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Original Research Article

EXPLORING THE ROLE OF CURIOSITY IN INTEGRATING INDIAN KNOWLEDGE SYSTEMS INTO MIDDLE SCHOOL SCIENCE: A STUDY OF CBSE GRADE 8 LEARNERS IN NEW DELHI

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Abstract

This study explores the integration of Indian Knowledge Systems (IKS) into middle school science learning within the framework of NEP 2020. Conducted with Grade VIII CBSE students in New Delhi, the quasi-experimental research investigates the impact of IKS-based interventions on students' curiosity levels. Findings reveal significant improvement in the experimental group, validating the pedagogical value of IKS. The study underscores how local knowledge can contribute to globally relevant, culturally rooted education — a cornerstone of India's internationalisation vision under NEP 2020.

Key words: *NEP 2020, Science curriculum, integration, scientific attitude, curiosity*

Introduction:

Science, at its core, is a fundamental human drive to understand our world – a journey of observing, questioning, and making sense of the universe. This innate curiosity echoes through the ages, finding early expression in ancient Indian texts. India once stood as a beacon of learning, drawing inquisitive minds globally.

The National Education Policy (NEP) 2020's focus on integrating the Indian Knowledge System (IKS) offers a compelling opportunity to connect our rich past with our present scientific understanding. This fosters a deeper connection to our roots and pride in our intellectual legacy.

Ultimately, this endeavour aims to tap into India's profound tradition of knowledge to tackle current and future challenges globally. By thoughtfully bridging ancient wisdom with contemporary science, we can strive for a more harmonious relationship with our planet and a sustainable future.

Global educational frameworks like the IB and IGCSE also emphasize diverse cultures and ways of understanding the world. This global trend highlights that integrating IKS allows India to enrich the global educational landscape by sharing its unique intellectual heritage, fostering mutual understanding and appreciation for diverse scientific and philosophical journeys. This exchange contributes to a more interconnected and culturally aware global learning community.

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Rationale for research:

Eighth grade marks the culmination of foundational science education, making the introduction of the Indian Knowledge System (IKS) at this stage potentially impactful for students' learning trajectories.

Early exposure to indigenous frameworks like IKS naturally aligns with global citizenship education. Understanding India's historical knowledge contributions fosters appreciation for diverse perspectives and global intellectual interconnectedness, cultivating empathy and respect for cultural diversity – crucial for responsible global citizens. Learning about IKS alongside modern science enriches their capacity for intercultural understanding and collaboration in an interconnected world.

This research study aims to experiment with how integrating IKS into science education for eighth graders of the CBSE curriculum in New Delhi influences their conceptual understanding of IKS, scientific attitude, and student engagement (motivation and self-regulation), while considering the moderating effects of curiosity.

Aim of the study:

To investigate the effectiveness of Indian Knowledge Systems (IKS) in science education for eighth graders in New Delhi by examining its impact on conceptual understanding of IKS, scientific attitude, and student engagement (motivation and self-regulation), while considering the moderating effects of curiosity.

Objectives of the study:

1. To compare the pre-test scores of the students in the experimental group and control group on their:
   a. Awareness of IKS in science
   b. Scientific Attitude
   c. Student Engagement through Students' Motivation and Self-Regulation in Science Learning.
2. To compare the post-test scores of the students in the experimental group and control group on their:
   a. Awareness of IKS in science
   b. Scientific Attitude
   c. Student Engagement through Students' Motivation and Self-Regulation in Science Learning.
3. To compare the pre-test and post-test scores of the students in the experimental group and control group on their:
   a. Awareness of IKS in science
   b. Scientific Attitude
   c. Student Engagement through Students' Motivation and Self-Regulation in Science Learning.
4. To study the interaction effect of the intervention program and Curiosity of students on their:
   a. Awareness of IKS in science
   b. Scientific Attitude
   c. Student Engagement through Students' Motivation and Self-Regulation in Science Learning.

Research Methodology:

The research study adopted was a quasi-experimental design, having equal participants in each group –

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Experimental Group (EG) and Control Group (CG). The final sample size of Experimental Group and Control group consisted of 64 students each from Grade Eighth studying in CBSE Schools of New Delhi. Two schools were selected through multi-stage sampling as Experimental Group and Control Group for the experimental study.

