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# The Universe in a classroom: A pedagogical initiative to explore the space education among secondary students

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**Abstract**

India has been the center of learning since ancient times where Astronomy has been an essential part as far as Indian Education system is concerned. Indian education concentrates on the holistic development of children by keeping them in center. A couple of questions arise when different pedagogical methods are applied in the classroom during teaching-learning process, would it be helpful to the students? And as far as Space Education is concerned, which method is preferable? here we aim to answer it. A study was conducted by an investigator among 285 students of Std. 9 and 10 who were of the age group of 14 to 15 years when they were asked to learn "the birth of star and its whole life cycle" by using three innovative methods that is lecture, singing and drama. After recording their responses, comparative quantitative and qualitative analysis were performed by an investigator having the positive result where the investigator could find that it would be helpful for the students to understand the chosen topic with high interest that makes the classroom environment alive and found that students do like practical approaches. If given a chance, we would like to broaden our research area.

***Keywords:****Secondary Education, lecture, Drama, Singing*

## 1. Introduction

Astronomy is consistently considered as the subject of interest for the people since it carries millions of mysteries of The Universe. With the help of Mathematics and technology, we have crossed the horizons of not only our solar system but even black hole and as far as the space education is concerned, there must a good amount of space stuff for the students so that they can understand the original essence and feel the fragrance of cosmic flower. India; since ancient time has been contributing in the field of Space education via different pedagogical approaches due to which the educator from childhood onwards starts thinking and computing his own ideas and can choose his filed of work further. Space education requires the knowledge of both: theory and practical; where theory constructs the conceptual base in which books and articles play an important role whereas a practical approach gives the real experiences along with multiple dimensions to understand any respective topic(s).

### 1.1 Literature Review & Research Gap

Pedagogical research highlights the value of multimodal instruction in science education. Drama-based pedagogy allows learners to embody abstract phenomena, transforming passive theoretical constructs into active visual and social representations. Similarly, music and arts integration in STEM education (STEAM) has been shown to enhance affective engagement, memory retention, and classroom participation. Traditional lectures remain essential for structuring rigorous conceptual foundations and explaining procedural or mathematical scientific mechanisms

While creative arts are frequently utilized in early childhood and primary education, empirical evaluations examining their combined application alongside traditional lectures in secondary astrophysics education remain limited. Specifically, few studies examine how secondary students (9th and 10th graders) differentiate the utility of lecture, drama, and singing when learning complex concepts like nuclear fusion and stellar life cycles within the Indian secondary school context. This study addresses this gap by analyzing student feedback following a structured classroom intervention involving all three methods

## 2. Rationale of Study

As an investigator, I would like to ignite the young minds of the students of $9^{th}$ and $10^{th}$standard. As far as Space is concerned, the secondary students are enthusiastic to learn about the stars and planets. They have potential to make their future in this field with proper

guidance. Since they don't study the topics of space science in their regular syllabus, it is possible that they might be deprived of it. I, as an investigator observed and selected this problem and planned to conduct a survey with the help of three pedagogicalmethodsthat is lecture, drama and singing. After selecting the title: Birth of the star and its whole life cycle, it was planned to conduct a lecture on the selected title with conceptual stuff along with interesting audio-visual parts. Afterclearing the concepts, I planned to implement the chosen title through drama and singing followed by the construction of a questionnaire and based on the reviews of the students and then aquantitative andqualitative data analysis was performed. This activity was planned to be completed by a month.

## 3. Methodology

### 3.1 Research Design

This study employed a **mixed-methods action research design** using a convergent framework. A classroom instructional intervention was conducted where three distinct pedagogical methods (lecture, drama, and singing) were utilized to teach the topic "The Birth and Life Cycle of a Star". Following the intervention, quantitative descriptive data were gathered to evaluate method-specific preferences, and qualitative open-ended responses were gathered to capture narrative feedback regarding learning experiences

### 3.2 Objectives of the study

- To improvise the teaching-learning approach in classrooms.
- To study the opinion of $9^{th}$ and $10^{th}$ Standard students on implementation of pedagogical methods used in Space Education in classrooms.
- Todevelop an interest to study the given topic through lecture, singing and drama method
- To differentiate the feedback given by the students between theoretical and practical approaches.
- To study the qualitative approach of the responses given by the pupils

### 3.3 Operationalization of key Terms

**1) Lecture Method:** Direct classroom instruction supported by presentation slides, photographs, and theoretical exposition.

