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Capacity Building Program/Leadership Development Program for TGT (Natural Science) of DOE, GNCTD and DIET/SCERT faculty, Delhi

Date and Duration of the Program: 11 – 16 November 2024
Venue Name: IIT, Gandhi Nagar, Gujrat

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Details of the Program:

- **No. of proposed participants:**99 (97 TGT Natural Science Teachers and 2 DIET/SCERT Faculty)
- **No. of participants attended:**99 (97 TGT Natural Science Teachers and 2 DIET/SCERT Faculty)
- **Stakeholders:**Trained Graduate Teachers (Natural Science)
- **Transaction Methodology:**Experiential Learning through practicums, observations and discussion
- **Name of Coordinator:**Mr Harish Kumar, Asst. Professor, DIET Pitampura and Dr Sunil Nandal, Asst. Professor, DIET Ghumanhera.
- **Report by:**Dr Sunil Nandal, Asst. Professor, DIET Ghumanhera.

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Schedule of Training (Course Design with Session Plan)

	SESSION 1 9:30 - 11 AM	Tea (10 min)	SESSION 2 11:15 AM - 1 PM	Lunch (1-1.55 pm)	SESSION 3 2 - 3:30 PM	Tea (10 min)	SESSION 4 3.45 - 5 PM	5:15 PM onwards	
DAY 1 12 Nov	- Introduction - MAKING- Bugle, 3 in 1 - Wifi ID - Quizz app mock run - Workshop kit distribution	Tea (10 min)	Sound	Lunch (1-1.55 pm)	Permanet slide preparation	Tea (10 min)	Prof Manish interaction	Making models with laser cutting	

DAY 2 13 Nov	Acid Base 1	Tea (10 min)	Photosynthesis	Lunch (1-1.55 pm)	Optics- Plane mirror	Tea (10 min)	Prof Manish interaction		Night sky watching with telescope
DAY 3 14 Nov	Electricity & Electromagnetism	Tea (10 min)	Exploring hidden biodiversity around us	Lunch (1-1.55 pm)	Chemical effects of electric current	Tea (10 min)	Prof Manish interaction		
DAY 4 15 Nov	Chemical Reactions 1	Tea (10 min)	Astronomy	Lunch (1-1.55 pm)	TLC 1		Review & Making session Biology : Observing Slides with bead microscope	Tea (10 min)	
DAY 5 16 Nov	Combustion and Candle	Tea (10 min)	Chemistry Games & Demos	Lunch (1-1.55 pm)	- Feedback - Graduation cap - Resource Sharing - Topishankar - Certificates distribution				
	Pressure								
	TLC 2								
	Optics- Microscope and Telescope								
	Buoyancy								
	Optics- Pinhole								
	Optics- Colours and Shadows								
	Astronomy and Telescope								

Objectives of the Program

- To promote hands-on experiential learning.
- To nurture creativity and conceptual understanding through real-life examples.
- Integrating toys and sports in science teaching.
- To give exposure to an alternative pedagogy of science.

Training Program - Brief Overview (day wise and session wise along with learning outcomes and activities photos)

All the 99 participants boarded the flights from IGI airport, Delhi on 11 November, 2024 in the morning and reached the venue by afternoon at IIT Gandhinagar. The stay was arranged in hostel building.

Date: 11.11.24 Travelling day and rest day.

Date: 12.11.24

Morning Sessions

Session 1 and Session 2

Topic: Sound and Ultrasonics

The first two sessions were dedicated to exploring the concepts of sound and ultrasonic waves. Participants learned about sound wave properties such as frequency, amplitude, and wavelength, as well as the unique characteristics and applications of ultrasonic waves. The sessions also included discussions and demonstrations on the uses of ultrasonic technology in fields like medicine, industry, and environmental science, providing valuable practical insights into the topic.

Session 3

Topic: Permanent Slide Making

This session focused on the skills needed for creating permanent slides. Participants were guided through the process of specimen preparation, staining, and mounting, which are critical steps for producing clear, long-lasting slides for microscopic examination. This hands-on session emphasized the importance of attention to detail and careful technique, providing valuable skills for academic and professional lab work.

Session 4

Topic: Passion and Struggle in Learning and Understanding Rules

The final session of the day was an inspiring and reflective discussion on the importance of passion and perseverance in learning. Participants were encouraged to explore the "why" behind each rule and concept, fostering a deeper understanding and appreciation for the material. This session emphasized a growth mindset, highlighting how curiosity and resilience can lead to meaningful, long-lasting learning experiences.

Summary

Today's sessions offered a balanced mix of theoretical knowledge, practical skills, and motivational insights. Participants left with a solid understanding of sound and ultrasonic waves, practical slide-making skills, and a renewed passion for learning and curiosity. The timely provision of lunch added to the overall positive experience of the day.