Instruments of the study :

- IKS Awareness Test (IKS-AT) (Amar and Jha, 2024): This instrument was constructed by the researcher. The face validity was established by the researcher with her research supervisor. The Content Validity was established by taking the suggestions of three subject experts. Science Curiosity in Learning Environments (SCILES): This instrument was developed by Jennifer L. Weible & Heather Toomey Zimmerman (2016). The Reliability of the instrument is 0.6957 and Validity is 0.83041.
- Scientific attitude scale (SAS) (Ahmed T. Syed Mustaq, 2007): Reliability of the scale based on Cronbach's α of .91
- Student Engagement through Students' Motivation and Self-Regulation in Science Learning (SALES) (Velayutham Sunitadevi, Aldridge Jill & Fraser Barry, 2011)
- Pre and post-tests were administered within a gap of 3 weeks with treatment given to EG for 10 consecutive sessions of 10 hours

Themes chosen for intervention:

The researcher consulted subject experts to determine the themes suitable for Grade VIII Science Curriculum for CBSE board schools of New Delhi. The themes thus incorporated for intervention were as follows:

a) Introduction to IKS and Ancient India of Vedic times
b) Vedas: A brief overview of ancient texts
c) Ancient Medicine practices- Ayurveda, Unani, Tibetan, Naturopathy, Siddha, Yoga
d) Ancient Anatomical practices and ancient scholars who contributed to the field
e) Contribution to world history in science and math
f) Ancient Astronomy
g) Metallurgy
h) Architectural marvels

Overall, ten lesson plans were designed incorporating IKS related to science education suitable for Grade VIII, and an intervention was made interactive using ICT tools keeping in mind the following aspects:

- Appreciation for richness and diversity of Indian intellectual traditions pertaining to Science Education.
- Recognition of the importance of preserving and learning from historical knowledge Systems in Science Education.
- Development of a critical perspective on how knowledge is created and disseminated in science teaching and learning.

Data collection: Two intact Eighth Grade classes were taken in combination as EG and CG from each CBSE school due to factors beyond the control of the researcher.

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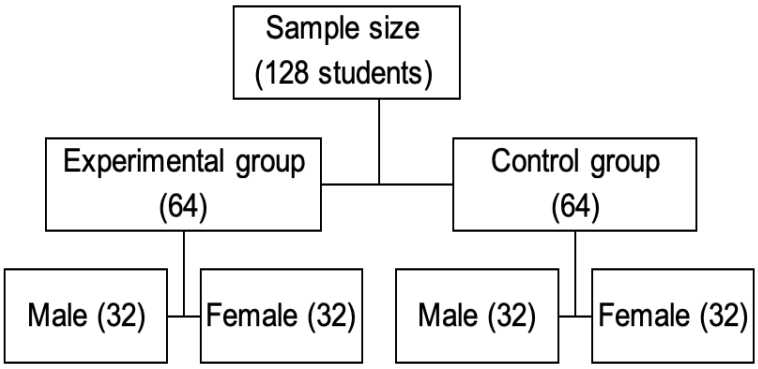

Figure 1: Sample Size

Data Analysis

Analysis consisted of the following statistics:

- Descriptive statistics (Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis and Range of scores)
- Inferential Statistics consisted of the following:
  - t-Test: Two-Sample Assuming Equal Variances
  - t-Test: Paired Two Sample for Means
  - Anova: Two-Factor with Replication

Major Findings of the study:

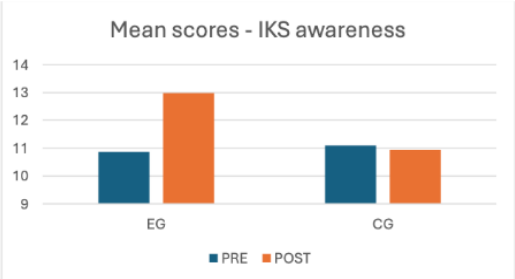

Figure 2: Pre-test and Post-test Mean Score Comparison of EG and CG for IKS Awareness.

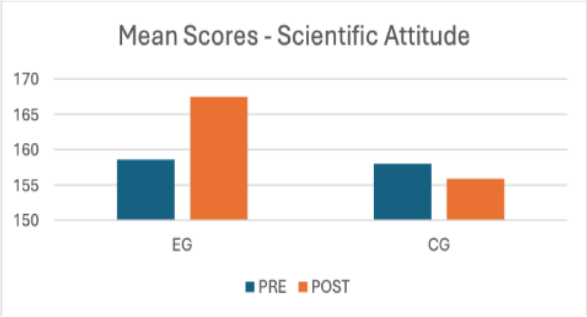

Figure 3: Pre-test and Post-test Mean Score Comparison of EG and CG for Scientific Attitude

