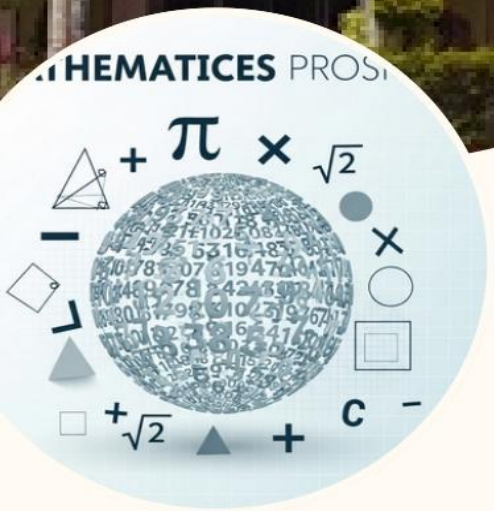
KENDRIYA VIDYALAYA SANGATHAN



E-MANUAL

5-DAY ONLINE WORKSHOP ON EFFECTIVE USE OF ICT IN MATHEMATICS TEACHING FOR TGT(MATHEMATICS)

08.09.2025 to 12.09.2025

ZONAL INSTITUTE OF EDUCATION AND TRAINING MYSURU

COURSE DIRECTOR

Ms. MENAXI JAIN

DEPUTY COMMISSIONER KVS &

DIRECTOR, ZIET MYSURU

ASSOCIATE COURSE DIRECTOR

Mr. VAMSI KRISHNA E V L N

PRINCIPAL, KV STEEL PLANT
HYDERABAD REGION

RESOURCE PERSONS

Mrs. ANIQUEEN A

TGT(MATHS), PM SHRI KV NO.2 KASARAGOD

&

Mrs. ANISHA N

TGT(MATHS), PM SHRI KV NO.2 CALICUT

COURSE COORDINATOR

D.SREENIVASULU

TRAINING ASSOCIATE(MATHEMATICS)
ZIET MYSURU

DIRECTOR'S MESSAGE

It is with great satisfaction and a deep sense of purpose that I extend my heartfelt appreciation to all participants, resource persons, and coordinators of the 5-Day Online Workshop on "Effective Use of ICT in Mathematics Teaching", conducted from 08.09.2025 to 12.09.2025.

In today's rapidly evolving educational landscape, the integration of Information and Communication Technology (ICT) has transformed the way mathematics is taught and learned. This workshop was designed to empower mathematics educators with the skills and confidence to incorporate digital tools effectively—making mathematical learning more visual, interactive, exploratory, and conceptually rich.

It is heartening to note the enthusiastic participation, meaningful interactions, and innovative practices shared by teachers from the four feeder regions. The sessions provided valuable insights into using ICT for concept visualization, problem-solving, assessment, and collaborative learning.

This e-Manual reflects the core essence of the workshop—its objectives, sessions, best practices, and digital resources. It is intended to serve as a practical guide and inspiration for teachers as they continue to design engaging, ICT-enabled mathematics learning experiences.

I am confident that the knowledge and skills gained through this workshop will encourage a shift from traditional methods to technology-integrated, inquiry-based, and student-centered learning, helping learners develop deeper conceptual understanding, critical thinking, and a genuine love for mathematics.

Let this be the beginning of a more innovative and digitally empowered journey in mathematics education.

With best wishes for your continued professional growth and excellence.

Ms. Menaxi Jain
Director
ZIET Mysuru

DETAILS OF PARTICIPANTS

S. No.	Name of the Employee (Mrs/Ms/Mr)	Designation	Name of KV	REGION
1	MANGE RAM	TGT Maths	KV CRPF PERINGOME	ERNAKULAM
2	VEENA M	TGT Maths	PM SHRI KV KELTRON NAGAR	ERNAKULAM
3	L AJITHA	TGT Maths	PM SHRI KV No.1 PALAKKAD	ERNAKULAM
4	DEEPA S	TGT Maths	PM SHRI KV PORT TRUST	ERNAKULAM
5	HRISHIK ROY	TGT Maths	PM SHRI KV KOLLAM	ERNAKULAM
6	SHEEBA S	TGT Maths	PM SHRI KV ADOOR (SHIFT II)	ERNAKULAM
7	KAVITHA G S	TGT Maths	PM SHRI KV CRPF PALLIPURAM	ERNAKULAM
8	NUNNU MICHAEL	TGT Maths	PM SHRI KV SAP PEROORKADA	ERNAKULAM
9	RODDA SAYANNA	TGT Maths	PM SHRI KV HVF AVADI	CHENNAI
10	POONAM BAGHEL	TGT Maths	PM SHRI KV DGQA CHENNAI	CHENNAI
11	SHER SINGH BANGERWA	TGT Maths	PM SHRI KV NO.1 TAMBARAM	CHENNAI
12	VINAY KUMAR	TGT Maths	PM SHRI KV ARAKKONAM	CHENNAI
13	RAVI SONI	TGT Maths	PM SHRI KV DHARMAPURI	CHENNAI
14	GEETA RAWAT	TGT Maths	KV KALPAKKAM NO.2	CHENNAI
15	M DEVAKI	TGT Maths	PM SHRI KV MADURAI NO.1	CHENNAI
16	VISHAL BAJPAI	TGT Maths	PM SHRI KV NAGERCOIL	CHENNAI
17	NEHA CHOUDHARY	TGT Maths	PM SHRI KV OOTY	CHENNAI
18	VASUDEV NANDHAN	TGT Maths	PM SHRI KV VIJAYANARAYANAM	CHENNAI
19	L.PRATHYUSHA	TGT Maths	BEGUMPET	HYDERABAD
20	M. SHANKER	TGT Maths	HCU Gachibowli	HYDERABAD
21	NARESH DUVVURI	TGT Maths	KAKINADA	HYDERABAD
22	PRABHA KANT	TGT Maths	KANCHANBAGH	HYDERABAD
23	RAVINDRA KUMAR	TGT Maths	KARIMNAGAR	HYDERABAD
24	SHAIK MAHATAB	TGT Maths	NELLORE	HYDERABAD
25	BHAWANI SHANKAR JYANI	TGT Maths	ONGOLE	HYDERABAD
26	C MUNISH KUMAR	TGT Maths	TIRUPATI No.1 SHIFT 1	HYDERABAD
27	SANDEEP KAUSHIK	TGT Maths	VIJAYAWADA No. 1	HYDERABAD
28	BUDHA RAM	TGT Maths	TENALI	HYDERABAD
29	SANDHYA JOSHI	TGT Maths	ASC & Centre	BENGALURU
30	CHINTAPALLI VIJAYA SHREE TANVI MANCHANDA	TGT Maths	Belagavi No.2 (Cantonment)	BENGALURU
31	RUCHI	TGT Maths	Donimalai	BENGALURU
32	KUSAM DEVI	TGT Maths	Hubli No.1	BENGALURU
33	LAVI CHAUHAN	TGT Maths	Udupi	BENGALURU
34	G SAITEJASREE	TGT Maths	Vijayapura	BENGALURU
35	BINDU MENON	TGT Maths	KV CRPF YELAHANKA	BENGALURU
36	POOJA	TGT Maths	Yeshwantpur	BENGALURU
37	M SUBHA	TGT Maths	Jalahalli (West) No.1	BENGALURU

TIME TABLE

DATE	9.30am - 11.00am	11.00am - 12.30pm	12.30pm - 1.00pm	1.00pm - 2.00pm
08.09.2025	EDUCATION AND TECHNOLOGY – THE SHIFT IN PERSPECTIVE. - Mr. Vamsi Krishna (ACD)	TECHNOLOGY INTEGRATED EDUCATION AS PER NEP 2020 - By Ms. Anisha N(RP)	BREAK	OBLIGATIONS OF DIGITAL CITIZENSHIP. - by Mr. Dinesh Kumar
09.09.2025	FLIPPED CLASSROOM USING ICT TOOLS -Ms. Ushma Teotia	ROLE OF ICT IN MATHEMATICS TEACHING (GeoGebra Basic)-By Mr. M. Sreenivasan		USE OF AI TOOLS IN CLASSROOM TRANSACTIONS -By Ms. Aniqueen A(RP)
10.09.2025	USEFUL ICT TOOLS FOR ASSESSMENT AND FEEDBACK. - By Ms. Aniqueen A (RP)	ROLE OF ICT IN MATHEMATICS TEACHING (GeoGebra Advanced) -By Mr. M. Sreenivasan		USE OF VIRTUAL LABS (O LAB) - By Mr. D Sreenivasulu
11.09.2025	LANGUAGE BARRIERS AND AGE-APPROPRIATENESS IN USE OF ICT IN CLASSROOMS. - By Ms. Anisha N(RP)	USEFUL ICT TOOLS FOR MATHEMATICS TEACHERS - By Ms. Aniqueen A(RP)		CYBER SAFETY AND SECURITY IN CLASSROOM TRANSACTIONS - By Mr. D Sreenivasulu
12.09.2025	USE OF INTERACTIVE PANEL - by Mr. Dinesh Kumar	21ST CENTURY SKILLS FOR HOLISTIC DEVELOPMENT - By Ms. Anisha N(RP)		TEST AND VALEDICTORY FUNCTION

DAYWISE REPORTS

DATE: 08.09.2025

The workshop began with the KVS prayer, setting a positive and spiritual tone for the event. This was followed by a welcome speech delivered by the Course Coordinator, Shri D Sreenivasalu , who warmly greeted all participants and emphasized the significance of the workshop in enhancing mathematics teaching practices.

The Director of ZIET Mysuru, Madam Menaxi Jain addressed the participants, underlining the importance of ICT in teaching mathematics. Madam motivated the participants to embrace technological tools to foster better teaching and learning outcomes.

The first technical session was conducted by Shri Vamsi Krishna , Associate Course Director and Principal of KV Steel Plant, Hyderabad Region on the topic "Education and Technology – The Shift in Perspective"

- He elaborated on the objectives of modern technology in education, highlighting key aspects such as:
    - Enhanced learning
    - Better conceptual understanding
    - Facilitating personalized learning
    - Promoting engagement, creativity, and critical thinking
    - Professional development of teachers
    - Improving the overall learning experience
- An interactive Buzz Math Activity was conducted, designed as a joyful self-learning quiz which engaged all participants actively.
- The session concluded with a video presentation on Augmented Reality (AR), followed by a discussion on the differences between AR and Virtual Reality (VR), and practical ideas on integrating AR into classroom teaching.
- He also introduced the PhET Simulation App as an effective tool to simulate mathematical concepts interactively.

Madam Anisha, Resource Person took over the next session and focused on Technology-Integrated Education in line with NEP 2020.

- She elaborated on core technologies that support digital transformation in education.

- Introduced the innovative Math Jam Game, a fun approach to learning mathematics.
- Key highlights of NEP 2020 – Vision for 21st Century Education were discussed.
- She emphasized various digital resources:
    - PM eVidya
    - DIKSHA Portal
    - SWAYAM Portal
    - NCERT Audio books
    - Video Lessons for Class VI Mathematics
    - Upper Primary Maths Kit

This session provided participants with practical tools and resources to integrate technology in their daily teaching.

