heritage, ensuring a holistic approach to education. By incorporating feedback from teachers and students, the program continued to evolve, becoming a model for future science outreach efforts. Vigyan Setu acted as a catalyst in ensuring equitable science opportunities for all children and contribute towards holistic development of all students.

**Findings and Impact**

- Increased Collaboration: The initiative encouraged collaboration between high school and primary school teachers, creating a sense of community and shared responsibility for student learning. Teachers became more open to cross-school partnerships and shared resources.
- Cultural Awareness: Teachers gained a deeper understanding of India's rich scientific and cultural heritage, which they passed on to their students. The introduction of Indian scientists, traditional knowledge, and cultural stories enriched their teaching and made learning more meaningful for students.

**Impact on High School Teachers:**

- Professional Growth: High school teachers gained valuable experience in adapting their teaching methods for younger learners, improving their own ability to communicate difficult scientific concepts in simple, engaging ways.
- Leadership and Mentorship: As Vigyan Mitras, high school teachers took on a mentorship role, guiding primary school students and teachers through the experiments and projects. This role allowed them to hone their leadership skills while also deepening their commitment to science education.
- Personal Satisfaction: Teachers felt a sense of fulfillment in contributing to the development of young minds, which encouraged a long-term commitment to the program and its goals.

**Conclusion**

The Vigyan Setu initiative achieved significant positive outcomes, fulfilling its objectives of enhancing scientific attitude & curiosity, fostering critical thinking, and integrating Indian Knowledge Systems into primary education. It successfully overcame challenges such as logistical constraints, teacher preparedness, and varying school schedules. The program not only impacted students but also contributed to the professional development of both primary and high school teachers. The focus on hands-on learning, inquiry-based science education, and the inclusion of cultural heritage has had a transformative effect on the educational environment in Tiswadi Taluka.

Vigyan Setu has made a tremendous impact in bridging social category gaps in access to, participation in, and the learning of science at the primary level. Equalizing access to science opportunities to achieve inclusive and by equitable science learning. Vigyan Setu emphasizes equality and inclusivity by focusing on socially and economically disadvantaged groups.

Through Vigyan Setu, Vigyan Mitras have successfully created a ‘Vigyan Deep’ in every primary school, building a scientifically progressive society. Moving forward, the continued collaboration and expansion of the initiative will further strengthen its impact and ensure that science education reaches more students across Goa & India.