**2) Drama Method:** A peer-performed instructional play titled *A Cosmic Assembly*, authored and acted by students, featuring personified astronomical entities (e.g., Nebula, Protostar, Red Giant, White Dwarf, Neutron Star, Black Hole, and The Universe).

**3) Singing Method:** An instructional poem authored and set to music by students, summarizing the stellar life cycle and performed collectively during classroom instruction

### 3.4 Population, Sample and Data flow

The target population comprised Grade 9 and Grade 10 students at Smt. M. M. Mehta English Medium School, Palanpur, following the NCERT curriculum. The sample consisted of 285 students drawn from Divisions I, J, and K of Grades 9 and 10.

**1) Quantitative Cohort (n = 285):** All 285 participating students completed the 9 close-ended items on the questionnaire (100% response rate).

**2) Qualitative Cohort (n = 201):** A total of 201 students (70.53% of the total sample) provided written responses to the open-ended item and 84 (29.47%) students refused to submit their responses.

3) **Qualitative Categorization (n = 159 and n = 42):** Of the 201 narrative responses, 159 focused on core academic and cognitive themes (Table 2), while 42 detailed affective benefits, personal interest, or subjective relaxation (Table 3).

### 3.5 Research Tool and Technique

**Instrument Description**

The data collection tool is a structured, 10-item multimodal feedback instrument designed to evaluate student preferences, perceived conceptual depth, emotional engagement, and subjective stress relief across three instructional methods: Lecture, Drama, and Singing.

**Structure:**

**1) Part A:** Demographic and background information

**2) Part B:** 9 Close-ended multiple-choice statements evaluating comparative preferences across specific instructional indicators.

**3) Part C:** 1 Open-ended feedback prompt capturing qualitative observations regarding personal and learning changes

**Validity:** Content validity was established through expert review by a panel of five domain experts in science education and pedagogy.

### 3.6 Data Collection

By teaching the selected topic through lecture method in which the investigator used power point presentation, photographs, and theories during classroom teaching. One of the students of class 10 wrote a drama titled: A Cosmic Assembly having different characters like the narrator (The Universe), Nebula, Neutron Star, White Dwarf, Black Hole, etc. that was performed in the classroom by the pupils. Third was singing where investigator found a 9$^{th}$ std. girl being interested in literature. She wrote a wonderful poem with the same title that was sung by the students. After that, I as an investigator prepared a questionnaire having 1 open ended and 9 closed ended questions and recorded the responses given by the students.

## 4. Data Analysis and Interpretation:

### 4.1 Quantitative Analysis:

**Table 1: Distribution of Student responses Across Pedagogical methods (N=285)**

| Item Statement | Lecture (%) | Drama (%) | Singing (%) |
|---|---|---|---|
| 1) The method you like the most to understand the life cycle of the star and its birth | 103 (36.14%) | 152 (53.33%) | 28 (9.82%) |
| 2) The method through which we can go deeper into the topic | 144 (50.52%) | 111 (38.94%) | 27 (9.47%) |
| 3) The method that makes study more interesting | 62 (21.75%) | 163 (57.19%) | 58 (20.35%) |
| 4) The method that should be implemented to understand other topics of Astronomy | 112 (39.29%) | 132 (46.31%) | 39 (13.68%) |
| 5) The method that makes learning easier | 66(23.15%) | 157 (55.08%) | 60 (21.05%) |
| 6) The character the students understood the most | - | - | - |
| 7) The method through which students better understand Nuclear Fusion process | 150 (52.63%) | 107(37.54%) | 28(8.77%) |
| 8) The best method to reduce the stress level | 48(16.84%) | 90(31.57%) | 143(50.17%) |
| 9) General endorsement of multimodal methods in class | 261 (91.57% -Yes) | | |