The afternoon session was conducted by Mr Dinesh Kumar ,TA(Physics), ZIET Mysuru.

- The session focused on the objectives of digital citizenship, covering:
    - Digital rights and responsibilities
    - Protecting privacy
    - Following digital laws and rules
    - Sharing responsibilities
    - Modelling good digital behaviour
- An engaging activity involved posing various questions to participants, encouraging them to reflect on responsible digital behaviour.
- At the end of the session, a Google Form link was shared for participants to self-assess their understanding of digital citizenship concepts.

Day 1 of the workshop was highly enriching and interactive, combining theoretical knowledge with hands-on activities. Participants were introduced to several technological tools and digital resources aligned with NEP 2020, focusing on practical application in the classroom. The sessions promoted innovative thinking, responsible digital practices, and creative methods to enhance teaching mathematics.

DATE: 09.09.2025

Session 1: Concept of Flipped Classroom

The first session was conducted by Ms. Ushma, who introduced the participants to the concept of the Flipped Classroom. She emphasized that the traditional teaching model should be restructured — the lecture component should be completed at home by students, while classroom time should be dedicated to active participation, interaction, and hands-on learning.

Ms. Ushma also introduced the participants to MAGIC SCHOOL AI, an innovative digital platform designed to enhance classroom engagement. She explained how to create rooms, integrate various AI tools, and utilize them for effective and personalized teaching.

The session was highly interactive, informative, and inspiring, encouraging teachers to rethink their instructional strategies and explore new ways to make learning more student-centered and engaging. Participants gained a clear understanding of how technology and AI can work together to transform classroom dynamics.

Session 2: Effective Use of ICT Tools in Teaching Mathematics

The second session was led by Mr. M. Srinivasan , who focused on the effective use of ICT tools, particularly GeoGebra, in teaching Mathematics. He elaborated on the wide range of applications available through this free educational platform, which includes six different integrated apps.

Mr. Srinivasan demonstrated how GeoGebra can be used to create animations, interactive worksheets, and visual demonstrations, making even complex mathematical concepts easier and more interesting for students to understand. He also shared practical insights into incorporating ICT tools to enhance conceptual clarity and encourage self-learning among students.

Overall, the session was highly practical, resourceful, and insightful, providing teachers with powerful digital tools to enrich their Mathematics teaching practices.

Session 3: Integration of Artificial Intelligence in Mathematics Classrooms

The third session was conducted by Ms. Aniqueen, who spoke on the integration of Artificial Intelligence (AI) in Mathematics classrooms. She highlighted the numerous benefits of using AI-based tools to make Mathematics teaching more efficient, engaging, and learner-friendly.

She gave a detailed demonstration of Wolfram Alpha, showcasing its features for solving mathematical problems, generating step-by-step explanations, and supporting concept-based learning. She also introduced TurboLearn AI and QuestionPaper AI, explaining how these platforms can assist teachers in lesson planning, content generation, and assessment design.

The session provided valuable insights into how AI can simplify complex topics, promote personalized learning experiences, and foster greater interest and curiosity among students.

Participants appreciated the practical demonstrations and the relevance of AI tools in modern classrooms.

All three sessions were highly enriching and future-oriented, focusing on how digital tools and AI can transform the teaching-learning process. The resource persons provided hands-on exposure, useful demonstrations, and innovative ideas that can be effectively applied in classroom settings. The sessions collectively reinforced the importance of embracing technology to create interactive, student-centered, and meaningful learning experiences.

DATE: 10.09.2025

The assembly commenced at 9:30 am which conducted by the Hyderabad Region, and it was immediately followed by the first session of the day, conducted by Mrs. Aniqueen, TGT (Mathematics), PM SHRI KV No.2, Kasargod, who served as the Resource Person.

During her insightful session, madam explained in detail the various types of assessment and enriched our knowledge with the introduction of a number of ICT tools. She gave us a very clear demonstration of interactive tools such as Kahoot Game, and elaborated on how to create engaging quizzes in Mathematics. We were also exposed to the process of hosting live quizzes, which proved to be highly engaging and interactive. She further highlighted the benefits of ICT and AI tools in enhancing the teaching and learning process of Mathematics. The session was lively, practical, and very impactful.

The second session began at 11:00 a.m. and was conducted by Mr. M. Srinivasan, Training Associate (Mathematics), KVS, ZIET Mumbai. This session was a continuation of the topic on GeoGebra from yesterday. He explained many important mathematical concepts with great clarity. He emphasized the effective use of GeoGebra in teaching concepts such as Arithmetic Progression, worksheets on Circles, Number of Zeroes of a Polynomial, and Construction of Similar Triangles (AAA & SAS criteria). In addition, he demonstrated concepts of Probability and Surface Area through GeoGebra. His session was extremely resourceful and showcased the wide applicability of GeoGebra in simplifying abstract mathematical concepts for students.

After the lunch break, the third session commenced at 1:00 p.m., led by Mr. D. Sreenivasalu, Training Associate (Mathematics), ZIET Mysuru. His focus was on the use of Virtual Labs in teaching Mathematics. He explained the importance and potential benefits of incorporating Virtual Labs into classroom teaching. He gave us a comprehensive demonstration of a variety of activities using OLABS. The session was highly informative and provided us with a deeper understanding of how platforms such as DIKSHA, GeoGebra, and Online OLABS can be effectively used in the teaching-learning process.

He also demonstrated a Class VI activity on Equivalent Fractions, conducted through Online OLABS. Furthermore, he provided an engaging demonstration of how quizzes can be created, conducted, and self-evaluated. Among other activities, he showcased how OLABS can be utilized to prove the Pythagoras Theorem and to demonstrate the Volume of a Right Circular Cylinder. The session was practical, innovative, and highly enlightening.

In conclusion, the day's sessions were extremely engaging, resourceful, and knowledge-enhancing. Each of the resource persons shared valuable insights and practical demonstrations which will certainly aid us in making our Mathematics teaching more effective, interactive, and student-centered.

On behalf of all the participants, I express my heartfelt gratitude to all the esteemed resource persons for their valuable contributions and to the organizers for arranging such informative sessions.

DATE: 11.09.2025

Session 1: Addressing Language Barriers and Age Appropriateness in ICT

Session 1 was conducted by Ms. Anisha, who addressed the topic of language barriers and age appropriateness in ICT. She discussed the various challenges faced by students due to linguistic diversity and highlighted the difficulties teachers encounter while implementing ICT-based learning across different age groups.

Ms. Anisha presented practical solutions to overcome language barriers, such as the use of Google Translate and Microsoft Translate, emphasizing how these tools can make digital learning more inclusive. She also underscored the importance of aligning ICT tools with the learners' age and cognitive level, ensuring that technology serves as a facilitator rather than a distraction.

She concluded by reminding participants that technology, when used wisely and purposefully, can bridge communication gaps and empower learners from diverse linguistic and cultural backgrounds. The session was both insightful and thought-provoking, inspiring teachers to adopt ICT responsibly to enhance inclusivity in education.

Session 2: Specialized ICT Tools by NCERT

Session 2 was conducted by Ms. Aniqueen , who introduced participants to specialized ICT tools developed by NCERT. She demonstrated the use of innovative platforms such as "Tictac Learn" and "Live worksheets", highlighting their effectiveness in creating interactive and engaging learning experiences.

The session was highly practical and participatory, allowing teachers to explore the tools hands-on. Through live demonstrations, Ms. Aniqueen showcased how these resources can be seamlessly integrated into lesson planning, assessment, and classroom interaction.

The session reinforced the idea that when technology meets pedagogy, learning becomes a joyful and meaningful journey. It motivated teachers to explore digital tools not as mere add-ons but as powerful enablers of active learning.

Session 3: Cyber Security and Digital Awareness

Session 3 was delivered by Mr. D. Sreenivasulu , who addressed the critical topic of Cyber Security. He elaborated on the need for educators to act as vigilant and responsible digital citizens, emphasizing that cyber awareness is the first step toward cyber security.

Mr. Sreenivasulu discussed various cyber threats such as phishing, malware, ransomware, typo squatting, and pharming, explaining how these can compromise data integrity and privacy. He also provided valuable preventive measures and best practices to ensure online safety and responsible digital conduct among teachers and students alike.
The session was informative, relevant, and empowering, equipping participants with essential knowledge to safeguard themselves and their institutions in the digital space.

The ICT workshop was a rich blend of knowledge, awareness, and hands-on learning. Each session contributed significantly to enhancing participants' understanding of how to use technology effectively, creatively, and responsibly in the teaching-learning process.
The workshop not only expanded teachers' digital competencies but also encouraged a mindset of innovation, inclusivity, and cyber awareness.
As educators, let us continue to embrace technology with wisdom, creativity, and responsibility, ensuring that our classrooms remain safe, engaging, and future-ready.

DATE: 12.09.2025

The first technical session was conducted by Mr. Dinesh Kumar on the use of Interactive Panel. The participants were introduced to the wide range of features available in the interactive panel such as:

-Sharing files

-Drawing regular figures

-Converting handwriting into digital format

-Using the digital geometry box

-Inserting shapes and tables

-Importing files by scanning

-Adding sticky notes, flow charts, and mind maps

-Splitting the screen for multiple uses

He also emphasized how the interactive panel serves as a blend of Android and computer, making it a versatile tool in teaching. The session was highly interactive and well-received by participants.

Second Session

The next session was taken by Ms. Anisha, who focused on the theme "21st Century Skills for Holistic Development."

She began by highlighting the importance of these skills in today's educational landscape. Her discussion covered:

-Learning Skills, Literacy Skills, and Life Skills

-The 4Cs: Critical Thinking, Creativity, Communication, and Collaboration

-The role of experiential learning in achieving holistic development

She also gave a practical demonstration of using the "Teach Better" website and introduced participants to the Gamma website, showcasing how it can be used to create PowerPoint presentations and generate customized content through simple commands.

Assessment Session

Post-lunch, an assessment form (Google Form) was shared by the Course coordinator, Shri D. Sreenivasalu, which the participants filled to reflect on their learning outcomes.

Valedictory

The valedictory program began with a welcome address by Ms. M. Subha, TGT (Maths), PM SHRI KV No.1, Jalahalli, Bengaluru Region.

Participants from different regions then shared their impressions of the workshop:

1. Ms. Sandhya Joshi, TGT (Maths), PM SHRI KV ASC Centre, Bengaluru Region
2. Mr. Naresh Duvvuri, TGT (Maths), PM SHRI KV Kakinada, Hyderabad Region
3. Mr. Sher Singh Bangerwa, TGT (Maths), PM SHRI KV No.1 AFS Tambaram, Chennai Region
4. Ms. Veena M, TGT (Maths), PM SHRI KV Keltron Nagar, Ernakulam Region

This was followed by an inspiring speech from the Assistant Course Director, Shri Vamshi Krishna E V L N, Principal, KV Steel Plant, Hyderabad Region.