Date:13.11.24

Session 1: Acids, Bases, and Neutralization

Objective:

To observe how indicators identify acids and bases and understand neutralization reactions.

Summary:

Indicators: Litmus, phenolphthalein, and methyl orange changed color based on pH.

Neutralization: Mixing HCl and NaOH showed how acids and bases form water and salt.

Key Insight:

Indicators reveal acidity/basicity, and neutralization balances their properties.

Session 2: Photosynthesis

Objective:

To explore photosynthesis and its role in plant energy production.

Summary:

Process: Discussed light-dependent and independent reactions in producing glucose and oxygen.

Experiment: Observed oxygen release from Elodea and tested leaf starch to confirm photosynthesis.

Key Insight:

Photosynthesis fuels ecosystems by producing essential glucose and oxygen.
Session 3: Light, Mirrors, and Parallax
Objective:
To understand light reflection, image formation, and the parallax method for distance measurement.
Summary:
Reflection: Explored image formation in plane mirrors.
Parallax Method: Used apparent shifts to measure distances.
Key Insight:
Light behavior with mirrors and parallax is crucial for imaging and precise measurements.
Session 4: Density, Volume, and Archimedes' Principle
Objective:
To understand density, volume, and buoyancy using Archimedes' principle.
Summary:
Density and Buoyancy: Studied how objects displace water based on volume.
Real-Life Application: Explained why objects float or sink, relevant to ship design and volume measurement.
Key Insight:
Density and Archimedes' principle are essential for understanding buoyancy and object behavior in fluids.

Date :14.11.24

Session 1: Electricity, Current, and Motor-Making Activity
In this session, we covered the basics of electricity, examining electric current and its two types—Direct Current (DC), which flows in one direction, and Alternating Current (AC), which reverses direction periodically. We also discussed Electromotive Force (EMF), the driving force for current. A motor-making activity using a battery, wire, and magnet demonstrated how current and magnetic fields can produce motion, highlighting EMF and current in a practical setting.
Session 2: Biodiversity and Species
Session 2 focused on biodiversity, with discussions on various species, their habitats, and roles within ecosystems. Through specimens and stories, participants gained insights into the importance of preserving biodiversity for ecological balance, fostering an appreciation of the interconnectedness of life.
Session 3: Chemical Effects of Electricity
In this session, we explored the chemical effects of electricity through experiments like electrolysis (breaking down compounds with electric current) and electroplating (depositing metal ions onto surfaces). These hands-on activities illustrated how electricity can induce chemical reactions, expanding our understanding of its applications in chemistry.
Session 4: Scientific Toys and Underlying Concepts
Session 4 was dedicated to scientific toys created by the team. Each toy demonstrated a scientific principle, such as magnetic levitation, gravity, or simple electrical circuits. Team members explained the concepts behind each toy, making science more accessible and engaging through playful yet educational models. This session highlighted creativity and teamwork, as well as the application of scientific ideas in a hands-on format.
Overall Summary
Through these sessions, we gained a comprehensive foundation in electrical science, chemistry, biodiversity, and creative engineering. Interactive activities—from motor-making and experiments to scientific toys—allowed participants to explore science in fun, hands-on ways, promoting both knowledge and curiosity across multiple disciplines.

Date: 15.11.24

Session 1: Chemical Reactions
Objective: To explore the principles of chemical reactions, focusing on observable changes such as gas formation, temperature shifts, and color variations.
Session Overview: Students engaged in hands-on experiments showcasing different types of chemical reactions, including exothermic, endothermic, and oxidation reactions. The experiments emphasized energy exchange and transformations of matter, reinforcing theoretical concepts through practical applications.
Outcomes: The session helped students grasp the fundamentals of chemical reactions and their real-world significance. It also promoted critical thinking, observational skills, and safe laboratory practices.