**Note for Item 6 breakdown**: Universe: 147 (51.57%); Black Hole: 70 (24.56%); Nebula: 34 (11.92%); Red Giant: 16 (5.61%); Protostar: 6 (2.10%); White Dwarf: 4 (1.40%); Neutron Star: 3 (1.05%); none: 5 (1.75%)

The quantitative findings indicate distinct functional roles for each method:

- **Drama** was selected as the preferred overall method (53.33%), the most interesting (57.19%), and the method making learning easiest (55.08%).
- **Lecture** was selected as most effective for achieving conceptual depth (50.52%) and clarifying complex mechanistic topics such as nuclear fusion (52.63%).
- **Singing** was identified as the most effective approach for fostering a relaxed classroom environment and reducing subjective stress (50.17%).
- Overall, 91.57% (n = 261) endorsed the implementation of these multimodal strategies in routine classroom teaching.

### 4.2 Qualitative Analysis (n=201):

Thematic analysis of the open-ended prompt ("Describe changes experienced in learning through lecture, drama, and singing") yielded core academic and affective categories

**Table 2 Primary Academic and Cognitive Themes (n =159)**

| Response Theme | Description/ Student Perspective | Frequency | Percentage |
|---|---|---|---|
| Ease & Engagement | Perceived study as simpler, more enjoyable, and engaging | 91 | 57.23% |
| Cognitive Grasp | Reported enhancements in memory, retention, and grasping power | 10 | 6.29% |
| Depth & Curiosity | Expressed interest in deeper exploration and research attitude | 4 | 2.52% |
| Visualization & Focus | Noted improvements in visual thinking and concentration | 3 | 1.89% |
| Active Participation | Highlighted increased peer involvement and research orientation | 2 | 1.26% |
| Miscellaneous Patterns | Specific observations regarding study habits and strength identification | 5 | 3.14% |
| Neutral / No Change | Reported no perceptible shift in learning outcome | 44 | 27.67% |
| **Total Responses** | **159** | **100%** | |

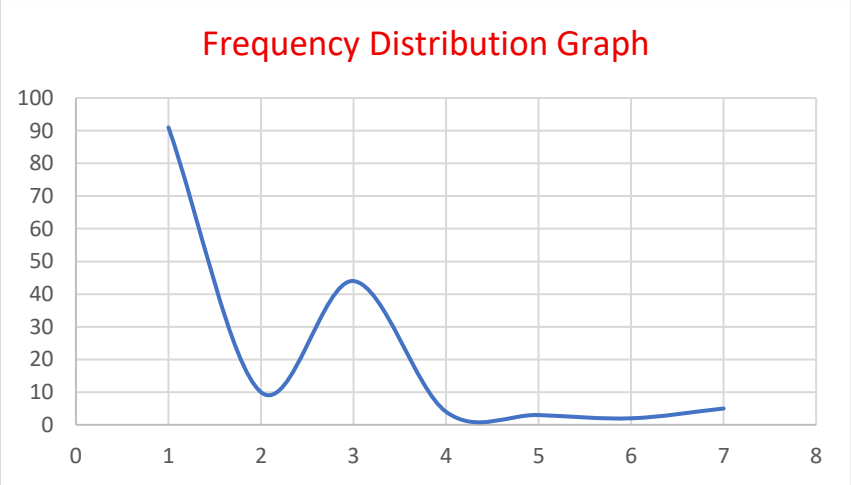



**Figure 1 Frequency distribution Graph of Response theme Vs. Frequency (of table 2)**

The graph explains the frequency distribution of the responses recorded by an investigator in table 2. According to that, 91 (maximum frequency) students have responded under Ease & Engagement theme followed by further responses. The interesting pick at 91 can be easily observable.