The program concluded with blessings from Ms. Menaxi Jain, DC & Director, ZIET Mysore, and a heartfelt Vote of Thanks proposed by Mr. Sandeep Koushik, TGT (Maths), Hyderabad Region.

The workshop was enriching and insightful, providing participants with valuable exposure to ICT tools and 21st century pedagogical practices. The interactive sessions, hands-on demonstrations, and discussions on holistic learning approaches will undoubtedly enhance the teaching-learning process in classrooms.

SESSIONS

EDUCATION AND TECHNOLOGY – THE SHIFT IN PERSPECTIVE.

Mr. VAMSI KRISHNA (ACD)
PRINCIPAL
KV STEEL PLANT
HYDERABAD REGION

Technology-Integrated Education as per NEP 2020

The National Education Policy (NEP) 2020 marks a landmark reform in India's education system, introduced after 34 years. It aims to create an accessible, equitable, affordable, and high-quality education ecosystem that prepares learners for the challenges of the 21st century. The policy envisions an education system rooted in Indian ethos, nurturing global citizens who embody knowledge, skills, values, and respect for constitutional ideals.

Vision and Core Principles

NEP 2020 envisions transforming India into a vibrant knowledge society by fostering holistic, multidisciplinary learning. Its guiding principles include:

- Recognizing and nurturing each learner's unique potential
- Ensuring Foundational Literacy and Numeracy by Grade 3
- Promoting multidisciplinary learning, conceptual understanding, creativity, and critical thinking
- Encouraging multilingualism and respect for diversity
- Integrating technology extensively in teaching, learning, and educational management
- Emphasizing equity and inclusion as the foundation of all educational initiatives

Technology Integration in Education

Technology serves as a key enabler in achieving NEP 2020's goals. It enhances teaching and learning processes, breaks language barriers, supports inclusion, and democratizes access to quality education.

Key Technologies and Tools

- **Devices:** Laptops, tablets, and smartphones expand learning opportunities.
- **Learning Management Systems (LMS):** Platforms like *Google Classroom* support online collaboration and resource sharing.
- **Smartboards & Projectors:** Facilitate interactive and multimedia-based instruction.
- **AR/VR Tools:** Provide immersive learning experiences such as virtual field trips.
- **AI & Adaptive Platforms:** Enable personalized learning and performance tracking.
- **Gamification & Coding Tools:** Make learning engaging while building problem-solving skills.
- **Virtual Classrooms & Collaboration Tools:** Platforms like *Google Meet*, *Teams*, and *Padlet* foster teamwork and communication.

Technology in NEP 2020 (Chapters 23 & 24)

Chapter 23 – Technology in Education

- Integration of technology at all educational levels
- Development of e-content and digital platforms
- Strengthening of **DIKSHA**, **SWAYAM**, and creation of **NETF (National Educational Technology Forum)**
- ICT-based teacher training and continuous professional development
- Promotion of regional language e-content

Chapter 24 – Online and Digital Education

- Expansion of **SWAYAM**, **DIKSHA**, and **e-Pathshala**
- Ensuring that no learner is left behind due to lack of digital access
- Piloting innovative digital education models

Major Digital Initiatives

1. PM eVIDYA

A government initiative under *Atmanirbhar Bharat Abhiyan* to unify all digital education efforts, offering resources through TV channels, radio, and online platforms.

2. DIKSHA

The *Digital Infrastructure for Knowledge Sharing* platform developed by NCERT provides multilingual, curriculum-aligned digital content for teachers, students, and parents.

3. SWAYAM and SWAYAM PRABHA

- *SWAYAM* hosts online courses for school and higher education.
- *SWAYAM Prabha* operates 40 DTH channels broadcasting educational content 24/7, supported by IITs, UGC, CEC, and IGNOU.

4. NETF (National Educational Technology Forum)

An autonomous body that promotes innovation, digital equity, and exchange of best practices for technology integration in education.

5. ANUVADINI

An AI-powered translation tool supporting 22 Indian and foreign languages to bridge communication gaps and promote linguistic inclusivity.

Blended Learning and Teacher Empowerment

NEP 2020 promotes blended learning—a harmonious mix of traditional and digital education. Teachers are envisioned as facilitators who guide learners through interactive, technology-driven learning environments. Continuous professional development and training in ICT tools are integral to this transformation.

Artificial Intelligence in Education

AI plays a transformative role by:

- Creating personalized learning paths
- Offering virtual tutoring and automated feedback
- Supporting timely academic intervention
  This makes education adaptive, efficient, and learner-centered.

Overcoming Challenges and Promoting Equity

Efforts are being made to ensure digital inclusivity by:

- Expanding public digital infrastructure
- Providing low-cost devices and regional language content
- Supporting rural schools through continuous training and assistance

Real-World Implementation

Examples of successful technology integration include:

- **NagaEd Platform:** Conducted over 10,000 online assessments aligned with NEP 2020.
- **CBSE AI & IoT Curriculum:** Introduced future-ready skills in schools.
- **Entab Experiential Learning:** Utilizes VR and simulations for immersive learning.

The integration of technology in education, as envisioned by NEP 2020, represents a paradigm shift toward inclusive, flexible, and future-ready learning. By empowering teachers and students with digital tools, India moves closer to realizing its vision of becoming a global knowledge superpower. NEP 2020 stands as a roadmap for nurturing responsible, innovative, and technologically proficient citizens ready to lead in a digital world.

TECHNOLOGY INTEGRATED EDUCATION AS PER NEP 2020

Ms. ANISHA N
TGT(MATHS)
PM SHRI KV NO.2 CALICUT
ERNAKULAM REGION

Introduction

The National Education Policy (NEP) 2020 is a transformative framework aimed at restructuring India's education system to make it accessible, equitable, affordable, and of high quality. It focuses on holistic and learner-centric education aligned with the demands of the 21st century. The policy seeks to transform India into a vibrant knowledge society by integrating modern technology at all stages of education and fostering innovation, critical thinking, and inclusivity.

Vision of NEP 2020

NEP 2020 envisions an education system deeply rooted in Indian ethos, contributing to the sustainable transformation of India into an equitable and global knowledge superpower. It emphasizes:

- Respect for Fundamental Duties and Constitutional values.
- Development of pride in being Indian, in thought and action.
- Fostering global citizenship, sustainability, and human values.

The policy introduces a 5+3+3+4 structure to replace the old 10+2 system and emphasizes early childhood care, vocational education, and multilingual learning.

Technology Integration in Education

Technology plays a **pivotal role** in realizing the NEP 2020 vision. It enhances learning quality, accessibility, and engagement through digital tools and platforms that connect educators and learners across diverse contexts.

Core Technologies

- **Devices:** Laptops, tablets, and smartphones for digital access.
- **Learning Management Systems (LMS):** Platforms like *Google Classroom* for managing and sharing resources.
- **Smartboards and Projectors:** Promote interactive multimedia learning.
- **AR/VR Tools:** Create immersive, experiential learning environments.
- **AI-based Platforms:** Personalize learning experiences and support educators.
- **Gamification and Robotics:** Encourage problem-solving, creativity, and active participation.
- **Virtual Classrooms & Collaboration Tools:** Platforms like *Microsoft Teams* and *Padlet* enable real-time interaction.

Technology Use and Integration in NEP 2020

India's leadership in ICT and digital innovation enables effective integration of technology at all educational levels.
The NEP recognizes the bi-directional relationship between technology and education—each driving the other's growth.

Key Features – Chapter 23: Technology in Education

- Integration of technology at all educational levels.
- Use of technology for better access and inclusion.
- Development of e-content and strengthening of platforms such as DIKSHA and SWAYAM.
- Establishment of the National Educational Technology Forum (NETF).
- Teacher training in ICT tools and online pedagogy.
- Creation of e-content in multiple regional languages.

- Continuous professional development (CPD) for teachers.

Key Features – Chapter 24: Online and Digital Education

- Expansion of digital platforms like SWAYAM, DIKSHA, and e-Pathshala.
- Ensuring no learner is left behind due to lack of technology.
- Implementation of pilot programs to test various models of digital learning.

Why Technology Integration Matters

- **Enhanced Accessibility:** Extends educational opportunities to remote and marginalized areas.
- **Personalized Learning:** Adapts to individual learning needs and pace.
- **Bridging Gaps:** Addresses shortages in infrastructure and teacher availability.
- **Quality Improvement:** Facilitates engagement, innovation, and real-time feedback.

Technology is not an add-on but a core pillar for achieving NEP 2020's educational goals.

Core Initiatives for Digital Transformation

1. PM eVIDYA

A flagship program under *Atmanirbhar Bharat Abhiyan*, PM eVIDYA unifies digital education through online platforms, TV, and radio to ensure equitable access to quality learning for all.

2. DIKSHA (Digital Infrastructure for Knowledge Sharing)

- Developed by NCERT under the Ministry of Education.
- Provides digital resources, training modules, and interactive content for teachers, students, and parents.
- Available in 18 Indian languages and aligned with national curricula.
- Features include QR codes, language and location-based access, and class-specific materials.

3. SWAYAM and SWAYAM Prabha

- SWAYAM hosts online courses for school and higher education.
- SWAYAM Prabha broadcasts educational content 24/7 across 40 DTH channels, with support from IITs, UGC, CEC, and IGNOU.

- Channels are organized by subjects such as science, commerce, humanities, and vocational studies.

4. NETF (National Educational Technology Forum)

An autonomous platform promoting the effective use of technology in education through:

- Policy guidance and innovation.
- Digital equity in rural and underserved regions.
- Development of multilingual digital content.
- Collaboration among educational institutions and EdTech bodies.

5. ANUVADINI

An AI-based translation tool supporting 22 Indian and foreign languages to bridge linguistic barriers and promote "Ek Bharat, Shreshtha Bharat."
It is integrated with the e-KUMBH portal for translated educational content.

Blended Learning and Teacher Empowerment

NEP 2020 promotes blended learning, integrating classroom teaching with online methods to ensure flexibility and inclusivity. Teachers are viewed as facilitators of learning, empowered through:

- ICT-based professional training.
- Online pedagogy development.
- Continuous professional development programs.

Artificial Intelligence in Education

AI enhances the educational process through:

- **Personalized Learning Paths** for every student.
- **Virtual Tutors and Chatbots** providing 24/7 support.
- **Automated Grading Systems** identifying learners' progress and needs.

These tools make learning more efficient, interactive, and accessible.

Multidisciplinary and 21st-Century Skills

NEP 2020 emphasizes early integration of skills such as:

- Coding, AI, and Design Thinking.
- Creativity, Collaboration, and Critical Thinking.
- Digital Literacy and Vocational Flexibility.

Students are encouraged to choose across streams for a well-rounded, holistic education.

Overcoming Challenges and Ensuring Equity

To bridge the digital divide, NEP 2020 emphasizes:

- Investment in public digital infrastructure.
- Development of regional-language e-content.
- Affordable access to devices and internet connectivity.
- Continuous support for rural and underserved schools.