Session 2: Day and Night on Earth
Objective: To understand Earth's rotation and its role in creating day and night, along with the concept of time zones.
Session Overview: Through interactive demonstrations using globes and light sources, students visualized how Earth's rotation on its axis causes alternating periods of light and darkness. The session also explained why the Sun appears to move across the sky and introduced time zones to illustrate the global effects of Earth's rotation. Seasonal variations in daylight were briefly covered.
Outcomes: Students gained clarity on Earth's rotation and its impact on daily life, such as time zones and varying daylight hours. They connected these concepts to their experiences and developed an understanding of their practical implications.
Session 3: Chromatography
Objective: To introduce chromatography as a method for separating mixtures and explore its various types and uses.
Session Overview: Students learned the fundamental principles of chromatography and observed its application in separating and identifying components in a mixture. Techniques like paper chromatography, thin-layer chromatography (TLC), and column chromatography were demonstrated, with practical examples including pigment separation and purification.
Outcomes: The session highlighted the versatility of chromatography and its importance in fields like research and industry. Hands-on activities helped students appreciate the technique's precision and scientific relevance.
Session 4: Permanent Slides
Objective: To guide students in creating and refining permanent microscope slides, improving their technical skills in specimen preparation.
Session Overview: Students worked on making permanent slides, focusing on proper techniques for mounting, staining, and sealing. Constructive feedback and corrections were provided to enhance their skills, ensuring clarity and accuracy in their work.
Outcomes: The session improved students' proficiency in slide preparation and microscopy techniques, emphasizing attention to detail and scientific rigor. It fostered a deeper appreciation for microscopic studies and their applications in biology.
Reflection
The four sessions provided a comprehensive learning experience, integrating practical skills with theoretical knowledge across chemistry, astronomy, and biology. Students actively participated, demonstrating curiosity and enthusiasm. The variety of topics and hands-on activities reinforced critical thinking, precision, and interdisciplinary connections, setting a solid foundation for future exploration.
All the participants enthusiastically learnt the concepts by doing the experiments and were eager to transfer and translate the knowledge among their students. The teachers are indebted towards SCERT, Delhi, and IIT Gandhinagar for amazing experience of our lives. The teachers are thankful to all the faculty members involved in the program.
Date: 16.11.24
Session 1: The Chemical History of Candle
Objective: To explore the principles of chemical reactions, focusing on observable changes such as burning of candle, the history behind the chemistry of candle.
Session Overview: Participants engaged in hands-on experiments showcasing different stages of chemical reactions, including exothermic, endothermic, and oxidation reactions. The experiments emphasized energy exchange and transformations of matter, reinforcing theoretical concepts through practical applications.
Outcomes: The session helped participants grasp the fundamentals of chemical reactions involved in candle burning. It also promoted critical thinking, observational skills, and safe laboratory practices.
Session 2: Hydrophobic carbon particles
Objective: To understand the nature of carbon particles upon heating.
Session Overview: Through experimentation using

Outcomes: Participants gained clarity on Earth's rotation and its impact on daily life, such as time zones and varying daylight hours. They connected these concepts to their experiences and developed an understanding of their practical implications.

Session 3: To see the hot air move up and Formation of Voltaic Cell

Objective: To observe the hot air, move up and cool air move down.

Session Overview: Participants learned the fundamental principles of Hot air moving up and cool air flowing down. The simple materials like candle, plastic sheets, incense stick and cardboard were used for experimentation to see the fundamental principle of hot air going up and is replaced by cold air and there is a systematic flow.

Outcomes: The session highlighted the flow of air current in the atmosphere and how it is also observed in our daily life as well. Hands-on activities helped participants appreciate the scientific relevance.

Session 4: Valediction Ceremony

After the successful completion of the theoretical and practical classes, it was time for valediction ceremony. The participants expressed their gratitude to the SCERT, Delhi and IIT Gandhi Nagar for their collaboration to make this exposure tour a reality. The resource persons also praised the active involvement of the participants during the sessions and their enthusiasm to enrich their learning. The teachers and coordinators were given completion certificates by the CCL Director, Sh. Manish Jain and his team.

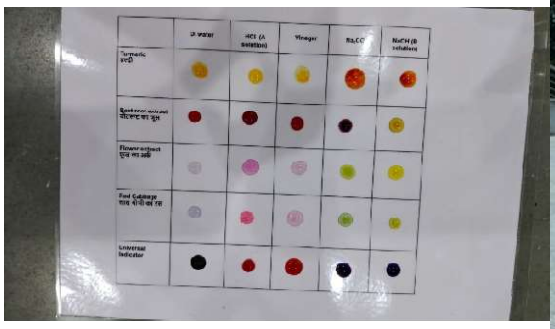
Feedback from participants

The participants were overwhelmed to learn with the ease of experiential learning. The classroom environment was so highly conducive for learning that the participants spent even the tea period in doing one or the other activity. The teachers were not only eager to learn or revise concepts but also devised methods on how they can take their learnings into their school classrooms and laboratories. The teachers also mentioned and emphasized on the importance of team work and how this leads to permanent learning.

Plan for Implementation of Learning Outcomes (by Participants)

With the experiences gained during the program, the teachers were very enthusiastic to exercise their learning in the classroom teaching. The participants were of the view that this program has transformed their level of understanding of the concepts and how science is to be taken up in schools. They also learnt to link the theoretical part with the real-life situations. Though many of the participants are well qualified in their field of expertise, yet it was the challenges in other associate subjects that kept the motivation high.