**Table 3 Secondary Affective and Personal Development Themes (n=42)**

| **Environment** | |
|---|---|
| Mental relaxation | 10 |
| Low Stress level and happiness | 17 |
| **Personality** | |
| Reducing loneliness | 1 |
| Truth of our existence and life | 1 |
| Feeling of twinkling | 3 |
| Change the point of view to see the world | 5 |
| Disciplined life | 1 |
| Started reading more books | 2 |
| Started daily stargazing | 2 |

The qualitative responses suggest that while drama and music fostered engagement and subjective relaxation, direct theoretical instruction remained vital. A notable segment (27.67%, n = 44) reported no change, indicating that traditional learning preferences persist among a subset of students

***Note: 201 out of 285 have submitted their responses (as discussed above) of open ended question given to them and 84 students refused to submit their responses.***

## 5. Discussion and Result:

The findings indicate that combining lecture, drama, and singing can support secondary science education by addressing different aspects of student learning. Rather than replacing standard direct instruction, creative strategies appear to complement traditional methods.

1) **Conceptual Depth vs. Experiential Engagement:** While drama was rated highest for overall interest (57.19%) and accessibility (55.08%), students recognized the lecture method as key for conceptual rigor (50.52%) and technical understanding (52.63% for nuclear fusion). This indicates that students differentiate between structural explanation and creative engagement.

2) **Role of Narrative and Personification:** The high recognition of "The Universe" (51.57%) and "Black Hole" (24.56%) characters suggests that personifying astronomical concepts in drama helps students contextualize abstract physical bodies.

3) **Affective and Environment Benefits:** Singing was viewed by over half the cohort (50.17%) as beneficial for creating a relaxed atmosphere. Fostering low-anxiety environments can support student participation during complex science lessons.

## 6. Derived Findings:

- To make a positive change in teaching learning process along with a smooth and healthy environment.
- It helps to to the secondary students to learn in a better way and can change the educational scenario in a positive direction.
- It provides a golden opportunity for a subject teachers to involve deeply by using these techniques
- It opens new windows especially for Math-Science teachers to explain any complex or lengthy topic(s).
- Students can select their method of study by themselves that increases the amount of interest.

## 7. Suggestions and Recommendations:

- As an Investigator, I would like to suggest the implementation of these techniques in day-to-day teaching- learning process that would be beneficial for the students.

- As an Investigator, I recommend such important topics of Astronomy and Astrophysics to be included in NCERT of standard 8, 9 and 10 to develop students' interest in research field.
- As an Investigator, I recommend teachers to discover such innovative and pedagogical techniques in classroom so that students could start loving their subjects.

## 8. Conclusion:

In the process of the present study, the investigator has recorded the responses and tried to touch each possible corner of the above study. After implementing these methods, investigator finds Positive feedback after the detailed analysis of each recorded response. The above findings are an original contribution to the existing knowledge system. This study may help the teachers as well as students to look forward and simultaneously improve teaching-learning process.

## 9. References:


- Clark, W. E. (1930). *The Aryabhatiya of Aryabhata: An ancient Indian work on mathematics and astronomy*. University of Chicago Press
- Dutta, A. K., & Sriram, M. S. (2016). Mathematics and astronomy in India before 300 BCE. *Indian Journal of History of Science*, 51(1), 1–18.
- Iyengar, R. N. (2016, November). Ancient Indian astronomy in Vedic texts. *Proceedings of the IX International Conference on Oriental Astronomy*, 7, 2021–2030.
- Iyengar, R. N. (2018, March). Archaeo-astronomy and ancient Indian chronology. *Proceedings of the ICHR National Conference on Indian History: Emerging Perspectives*, 5–7.
- Kolachana, A., Mahesh, K., & Ramasubramanian, K. (2019). Astronomy in ancient and medieval India. In *Studies in Indian Mathematics and Astronomy* (pp. 487–494). Springer.
- Neugebauer, O. (1946). The history of ancient astronomy: Problems and methods. *Publications of the Astronomical Society of the Pacific*, 58(341), 104–142.

- Pingree, D. (1976). The recovery of early Greek astronomy from India. *Journal for the History of Astronomy*, 7(2), 109–123.