Equitable access is central to the policy's success.

Real-World Examples of Implementation

- **NagaEd Platform:** Conducted 10,000+ online assessments aligned with NEP 2020.
- **CBSE Initiatives:** Introduced AI and IoT in classes 6–10 to build technological competence.
- **Entab Learning Platform:** Uses VR and simulations for experiential, immersive learning.

These examples reflect NEP 2020's impact on modernizing education and preparing future-ready learners.

Conclusion

The National Education Policy 2020 marks a monumental shift in India's education landscape. Through technology integration, it ensures quality, inclusivity, and innovation at all levels of learning. By equipping students and teachers with digital tools and competencies, NEP 2020 lays the foundation for an empowered, adaptable, and globally competent generation.

Technology-integrated education under NEP 2020 is not merely a reform—it is a revolution, bridging the past with the future and enabling lifelong learning for all

FLIPPED CLASSROOM USING ICT TOOLS

Ms. USHMA TEOTIA
TGT(SCIENCE)
PM SHRI KV No.1 JALAHALLI
BENGALURU REGION

Introduction

The flipped classroom model is a transformative approach to teaching and learning that redefines how classroom time is utilized. Instead of the traditional teacher-led instruction, students first engage with new learning material at home—through videos, readings, or simulations—and then apply that knowledge during classroom sessions through discussions, experiments, and collaborative activities.

This model leverages Information and Communication Technology (ICT) to make learning more interactive, personalized, and student-centered, in alignment with the National Education Policy (NEP) 2020 and the National Curriculum Framework (NCF) 2023.

Objectives

The key objectives of the session are to:

- Understand what a flipped classroom is.
- Connect the approach with NEP 2020 and NCF 2023 guidelines.
- Explore the use of magicschool.ai for flipped lessons.
- Get practical ideas for implementing flipped learning in subjects like mathematics and science.
- Plan an example of a flipped classroom lesson.
- Discuss the challenges and solutions associated with this approach.

Alignment with NEP 2020 and NCF 2023

NEP 2020 emphasizes blended, experiential, and student-centered learning. It encourages the integration of ICT tools to enable self-paced learning modules and promote higher-order thinking skills.

Similarly, NCF 2023 focuses on deeper understanding, multimodal learning, and the use of classroom time for hands-on, discussion-based, and project-based learning.
The flipped classroom approach fits seamlessly within these frameworks, ensuring meaningful engagement and active participation.

Traditional Classroom Approach

In a traditional classroom, the teacher delivers instruction during class while students listen passively. Learning is largely one-way, and homework usually involves practicing or reinforcing concepts taught during class.
This system often limits interaction, creativity, and critical thinking.

What is a Flipped Classroom?

A flipped classroom reverses the traditional learning process.
Here, students learn the content at home through short videos, reading assignments, or simulations and use class time for activities such as experiments, group discussions, and collaborative projects.

In this model:

- Students study new material before class.
- Classroom time is used for active learning and concept application.
- Learners participate more actively, promoting deeper understanding and critical thinking.

How a Flipped Classroom Works

At Home:

- Students engage with short video lectures, digital reading materials, or interactive simulations to understand key concepts at their own pace.

In Class:

- The teacher facilitates group work, experiments, model-making, and debates.
- The focus is on application, problem-solving, and collaboration, rather than passive listening.

Benefits of a Flipped Classroom

The flipped classroom offers several advantages for both students and teachers:

- **Flexibility:** Students learn at their own pace and revisit concepts when needed.
- **Deeper Learning:** Class time is dedicated to applying and analyzing concepts rather than rote memorization.
- **Collaboration:** Encourages teamwork and peer learning.
- **Engagement:** Students become active participants rather than passive recipients.

- **Teacher Facilitation:** Teachers can provide personalized attention and guidance.

How Teachers Can Implement the Flipped Model

To successfully adopt this method, teachers should:

1. **Plan Class Time Purposefully:** Decide what interactive tasks or discussions will take place in the classroom.
2. **Curate or Create Resources:** Identify suitable videos, simulations, and readings for students to explore at home.
3. **Train Students:** Guide them on how to use the provided materials effectively.
4. **Assess Understanding:** Use quizzes, group work, or reflections to check comprehension during class.

Integrating magicschool.ai in Flipped Learning

Magicschool.ai is an AI-powered educational platform designed to assist teachers in creating personalized learning experiences. It provides ready-to-use teaching tools, resources, and content-generation aids.

Steps to Use magicschool.ai:

1. Visit https://www.magicschoolai.com.
2. Click on **'Free for Teachers'**.
3. Sign up using your **Google Account**.
4. Choose **"I am a Teacher/Educator."**

The platform helps educators generate lesson plans, create assessments, design activities, and adapt content for a flipped classroom approach.

Challenges and Solutions

Challenges	Possible Solutions
Limited access to technology or internet	Provide offline materials or community learning spaces
Students' unfamiliarity with self-learning	Train students gradually on how to engage with pre-class materials
Time constraints for teachers	Use AI-based platforms like *magicschool.ai* to save preparation time
Monitoring students' engagement	Use online quizzes and feedback tools to track participation
Resistance to change	Conduct orientation sessions to highlight benefits and success stories

OBLIGATIONS OF DIGITAL CITIZENSHIP

Mr. DINESH KUMAR
TA(PHYSICS)
ZIET MYSURU

Introduction

As part of the 5-Day Online Training Programme on ICT in Mathematics Teaching organized by ZIET Mysuru, an enlightening session on "Features of Digital Citizenship" was conducted on 8th July 2025 by *Shri Dinesh Kumar*. The session aimed to create awareness among teachers about the significance of being responsible, ethical, and informed users of technology in today's digitally connected educational landscape.

In an era where digital tools and platforms have become integral to teaching and learning, it is essential for educators to not only integrate technology effectively but also model ethical digital behaviour. The session emphasized how teachers play a crucial role in nurturing digitally responsible citizens among students by promoting safe, respectful, and meaningful use of online resources within the context of mathematics education.

Objectives of the Session

The major objectives of the session were:

- To create awareness among teachers about the concept, features, and importance of digital citizenship.
- To promote safe, ethical, and responsible use of technology among teachers and students.
- To help teachers integrate digital responsibility into ICT-based classroom practices and pedagogy in mathematics.

Key Highlights and Discussion Points

1. Understanding Digital Citizenship

The session began by defining *digital citizenship* as the responsible and ethical use of technology by anyone who engages with digital devices, networks, or online platforms.
The resource person emphasized that digital citizenship extends beyond technical proficiency—it involves understanding the impact of one's actions in the digital space, ensuring online safety, and fostering positive digital interactions.

He highlighted that in the context of mathematics education, teachers must not only be skilled users of technology but also mentors guiding students on how to navigate the digital world

safely, critically, and thoughtfully while engaging in mathematical exploration and problem-solving.

2. The Nine Elements of Digital Citizenship

A major highlight of the session was the detailed explanation of the nine key elements of digital citizenship:

1. Digital Access: Ensuring equitable access to digital tools and learning resources for all students.
2. Digital Commerce: Understanding secure and ethical online transactions.
3. Digital Communication: Using appropriate and respectful communication on digital platforms.
4. Digital Literacy: Developing skills to find, evaluate, and use digital information effectively in learning mathematics.
5. Digital Etiquette: Practising courtesy and respect in online interactions and collaboration.
6. Digital Law: Understanding copyright, plagiarism, and fair use policies, especially while using online math resources or software.
7. Digital Rights and Responsibilities: Knowing one's rights to digital access and privacy while respecting those of others.
8. Digital Health and Wellness: Balancing screen time and promoting healthy technology habits.
9. Digital Security (Self-Protection): Safeguarding personal and institutional data, and being aware of online threats.

Through practical examples, the resource person demonstrated how these principles can be applied within mathematics classrooms—for instance, when students use online calculators, simulations, or collaborative platforms for data analysis and problem-solving.

3. Relevance in School Education

The session emphasized that digital citizenship is essential in the current educational context, particularly as mathematics teaching increasingly incorporates online simulations, assessment platforms, and collaborative tools.

Teachers were encouraged to integrate digital citizenship principles when guiding students in using mathematical software, exploring online resources, or submitting digital assignments.
It was highlighted that digital citizenship should not be viewed as a separate subject, but rather as an integral part of the teaching-learning process that shapes students into responsible digital learners.

4. Cyber Safety, Ethics, and Digital Responsibility

The resource person also focused on cyber safety and ethics, essential for maintaining a safe digital learning environment. Topics discussed included:

- Cyberbullying and promoting empathy and respect in online communication.
- Online privacy—protecting personal and student data when using educational platforms.
- Plagiarism and academic honesty—encouraging original work and proper citation, particularly in mathematical research and presentations.
- Respectful online communication—building a culture of collaboration and mutual respect among students and teachers.

The discussion highlighted that a strong foundation in cyber ethics enhances not only safety but also the credibility and integrity of digital teaching practices.

5. Role of Teachers

Teachers, as digital leaders and role models, hold a key responsibility in cultivating digital citizenship values among students.
The session encouraged teachers to:

- Demonstrate ethical and responsible technology use in their professional practices.
- Include discussions on digital responsibility and data ethics during mathematics lessons.
- Integrate ICT tools such as online quizzes, interactive geometry tools, and graphing software while reinforcing principles of digital behaviour.
- Promote collaboration and reflection through safe digital platforms for mathematical discussions and projects.

By embedding these practices into their teaching, educators can help students become ethical, critical, and creative users of digital resources in mathematics learning.

Conclusion

The session on “Features of Digital Citizenship” was insightful, engaging, and highly relevant to the current digital era of education. It provided teachers with valuable insights into fostering responsible, ethical, and informed digital behaviour among learners.

Participants appreciated the clarity of the presentation, the practical examples tailored to mathematics education, and the resource person’s emphasis on integrating digital citizenship with classroom practice.
An assessment test conducted at the end of the session helped reinforce understanding and ensure practical learning outcomes.

Overall, the session underscored the idea that teaching mathematics through ICT is not merely about using technology—it is about doing so ethically, responsibly, and effectively. By modeling digital citizenship, teachers can inspire students to become responsible digital learners and lifelong users of technology for learning and innovation.

USEFUL ICT TOOLS FOR MATHEMATICS TEACHERS

Ms. ANIQUEEN A
TGT(MATHS)
PM SHRI KV NO.2 KASARAGOD
ERNAKULAM REGION

Introduction

The session on "Use of ICT Tools for Mathematics Teachers" was organized with the objective of empowering mathematics educators with digital competencies essential for effective teaching and learning in the 21st-century classroom. In the era of rapid technological advancement, Information and Communication Technology (ICT) has become a powerful medium for enhancing pedagogical practices, enriching classroom experiences, and promoting deeper conceptual understanding among students.