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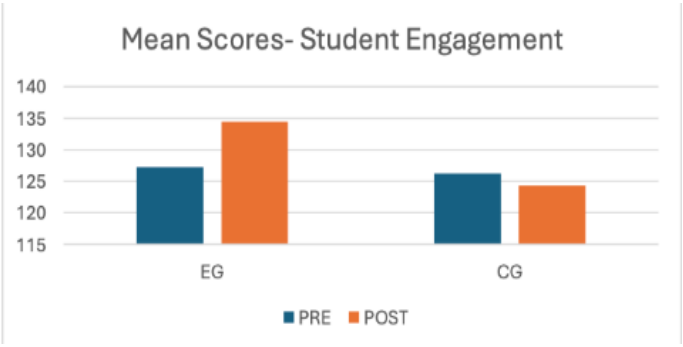

Figure 3: Pre-test and Post-test Mean Score Comparison of EG and CG for Student Engagement

Summary of the findings:

From the data analysis, it is evident that enhancing students' awareness of Indian Knowledge Systems (IKS) in the Grade VIII significantly influenced their scientific attitudes and engagement.

Overall, the study demonstrated a clear disparity in IKS awareness, scientific attitude, and student engagement between the intervention group and the control group following the intervention program.

Key findings:

- **Pre-intervention:**
  There were **no discernible differences** in IKS awareness, scientific attitude, or student engagement between the experimental and control groups before the intervention.
- **Post-intervention:**
  The experimental group **exhibited significantly higher levels** of IKS awareness, scientific attitude, and student engagement compared to the control group.
- **Within-group analysis:**
  The intervention group **experienced substantial improvements** in IKS awareness, scientific attitude, and student engagement from the pre-intervention assessment to the post-intervention evaluation. In contrast, the control group showed no notable changes.
- **Covariate analysis:**
  Due to the negligible differences in pre-intervention scores between the groups, ANCOVA was not conducted.
- **Interaction effects:**
  No significant interactions were observed between the intervention program and student **curiosity** regarding IKS awareness, scientific attitude, or student engagement.

Conclusion:

The intervention program **effectively enhanced IKS awareness, scientific attitude, and student engagement**, suggesting its positive impact on these crucial educational outcomes.

No significant interactions observed between the **intervention program** and student **curiosity** suggests that

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the study is an equaliser for science education in India and has implications for international students as well.

Delimitation:

This study is delimited to develop and validate the effectiveness for secondary school students in two schools located in South Delhi. Similar studies can be undertaken with a larger sample of different school subjects.

Recommendations:

1. Teachers should be trained in acquiring knowledge of IKS or Indigenous Knowledge and integrating it within the science curriculum to enhance scientific attitude and engagement in science classes.
2. Schools should focus on integrating important contributions of ancient scientific knowledge in science and math along with celebrating important days and birth anniversaries of native scholars to raise awareness during assemblies, or through co-curricular activities.
3. Student cultural exchange programs could be promoted to raise awareness about indigenous scientific contributions from various parts of the world.
4. Content and Pedagogy alignment can be done through a teacher education program, it must blend in the learning about IKS and its role in holistic development of students.
5. Modules of Instructional Strategies based on IKS should be developed for all subjects' content at all levels.
6. Drawing up of parallel of Indigenous Knowledge and drawing comparison between ancient scholars of various civilisations could be taken up in Project based activity.
7. Setting up of exhibitions, fairs, workshops by resource persons, etc. involving IKS based themes or projects across various disciplines must be undertaken to help develop the passion for the subject and inculcate National Pride.
8. Networking with National Agencies like UGC, NUEPA, NCERT, CEC, and INFLIBNET so that online resources can be accessed by teachers and students alike free of cost with no boundaries.
9. Conduct International seminars or workshop for teachers to create awareness about ancient scholars of various civilisations to connect the dots of building global understanding.

Suggestions for future research :

1. Detailed Research can be carried out to know the awareness level of the students on indigenous science practices in relation to the chapters being studied under the present curriculum globally.
2. A long-term experimental study may be planned with the same design to study the effectiveness of integrating IKS in the curriculum with specially designed activities and study the impact of it on inculcating the core values that IKS teaches.
3. The present study is conducted only to the grade 8th school students & it can be extended to upper primary or other levels of middle school.
4. Present study is confined to developing IKS awareness to teach science. It can be extended to teach other subjects as IKS encompasses many disciplines and is holistic in nature.
5. The present study is confined to a limited number of dependent and moderator variables, it can be used to assess the impact on other variables like core values, sense of national pride, ethics, etc.

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6. The present study is confined to only academic pursuits on effectiveness of IKS but can be extended to yoga, naturopathy and assessing its impact on mental health of an individual and its impact on academics all over the world.
7. Cohort studies can also be carried out for students at secondary school to assess long term impacts of IKS in shaping well rounded individuals.
8. Many studies show how ethnoscience can help and impact the environment directly in understanding evolution and being mindful of nature and environment. Similar studies can be extended to develop and inculcate environmental sensitivity in students globally.

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