Glimpses of the Capacity Building Program/Leadership Development Program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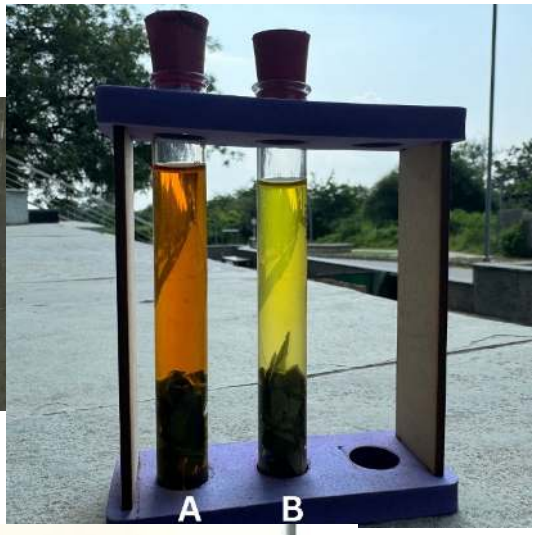
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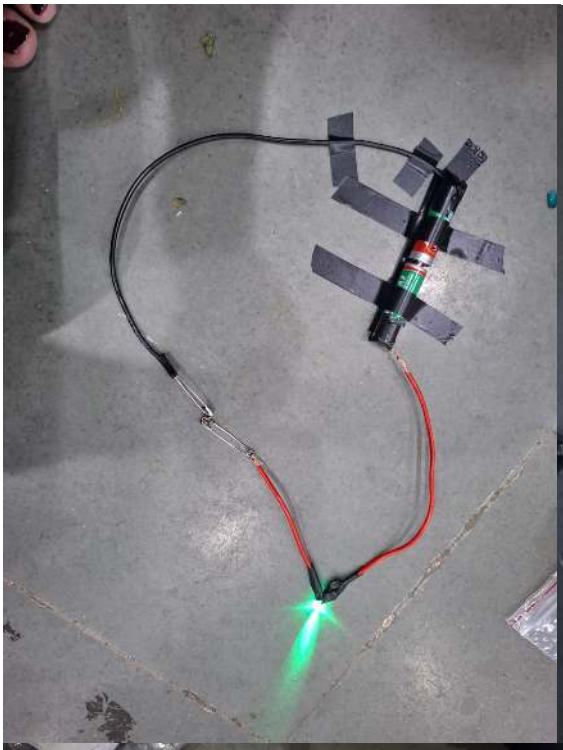

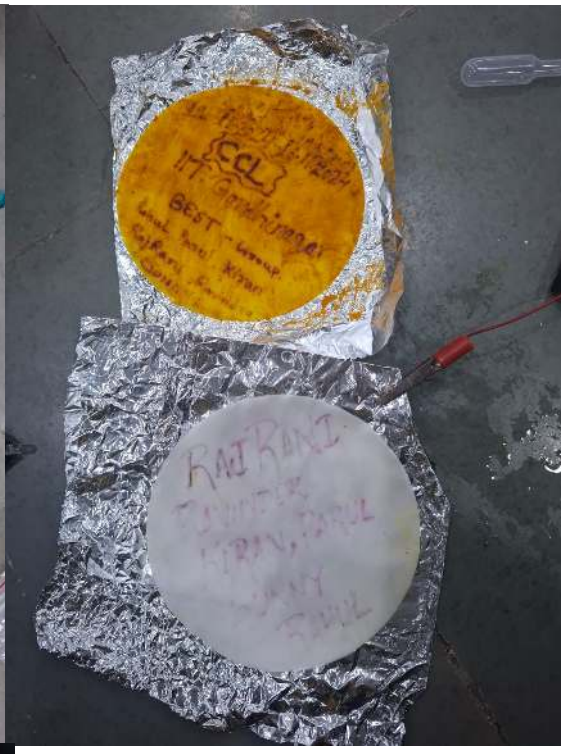

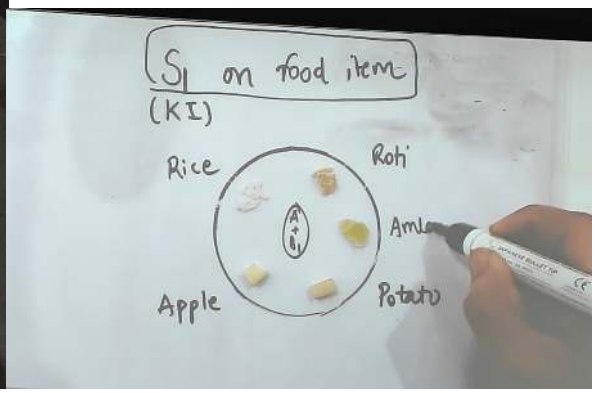
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