Mathematics, often perceived as an abstract and difficult subject, can be made more engaging and accessible through the appropriate use of ICT. The session was therefore designed to demonstrate practical tools, platforms, and techniques that can help teachers integrate technology seamlessly into their daily lessons. The session also aligned with the National Education Policy (NEP) 2020, which emphasizes digital integration, experiential learning, and competency-based assessment.

Objectives of the Session

The key objectives of the session were to:

1. Familiarize teachers with ICT tools that can make the teaching of Mathematics interactive and student-centered.
2. Demonstrate the use of technology for visualizing mathematical concepts and problem-solving.
3. Explore platforms that support digital content creation, assessment, and collaboration.
4. Promote awareness about ICT initiatives by NCERT and CIET in line with NEP 2020.
5. Encourage teachers to adopt innovative approaches using free and accessible tools.

Overview of ICT Tools for Mathematics Teaching

The session covered a variety of ICT tools categorized under different pedagogical needs. The following sections summarize the key tools and platforms introduced.

1. Dynamic Geometry and Graphing Tools

Dynamic geometry software helps visualize mathematical ideas, explore patterns, and develop reasoning skills. Teachers were introduced to:

- GeoGebra: A powerful, free, open-source platform combining geometry, algebra, calculus, and statistics. It enables teachers and students to construct and manipulate mathematical objects dynamically.
- Desmos: An intuitive online graphing calculator that allows plotting complex equations and exploring functions visually.
- Geometry Pad: A tablet-friendly tool that supports geometric constructions, transformations, and measurements interactively.

These tools help students connect algebraic expressions with geometric representations and promote exploratory learning.

2. Problem-Solving and Computational Tools

Technology can assist in demonstrating mathematical reasoning and verifying problem-solving steps. The session showcased several such platforms:

- Photomath: A mobile app that reads and solves handwritten or printed math problems, showing step-by-step explanations.
- Microsoft Math Solver: Offers instant solutions with explanations and links to similar problems.
- Symbolab and WolframAlpha: Provide symbolic computation and algebraic manipulation with detailed steps, supporting teachers in illustrating alternative solution paths.

These applications not only support teachers in lesson preparation but also help students in self-directed learning.

3. Interactive Learning and Assessment Tools

Interactive and game-based learning tools can increase student engagement and motivation. Teachers were introduced to:

- Kahoot and Quizizz: Platforms for creating online quizzes and formative assessments in a gamified environment.
- Prodigy Math Game: A game-based learning tool aligned with curriculum standards that personalizes math practice through adaptive learning.

These platforms make classroom participation more active and provide instant feedback, supporting continuous assessment.

4. Collaboration and Classroom Management Tools

Efficient classroom management and digital collaboration are vital components of ICT-enabled teaching. The following tools were highlighted:

- Google Classroom: A comprehensive platform for creating, distributing, and grading assignments digitally.
- Microsoft Teams: Facilitates communication, file sharing, and live teaching sessions.
- Jamboard: A collaborative digital whiteboard used for brainstorming, visual problem-solving, and concept mapping.

These tools help teachers manage hybrid or online classrooms efficiently while fostering teamwork and interaction among students.

5. NCERT and CIET Initiatives

The session emphasized ICT initiatives spearheaded by NCERT's Central Institute of Educational Technology (CIET), which provides numerous resources to support digital teaching and learning in line with NEP 2020. These include:

- ePathshala: A platform for digital textbooks, e-content, and multimedia materials.
- DIKSHA Portal: Offers high-quality, curriculum-aligned resources for teachers and students in multiple Indian languages.
- SWAYAM: A national online learning platform providing courses and lectures from school to university level.
- NISHTHA: Training modules for teachers focusing on ICT integration in classroom practices.
- AR/VR Initiatives: ePathshala AR app and other virtual simulations that bring abstract mathematical concepts to life.

Teachers were encouraged to explore these government-supported platforms, which are free and easily accessible.

6. Creative and Specialized Learning Resources

To make mathematical learning more enjoyable, the session also introduced some creative digital resources:

- TicTacLearn: A free, curriculum-aligned digital learning platform developed by the Central Square Foundation, offering animated videos, quizzes, and activities for Mathematics and Science in regional languages.
- Numberock: A collection of math music videos and accompanying materials designed by educators to help children remember mathematical concepts through rhythm and song.

- Wolfram Mathematica: An advanced computational software used for higher-order visualization and research-based mathematical exploration.
- Brisk Teaching (AI Tools): AI-driven platforms that support teachers in content generation, lesson planning, and performance analysis.

Interactive Live Worksheets

One of the key highlights of the session was the introduction of interactive live worksheets—digital worksheets enhanced with clickable, fillable, and auto-correcting features. These tools transform static paper-based exercises into dynamic learning experiences. Teachers learned how to create and share such worksheets to allow real-time monitoring of student progress and to promote independent learning with instant feedback.

Impact and Reflections

The session received enthusiastic participation from the teachers. Participants actively explored the tools, shared their classroom experiences, and discussed ways to adapt these technologies according to the learners' age group and curriculum requirements. Many teachers expressed that ICT integration will help them:

- Simplify abstract mathematical concepts using visual and interactive aids.
- Engage students through gamified learning and instant feedback.
- Personalize instruction based on students' learning pace.
- Develop digital lesson plans and maintain resource repositories.
- Facilitate blended and online modes of teaching effectively.

The resource person emphasized that ICT tools are not meant to replace traditional teaching but to enrich it by making learning more meaningful, accessible, and enjoyable.

The session on Use of ICT Tools for Mathematics Teachers was an enriching learning experience that highlighted the transformative potential of technology in mathematics education. By adopting these tools, teachers can move beyond rote learning and foster inquiry, creativity, and collaboration among students.

The participants concluded that ICT integration is not merely a technical skill but a pedagogical approach that prepares both teachers and students for the digital future envisioned under NEP 2020. The session thus reinforced the role of teachers as facilitators of digital learning and change-makers in building technologically empowered classrooms.

USE OF AI TOOLS IN CLASSROOM TRANSACTIONS

Ms. ANIQUEEN A
TGT(MATHS)
PM SHRI KV NO.2 KASARAGOD
ERNAKULAM REGION

Introduction

"Technology can become the wings that will allow the educational world to fly farther and faster than ever before—if we allow it." – *Jenny Arledge*

The session on "Use of AI Tools for Mathematics in Classroom Transactions" highlighted the transformative role of Artificial Intelligence (AI) in reshaping teaching and learning processes. The integration of AI in education is not just a technological advancement but a pedagogical evolution—helping teachers personalize instruction, automate routine tasks, and make mathematics more interactive and accessible to every learner.

AI enables machines to simulate human intelligence, perform reasoning, solve problems, and learn from data. In the context of education, particularly Mathematics, AI supports personalized learning, enhances conceptual visualization, and provides real-time feedback, making classrooms more efficient and engaging.

AI in Education

AI has emerged as a powerful ally in education by supporting both teachers and learners. It transforms the traditional classroom into a smart learning environment through features like adaptive learning paths, data-driven insights, and interactive content generation.

Key ways AI contributes to education include:

- Learning and Reasoning: AI systems analyze student inputs to provide intelligent recommendations.
- Personalization: Adjusts difficulty levels and learning pace according to individual learner needs.
- Automation: Simplifies grading, feedback, and administrative work, allowing teachers to focus on pedagogy.
- Visualization: Makes abstract mathematical concepts more tangible and engaging through simulations and visual tools.

Why Use AI in Math Classrooms

AI tools in mathematics teaching offer several benefits that address diverse learning needs and teaching challenges. The session highlighted the following major advantages:

1. Personalized Learning Paths: AI tailors instruction based on each student's progress, strengths, and learning style.
2. Instant Feedback and Assessment: AI-based systems analyze responses and provide real-time corrections, helping students self-correct.
3. Visualization of Abstract Concepts: AI-powered visualization tools help students grasp difficult topics like geometry, calculus, and algebra.
4. Support for Diverse Learners: AI caters to different ability levels and learning paces, providing adaptive support.
5. Time-Saving for Teachers: Automates repetitive tasks like grading, worksheet creation, and quiz generation, allowing teachers to focus on higher-order teaching.

Popular AI Tools for Mathematics Education

The session demonstrated several AI-based platforms and applications that teachers can use for enhancing mathematics teaching:

- Photomath: Allows users to snap a picture of a problem and get step-by-step solutions—ideal for middle to high school levels.
- Wolfram Alpha: A computational knowledge engine that solves mathematical problems across all levels and provides detailed explanations.
- SchoolAI: An AI-driven personalized tutoring system integrated with Learning Management Systems (LMS) for K–12 education.
- Socratic (by Google): Helps students understand homework problems using AI-powered explanations and learning resources.
- Mathway: Solves problems from algebra to calculus and beyond, suitable for higher secondary and college students.
- Turbolearn: A versatile AI-powered study tool that converts PDFs, videos, or websites into notes, flashcards, quizzes, and diagrams. It also includes an AI chatbot for Q&A, making it an effective aid for both students and teachers.

These tools help teachers simplify difficult concepts, promote self-learning, and make mathematics instruction more dynamic and interactive.

Classroom Applications of AI Tools

AI tools can be effectively integrated into mathematics classrooms in various ways:

- Lesson Planning: Teachers can use AI to generate quizzes, worksheets, and practice problems tailored to different ability levels.
- Conceptual Modeling: AI-driven visualization tools support teaching of geometry, algebra, trigonometry, and calculus through dynamic models.
- Feedback and Assessment: Real-time progress tracking enables teachers to monitor learning outcomes and address individual needs.
- Differentiation: AI systems can modify task complexity based on student performance, promoting inclusive learning.

These applications make learning more responsive and data-informed, supporting competency-based education as envisioned in NEP 2020.

Role of the Teacher in AI-Enabled Classrooms

While AI offers advanced tools and analytics, the teacher remains central to the learning process. The session emphasized that technology must be viewed as a support system, not a replacement for human educators.

In an AI-enabled classroom, teachers play the roles of:

- Facilitator of Learning: Guiding students to explore, reason, and apply mathematical concepts.
- Critical Evaluator: Verifying AI-generated outputs to ensure conceptual accuracy.
- Ethical Guide: Teaching responsible use of AI tools and addressing issues like plagiarism and dependency.
- Innovator: Integrating AI meaningfully into pedagogy to enhance engagement and critical thinking.

Challenges and Considerations

Despite its vast potential, the use of AI in education presents certain challenges that must be addressed:

- Accuracy and Reliability: AI-generated solutions may sometimes be incorrect or incomplete, requiring teacher validation.
- Over-Reliance on Technology: Students may depend excessively on AI tools, reducing independent problem-solving ability.
- Academic Integrity: Easy access to solutions may lead to misuse during assessments.

- Digital Divide: Unequal access to devices and the internet can hinder equitable learning opportunities.
- Teacher Preparedness: Continuous professional development is necessary for teachers to use AI tools effectively.

The session underscored the need for balanced, ethical, and pedagogically sound integration of AI in classrooms.

Future Trends in AI and Mathematics Education

Looking ahead, AI is expected to play an even greater role in transforming mathematics teaching through:

- Adaptive Learning Platforms: Systems that continuously adjust learning materials based on student data.
- AR/VR Integration: Immersive environments combining AI with Augmented and Virtual Reality for experiential learning.
- Predictive Analytics: Early identification of learning gaps and performance trends using AI-driven data analysis.
- AI Tutors: Intelligent virtual assistants offering 24/7 support and personalized guidance.

These advancements will not only make mathematics learning more engaging but also equip students with digital skills for the future.

Conclusion

The session on “Use of AI Tools for Mathematics in Classroom Transactions” successfully demonstrated how Artificial Intelligence can revolutionize mathematics teaching by providing personalized, visual, and adaptive learning experiences.

While AI tools offer immense potential for innovation, the human element of teaching—creativity, empathy, and guidance—remains irreplaceable. Teachers are the key to ensuring that AI serves as a means to deepen understanding, foster curiosity, and nurture problem-solving skills rather than merely delivering answers.

By thoughtfully integrating AI tools into their teaching practices, mathematics teachers can truly transform their classrooms into spaces of exploration, discovery, and lifelong learning.

ICT TOOLS FOR MATHEMATICS ASSESSMENT

Ms. ANIQUEEN A
TGT(MATHS)
PM SHRI KV NO.2 KASARAGOD
ERNAKULAM REGION

Introduction

"Assessment is a major part of the educational process and without it, teaching would be a rather unfocused activity."

Assessment is integral to teaching and learning. It provides the feedback loop that connects instruction to outcomes, guiding both teachers and learners toward improvement. The session on "ICT Tools for Mathematics Assessment" was organized to help teachers understand how modern digital tools can be effectively integrated to assess, analyze, and enhance student learning in Mathematics.

In today's classrooms, Information and Communication Technology (ICT) is transforming traditional methods of assessment. Teachers can now use digital tools to conduct quick evaluations, provide personalized feedback, and track progress over time. Such tools make the assessment process more interactive, efficient, and data-driven—aligning with the National Education Policy (NEP) 2020, which emphasizes competency-based assessment and continuous learning improvement.

Objectives of the Session

The main objectives of this session were to:

1. Introduce teachers to a variety of ICT tools used for assessing students in Mathematics.
2. Demonstrate how technology can support diagnostic, formative, and summative assessments.
3. Show how instant feedback and performance tracking enhance student learning.
4. Encourage teachers to integrate ICT-based assessment tools into daily classroom practices.
5. Promote understanding of how data-driven assessment supports individualized and competency-based learning.

The Assessment Cycle

The assessment cycle in education is a systematic and ongoing process of evaluating student learning to improve teaching strategies and outcomes. ICT tools enhance every stage of this

cycle—from designing questions and conducting assessments to collecting responses, analyzing data, and providing feedback.

Through ICT integration, teachers can:

- Monitor student progress in real time.
- Identify learning gaps and misconceptions quickly.
- Modify instruction based on data insights.
- Foster a culture of continuous and reflective learning.

Types of Assessment

The session explained three key types of assessments and how ICT can be used effectively in each stage:

1. Diagnostic Assessment – Conducted at the beginning of a course or unit to identify prior knowledge and learning needs.
   Example tools: Google Forms, Mentimeter, Socrative.
2. Formative Assessment – Takes place during instruction to provide ongoing feedback for both teachers and students.
   Example tools: Kahoot, Quizizz, Edpuzzle.
3. Summative Assessment – Administered at the end of a topic or term to evaluate overall understanding and achievement.
   Example tools: Microsoft Forms, Turnitin, GeoGebra-based tasks.

Each tool supports different aspects of the learning process and helps teachers make informed pedagogical decisions.

Best ICT Tools for Assessment and Feedback

The session featured several ICT tools that have proven effective in assessing mathematical learning outcomes.

1. Google Forms / Microsoft Forms

- Purpose: Creating quizzes, surveys, and assignments.
- Features: Auto-grading, branching questions, and instant feedback.
- Benefits: Quick assessments, easy tracking of responses, and analytical reports.

2. Kahoot!

- Purpose: Game-based learning and quizzes.
- Features: Real-time leaderboard, instant scoring.
- Benefits: Makes assessment fun and competitive, encouraging active participation.

3. Quizizz

- Purpose: Interactive quizzes for both live and homework modes.
- Features: Instant feedback, progress reports, and adaptive learning.
- Benefits: Self-paced learning and engaging classroom experience.

4. Mentimeter

- Purpose: Live polls, word clouds, and short quizzes.
- Benefits: Encourages immediate student responses and classroom interaction.

5. Socrative

- Purpose: Conducting formative assessments and exit tickets.
- Features: Real-time questioning, feedback, and performance analytics.
- Benefits: Enables teachers to modify instruction dynamically.

6. Edpuzzle

- Purpose: Embedding questions and checkpoints into video lessons.
- Features: Interactive video-based learning with immediate feedback.
- Benefits: Supports differentiated learning and student engagement.

7. Desmos & GeoGebra

- Purpose: Graphing, visualization, and modeling of mathematical problems.
- Features: Interactive simulations and dynamic geometry.
- Benefits: Enhances conceptual understanding and supports inquiry-based learning.

8. Turnitin & Classkick

- Turnitin: Focuses on plagiarism detection, originality reports, and rubric-based grading.
- Classkick: Allows real-time teacher feedback through voice and text comments.

- Benefits: Promote academic integrity, personalized feedback, and learner autonomy.

Key Benefits of Using ICT Tools in Assessment

The integration of ICT tools offers several measurable benefits for both teachers and students:

- ❖ Instant Feedback: Students can correct errors and misconceptions immediately.
- ❖ Personalized Learning: Tailors assessments to individual needs and progress levels.
- ❖ Data Tracking: Helps teachers monitor learning trends and identify areas needing reinforcement.
- ❖ Interactive Tools: Increase student engagement and motivation.
- ❖ Visual Simulations: Aid in conceptual understanding through graphs, videos, and animations.

By leveraging these tools, teachers can make assessment a continuous learning experience rather than a one-time event.

Challenges and Precautions

While ICT-based assessments bring innovation, certain challenges must be addressed for effective implementation:

- Technical limitations such as internet access or device availability.
- Data privacy and responsible digital conduct.
- Teacher readiness and need for ongoing professional development.
- Maintaining balance between technology use and traditional problem-solving approaches.

The session emphasized that technology should complement—not replace—the teacher's role in assessment.

The session on "ICT Tools for Mathematics Assessment" emphasized that assessment is not merely a measure of learning but a tool for learning. ICT tools empower teachers to conduct timely, meaningful, and interactive assessments while providing students with instant insights into their performance.

When thoughtfully integrated, ICT tools make mathematics learning more efficient, engaging, and personalized. They also encourage reflective teaching practices and data-informed decisions that improve learning outcomes.

As technology continues to advance, teachers must evolve as digital facilitators, ensuring that assessment remains authentic, inclusive, and transformative.

ROLE OF ICT IN MATHEMATICS TEACHING (GEOGEBRA BASIC & ADVANCED)

Mr. M. SREENIVASAN
PGT(MATHS)
PM SHRI KV ASHOK NAGAR
CHENNAI REGION

1. Introduction

In alignment with the vision of the National Education Policy (NEP) 2020 and NCF-SE 2023, the integration of Information and Communication Technology (ICT) in classroom pedagogy has become indispensable. Recognizing the importance of technology in enhancing mathematical understanding, a one-day workshop was organized on "GeoGebra – Basic and Advanced Applications" for Trained Graduate Teachers (TGT – Mathematics).

The workshop aimed to empower teachers with the digital competencies required to make Mathematics teaching more interactive, visual, and engaging. It introduced GeoGebra as a dynamic software tool that integrates geometry, algebra, calculus, and statistics, providing a unified platform for exploring mathematical concepts.

2. Objectives of the Workshop

The workshop was designed to achieve the following objectives:

1. To familiarize participants with the GeoGebra interface and its core functionalities.
2. To enable teachers to construct and demonstrate geometric and algebraic concepts dynamically.
3. To integrate ICT tools effectively into lesson planning and classroom practice in line with NCERT and CBSE guidelines.
4. To explore advanced applications of GeoGebra in visualization, 3D modelling, and assessment.
5. To promote collaborative learning through GeoGebra Classroom and digital applets.

3. Structure and Content of the Workshop

The workshop was divided into two sessions—Basic Level and Advanced Level—each consisting of demonstrations, practice activities, and discussions.

Session I: GeoGebra – Basic Level

The introductory session focused on the fundamentals of GeoGebra. Teachers were introduced to:

- The user interface, toolbars, and navigation menus.
- Construction of points, lines, circles, polygons, and conic sections.
- Use of sliders to create dynamic models showing change and dependency.
- Simple examples from NCERT such as drawing triangles, verifying angle sum property, and graphing linear equations.

- Linking algebraic expressions with geometric visuals, strengthening conceptual understanding.

Session II: GeoGebra – Advanced Level

The advanced session explored the use of GeoGebra for higher-level concepts including:

- 3D Geometry: representation of solids, planes, and intersections.
- Graphs of functions: visualizing linear, quadratic, and trigonometric functions.
- Calculus basics: exploring derivatives and areas under curves.
- Use of CAS (Computer Algebra System) for symbolic computation.
- Integration of GeoGebra into interactive lesson plans and digital assessments.

Teachers were guided on using GeoGebra Classroom for assigning tasks, monitoring progress, and providing feedback in real time.

4. Hands-on Activities Based on NCERT Textbooks (Classes 8–10)

The most engaging component of the workshop was the hands-on practice sessions, where teachers worked on NCERT-aligned topics using GeoGebra. The following activities were demonstrated and practiced:

A. Geometry Activities

Class VIII

1. Verification of the Angle Sum Property of a Triangle
    - Construct a triangle using the polygon tool.
    - Measure all three angles using the angle tool.
    - Drag the vertices to observe that the sum remains constant at 180°.
    - *Learning Outcome:* Reinforces understanding of angle sum property through dynamic exploration.
2. Properties of Quadrilaterals
    - Create different quadrilaterals and measure sides and diagonals.
    - Verify that diagonals of a rectangle are equal, while those of a rhombus bisect at right angles.
    - *Learning Outcome:* Visualization of geometric properties and classification of quadrilaterals.

Class IX

1. Congruence of Triangles
    - Construct two triangles and use sliders to alter side lengths and angles.
    - Check conditions for SSS, SAS, and ASA congruence.
    - *Learning Outcome:* Students understand and verify congruence criteria dynamically.
2. Circle Theorems
    - Draw a circle, chords, and angles subtended by chords.

- Observe that angles in the same segment are equal and angle subtended by diameter is 90°.
- *Learning Outcome:* Promotes conceptual visualization of circle properties.

3. Construction of Tangents to a Circle
   - Use GeoGebra tools to construct tangents from an external point.
   - *Learning Outcome:* Strengthens procedural and conceptual understanding of tangency.

Class X

1. Verification of Pythagoras Theorem
   - Construct a right triangle and build squares on its sides.
   - Measure areas of the squares and verify $a^2 + b^2 = c^2$.
   - *Learning Outcome:* Establishes visual proof of the theorem using dynamic geometry.
2. Similar Triangles and Ratio of Areas
   - Create pairs of similar triangles and compare ratios of sides and areas.
   - *Learning Outcome:* Links geometric similarity to proportional reasoning.
3. Trigonometric Ratios and Their Variations
   - Construct right triangles with sliders for the angle.
   - Measure sides to observe variation in trigonometric ratios.
   - *Learning Outcome:* Builds intuitive understanding of trigonometric ratios.
4. Coordinate Geometry – Distance and Midpoint Formulae
   - Plot two points on coordinate axes and use GeoGebra tools to calculate distance and midpoint.
   - *Learning Outcome:* Connects algebraic formulae with graphical representation.

B. Algebra Activities

Class VIII

1. Linear Equations in Two Variables
   - Plot equations of the form $ax + by + c = 0$.
   - Observe the family of lines by changing coefficients through sliders.
   - *Learning Outcome:* Visualizes the impact of coefficients on slope and intercept.

Class IX

1. Graphical Representation of Linear Equations
   - Enter multiple linear equations to observe point of intersection as solution.
   - *Learning Outcome:* Connects algebraic and graphical methods of solving equations.

Class X

1. Quadratic Equations and Parabolas
   - Plot $y = ax^2 + bx + c$with sliders for a, b, c.

    - Analyze shape, vertex, and roots of parabola.
    - *Learning Outcome:* Understands how parameters affect the graph.
2. Arithmetic Progression (AP) Visualization
    - Use spreadsheet and graph views to represent terms of an AP.
    - Observe linearity when plotting term number vs. value.
    - *Learning Outcome:* Reinforces concept of constant difference through ICT.
3. Simultaneous Linear Equations
    - Plot two equations and find intersection point using GeoGebra intersection tool.
    - *Learning Outcome:* Demonstrates solution of equations visually.

5. Participant Engagement and Feedback

Teachers participated enthusiastically in all activities, sharing innovative ideas for classroom implementation. Many appreciated how GeoGebra aligned with NCERT textbook examples, enabling them to demonstrate abstract concepts concretely. The collaborative environment encouraged peer learning and exploratory teaching methods.

Feedback indicated that teachers found the sessions highly practical and transformative. Several participants expressed willingness to develop GeoGebra-based lesson repositories for classroom use and student projects.

6. Outcomes of the Workshop

- Teachers gained proficiency in using GeoGebra for concept visualization and lesson design.
- Participants created ICT-based resources aligned with NCERT topics for Classes 8–10.
- The workshop fostered a community of tech-empowered mathematics educators.
- Teachers resolved to incorporate digital explorations in daily classroom practice to enhance student engagement and understanding.

7. Conclusion

The Workshop on ICT in Mathematics – GeoGebra (Basic and Advanced) successfully bridged the gap between traditional pedagogy and digital learning. It empowered TGT (Mathematics) teachers to integrate technology meaningfully into the curriculum, transforming mathematical learning into an interactive, inquiry-based experience.

In alignment with NEP 2020's vision of competency-based education and experiential learning, such initiatives pave the way for a digitally enriched, concept-driven, and joyful Mathematics classroom.

USE OF VIRTUAL LABS (O LAB)

Mr. D SREENIVASULU
TA(MATHEMATICS)
ZIET MYSURU

➢ INTRODUCTION

In the context of National Education Policy (NEP) 2020, the integration of Information and Communication Technology (ICT) in classroom teaching has become essential for promoting experiential and competency-based learning. To strengthen Mathematics teaching through technology-enabled pedagogy, a workshop on "Use of OLabs in Mathematics Teaching" was organized for Trained Graduate Teachers (TGT – Mathematics).

The Online Labs (OLabs), a joint initiative by CBSE, NCERT, and Amrita Vishwa Vidyapeetham, provide students and teachers with an online platform to conduct virtual experiments, visual demonstrations, and interactive simulations. These labs are designed to complement physical laboratories and help students perform experiments in a safe, accessible, and engaging digital environment.

The workshop was conducted to empower Mathematics teachers to integrate OLabs effectively into daily teaching and to demonstrate how digital tools can make mathematical concepts more tangible, interactive, and learner-centered.

➢ OBJECTIVES OF THE WORKSHOP

The workshop aimed to achieve the following objectives:

1. To introduce teachers to the concept, features, and structure of OLabs in Mathematics.
2. To demonstrate hands-on virtual experiments available on the OLabs platform.
3. To train teachers to use OLabs for conceptual understanding, exploration, and assessment.
4. To integrate ICT-based pedagogy with NCERT Mathematics textbooks for Classes 8–10.
5. To encourage teachers to promote self-paced, inquiry-based learning using OLabs.

➢ ABOUT OLABS – ONLINE LABS FOR SCHOOLS

OLabs is a web-based platform designed to provide interactive simulations, animations, theory explanations, and lab-based assessments. It offers teachers and students the opportunity to perform virtual activities that mimic real-world mathematical experiments.

Key Features of OLabs for Mathematics:

- Interactive simulations for Algebra, Geometry, and Statistics.

- Step-by-step theoretical explanations and guided learning.
- Real-time feedback and automated assessment.
- Availability anytime and anywhere with internet access.
- Supports CBSE, NCERT, and State Board curriculum standards.

By integrating theory with visualization and experimentation, OLabs helps students bridge the gap between abstract concepts and practical understanding.

- **WORKSHOP PROCEEDINGS**

The workshop was conducted in two sessions:

- Session I – Introduction to OLabs and its Pedagogical Relevance
- Session II – Hands-on Practice and Lesson Integration

Session I: Introduction and Demonstration

The session began with an overview of the importance of virtual laboratories in Mathematics and how OLabs support NEP 2020's goals of experiential learning and digital literacy. The resource person demonstrated the user interface of OLabs and explained its key components — *Theory, Procedure, Simulator, Viva Voce, and Reference Materials.*

Teachers explored how these sections collectively promote conceptual learning and assessment readiness. The demonstration included live simulations of selected experiments from Mathematics OLabs for Classes 8–10.

Session II: Hands-on Practice

In this session, teachers engaged in hands-on activities using OLabs modules. They practiced navigating the platform, performing virtual experiments, and interpreting results.
The following activities were conducted based on NCERT Mathematics topics:

For Class VIII

1. Verification of Properties of Quadrilaterals – Interactive exploration of diagonals, sides, and angle properties using virtual geometry tools.
2. Linear Equations in Two Variables – Visual plotting and analysis of equations and intersection points.

For Class IX

1. Verification of Angle Sum Property of a Triangle – Dynamic visualization of internal angles changing while sum remains constant.

2. Pythagoras Theorem – Interactive demonstration showing the relationship between the squares on sides of a right triangle.
3. Area of Parallelogram and Triangle – Virtual measurement and comparison using geometric transformations.

For Class X

1. Theorem on Tangents to a Circle – Constructing tangents and observing properties virtually.
2. Trigonometric Ratios and Heights & Distances – Simulations showing the variation of trigonometric values with changing angles.
3. Statistics – Mean, Median, Mode – Dynamic visualization of grouped and ungrouped data using digital tools.

Through these activities, teachers experienced how OLabs can transform abstract concepts into visual and interactive experiences, strengthening students' logical reasoning and comprehension.

- **INTEGRATION OF OLABS IN MATHEMATICS TEACHING**

Teachers were guided on effective strategies to integrate OLabs in classroom instruction, such as:

- Using OLabs simulations during concept introduction.
- Assigning OLabs activities as homework or project-based learning.
- Conducting blended learning sessions combining traditional methods with virtual experiments.
- Encouraging students to explore OLabs for self-paced revision and enrichment.
- Using the "Viva Voce" section of OLabs for formative assessment and feedback.

The workshop highlighted that regular use of OLabs can enhance classroom efficiency, promote inquiry-based learning, and make Mathematics joyful and meaningful.

- **BENEFITS OF USING OLABS**

- Visualization of Abstract Concepts: Students can see geometric transformations, graph variations, and algebraic patterns dynamically.
- Conceptual Clarity: The interactive modules strengthen understanding through experimentation.
- Accessibility: Labs are available anytime, anywhere, reducing dependence on physical infrastructure.
- Continuous Assessment: Integrated tests provide immediate feedback and reinforce learning.
- Blended Learning Support: Enables teachers to combine physical and digital learning effectively.

➢ CHALLENGES AND RECOMMENDATIONS

Challenges Identified:

- Limited internet access in some schools.
- Lack of regular ICT periods in school timetables.
- Initial hesitation among teachers unfamiliar with digital tools.

Recommendations:

- Conduct periodic training on the use of OLabs and related ICT tools.
- Include OLabs-based activities in the school academic calendar.
- Encourage peer mentoring among teachers for knowledge sharing.
- Establish monitoring and feedback mechanisms to track student progress on OLabs.

➢ OUTCOMES OF THE WORKSHOP

- Teachers gained hands-on experience with OLabs modules.
- Participants learned to design lesson plans integrating virtual labs.
- Teachers developed confidence to use OLabs for visualization, experimentation, and assessment.
- The workshop promoted collaboration and sharing of best ICT practices among teachers.

➢ CONCLUSION

The Workshop on ICT in Mathematics Teaching – Use of OLabs successfully achieved its goal of equipping Mathematics teachers with practical digital skills for classroom integration. Participants realized the transformative potential of OLabs in making Mathematics interactive, visual, and engaging.

The use of OLabs supports the vision of NEP 2020 by promoting competency-based education, digital empowerment of teachers, and experiential learning for students. Teachers left the workshop motivated to adopt these tools to create meaningful learning experiences in their classrooms.

CYBER SAFETY AND SECURITY IN CLASSROOM TRANSACTIONS

Mr. D SREENIVASULU
TA(MATHEMATICS)
ZIET MYSURU

Introduction

With the increasing use of digital platforms and online tools in education, ensuring cyber safety and security has become a vital part of ICT-based teaching. To sensitize teachers towards safe and responsible digital practices, a workshop on "Cyber Safety and Security in Classroom Transactions" was organized for Trained Graduate Teachers (TGT – Mathematics).

Objectives of the Workshop

The workshop aimed to achieve the following objectives:

- To promote awareness about cyber safety, digital ethics, and data security in educational settings.
- To understand common types of cyber threats and attacks that can affect school systems and individuals.
- To equip teachers with preventive strategies to protect personal and institutional data.
- To inculcate safe and responsible online behavior among students and teachers.
- To guide teachers in establishing cyber-safe classroom environments using secure ICT tools and platforms.

Need for Cyber Safety in Schools

Schools today are increasingly dependent on digital tools for learning, assessments, and communication. With this dependency comes the risk of cyberattacks, phishing, malware, and data breaches. As the education sector faces an average of over 8,000 cyberattacks per week in India (higher than the global average), it is essential that teachers and students understand the principles of cyber safety.

The workshop highlighted that:

- School networks often have shared devices, unlogged accounts, and inadequate protection.
- Students are more tech-savvy but less aware of digital risks.
- Teachers handle sensitive student data, making data protection essential.

- Increasing incidents of online gaming payments, phishing, and misuse of social media make awareness crucial.

Content and Proceedings of the Workshop

The workshop was divided into two sessions — conceptual understanding and practical awareness.

Session I: Understanding Cyber Safety and Security

The session began with a discussion on the difference between safety and security.
Examples were used to clarify:

- Safety: preventive measures like emergency exits, antivirus software.
- Security: active protection measures like ID verification, passwords, and network monitoring.

The resource person explained types of cyber threats such as:

- Phishing, Smishing, and Vishing – fraudulent attempts to collect personal data.
- Malware and Ransomware – malicious software designed to harm systems or steal information.
- Pharming and Typosquatting – redirecting users to fake websites.
- Social Engineering – manipulation to gain confidential information.
- Cyberbullying – use of technology to harass or harm individuals.

Each concept was illustrated with real-life examples relevant to school contexts, such as fake scholarship emails, compromised student data, and misuse of social media accounts.

Session II: Safe Digital Practices and Preventive Measures

This session focused on practical approaches to maintaining digital hygiene and preventing cyber incidents.

Participants were introduced to the concept of Cyber Hygiene — regular practices to maintain the health and security of users, devices, and data.
Key steps discussed included:

- Using updated antivirus software and strong passwords.
- Avoiding unknown links, public Wi-Fi, and USB drives.

- Keeping backup data and logging out properly after sessions.
- Avoiding sharing of OTPs, banking details, Aadhaar, or PAN information.
- Never scanning QR codes that request PIN entry during payment receipt.

Teachers were advised to follow Internet and Cyber Ethics, which emphasize honesty, respect for privacy, and responsible online behavior.
The session also covered internet addiction, false warnings, and the spread of misinformation.
Participants were reminded that "A message shared many times does not make it true."

Cyber Ethics and Digital Citizenship

The workshop emphasized Cyber Ethics — the moral principles that govern responsible behavior online. Teachers were guided to:

- Model ethical digital behavior in front of students.
- Educate students on respecting intellectual property and privacy rights.
- Avoid posting or forwarding unverified or harmful content.
- Maintain digital discipline in classroom technology use.

Special attention was given to Cyberbullying Prevention, including:

- Monitoring classroom group communications.
- Reporting abuse or offensive messages immediately.
- Promoting kindness and empathy in digital interactions.

Teachers were also informed about the legal and reporting mechanisms available, including:

- Government of India Cybercrime Portal: www.cybercrime.gov.in
- Cyber Helpline Number: 1930

Ensuring Cyber Safety in Classroom Transactions

The workshop discussed practical strategies for maintaining cyber safety during ICT-based classroom teaching:

1. Use school-verified platforms for online learning and communication.
2. Disable geolocation tracking and control app permissions on school devices.
3. Set up two-factor authentication and enable login alerts.

4. Guide students on safe search practices and appropriate online behavior.
5. Maintain separate credentials for personal and professional accounts.
6. Conduct parent awareness sessions on digital safety for children.

Participants agreed that cyber safety is a shared responsibility involving teachers, students, and parents.

Outcomes of the Workshop

- Teachers gained a comprehensive understanding of cyber threats and preventive measures.
- Participants learned cyber hygiene practices applicable in both personal and professional use.
- Teachers became aware of reporting mechanisms for cyber incidents.
- The workshop fostered a culture of responsible digital citizenship among educators.
- Teachers resolved to educate students and parents on cyber safety regularly.

The Workshop on ICT in Mathematics Teaching – Cyber Safety and Security in Classroom Transactions was a timely and valuable program that addressed one of the most critical areas of digital education.

The workshop not only enhanced teachers' awareness of cyber threats and protection strategies but also strengthened their role as digital mentors for students. It emphasized that safe digital practices are as important as subject knowledge in today's technology-driven education system.

By following safe online habits, promoting ethical behaviour, and encouraging awareness, teachers can ensure a secure and trustworthy digital learning environment in schools.

USE OF INTERACTIVE PANEL

Mr. DINESH KUMAR
TA(PHYSICS)
ZIET MYSURU

Introduction

To align classroom pedagogy with the vision of the National Education Policy (NEP) 2020 and promote technology-enabled learning, a workshop on "Use of Interactive Board" was organized for Trained Graduate Teachers (TGT – Mathematics) under the ICT in Education programme.

The use of Interactive Boards (Smart Boards) has transformed Mathematics classrooms by promoting visualization, interactivity, and collaborative learning. The workshop aimed to enhance teachers' digital competency and confidence in using the Interactive Board effectively for lesson delivery, practice, and assessment.

Objectives of the Workshop

The workshop had the following objectives:

1. To introduce teachers to the features and tools of Interactive Boards for Mathematics teaching.
2. To demonstrate practical classroom applications of Interactive Boards in Geometry, Algebra, and Data Handling.
3. To enable teachers to design and deliver interactive and engaging lessons using technology.
4. To familiarize teachers with the integration of 2D and 3D visuals, graphs, and digital tools for conceptual clarity.
5. To promote effective implementation of Interactive Boards as part of ICT-based classroom transactions.

Structure of the Workshop

The workshop consisted of a single interactive session, combining demonstration, exploration, and practice.
The session provided teachers with hands-on experience in using Interactive Board tools and applying them to classroom teaching of Mathematics topics prescribed in NCERT textbooks.

Tools and Features Demonstrated

The resource person provided a detailed demonstration of various Interactive Board tools useful for Mathematics teaching. The tools were explained along with their pedagogical applications.

Key Tools and Their Uses:

1. Pen and Highlighter Tools: For writing, solving problems, and emphasizing key points on the board.
2. Eraser Tool: For correcting content dynamically during problem solving.
3. Shape Tools: For constructing polygons, circles, and other geometric figures quickly and precisely.
4. Geometrical Tools:
    - Ruler, Compass, Protractor, and Set Square – to draw, measure, and demonstrate geometric concepts.
    - Angle Measurement Tool – to verify geometric properties interactively.
5. Double Screen / Split Screen Tool: To display two sections simultaneously — for example, a question on one side and solution steps or a graph on the other. It was shown how this feature helps in comparing shapes, graphs, and problem-solving methods side by side.
6. Graph Tool: To plot linear, quadratic, and trigonometric functions, showing dynamic variations when coefficients are changed. This helped teachers demonstrate algebraic-graphical relationships visually.
7. 2D and 3D Figure Tools:
    - Used to display 2D shapes like triangles, rectangles, and circles.
    - 3D figures like cubes, cones, spheres, and cylinders were rotated and visualized in real time.
    - Teachers learned how to explain mensuration, volume, and surface area through 3D visualization.
8. Insert Figure Tool: Teachers practiced importing pre-drawn figures, diagrams, and images from textbooks or online sources directly onto the Interactive Board for discussion.
9. Annotation and Text Tool: To write on images, graphs, and webpages directly for explanation and feedback.
10. Screen Capture and Recording Tool: To save lesson steps for later reference or asynchronous learning.

11. Import/Export Tool: For inserting GeoGebra files, OLabs simulations, NCERT textbook PDFs, and DIKSHA resources for blended learning.

The demonstration emphasized ease of integration, visual clarity, and student engagement while using these tools effectively in day-to-day classroom practice.

Implementation in Mathematics Classroom

The resource person demonstrated how Interactive Board tools can be integrated into regular Mathematics teaching to make lessons more engaging and conceptually strong.
Teachers were guided through classroom examples such as:

1. Geometry:
    - Constructing and measuring angles, triangles, and quadrilaterals.
    - Demonstrating theorems such as the Pythagoras theorem and angle sum property using 2D figures.
    - Exploring symmetry, reflection, and transformation using interactive shapes.
2. Algebra:
    - Graphing linear and quadratic equations using the graph tool.
    - Visualizing the effect of coefficients on the slope and intercept of a line.
3. Mensuration and 3D Visualization:
    - Using 3D figures to explain volume, curved surface area, and total surface area of solids.
    - Demonstrating the relationship between 2D nets and 3D solids.
4. Trigonometry:
    - Showing trigonometric ratios dynamically using movable triangles.
    - Using the double screen tool to display both numerical solutions and graphical representations simultaneously.
5. Data Handling:
    - Creating interactive bar graphs, histograms, and pie charts using the graph tool.
    - Explaining concepts like mean, median, and mode visually.
6. Assessment and Revision:
    - Recording problem-solving steps and saving the session for revision or remedial use.

- Conducting interactive quizzes and brainstorming sessions through the board interface.

Advantages of Using Interactive Boards

The workshop highlighted the benefits of integrating Interactive Boards in Mathematics classrooms:

- Visualization of Abstract Concepts: Converts symbolic expressions into visible, manipulable forms.
- Active Student Engagement: Students participate by interacting directly with the screen.
- Dynamic Demonstration: Enables real-time exploration of mathematical models.
- Efficient Lesson Delivery: Saves time with pre-prepared visuals and reusable slides.
- Multimedia Integration: Combines text, graphics, audio, and video for multimodal learning.
- Facilitates Blended Learning: Seamless integration with online resources and simulations.
- Recording and Replay: Supports flipped classroom approaches and self-paced revision.

Teachers appreciated that the Interactive Board promotes learner-centered pedagogy and enhances comprehension through visual exploration and interactivity.

Participant Engagement and Feedback

Participants actively participated in tool-based exercises, practicing basic and advanced functions of the Interactive Board. They shared innovative ways to incorporate board features into Mathematics lessons.

Feedback from participants reflected that the session was highly practical, interactive, and relevant to their daily classroom needs. Teachers expressed confidence in handling the Interactive Board independently and a strong motivation to use it regularly for effective teaching-learning.

Outcomes of the Workshop

- Teachers became proficient in operating Interactive Board tools for Mathematics instruction.
- Participants learned to create and conduct interactive digital lessons using 2D/3D tools and graphs.
- Enhanced ability to visualize mathematical concepts dynamically.
- Strengthened understanding of ICT integration in Mathematics as per NEP 2020 guidelines.
- Encouraged teachers to use Interactive Boards for assessment, demonstration, and project-based learning.

LANGUAGE BARRIERS AND AGE-APPROPRIATENESS IN USE OF ICT IN CLASSROOMS.

Ms. ANISHA N
TGT(MATHS)
PM SHRI KV NO.2 CALICUT

Understanding Language Barriers in ICT-Based Teaching

Language plays a crucial role in the success of ICT integration in education. When digital tools, applications, or educational platforms are designed monolingually or without local adaptation, students face significant comprehension challenges. In multilingual classrooms, such barriers can limit understanding, engagement, and participation.

Definition and Causes

Language barriers in ICT refer to the limitations that arise when learners are not proficient in the language used in digital tools or educational platforms.
These barriers often stem from:

- Monolingual platform design with limited localization options.
- Complex technical vocabulary in ICT applications.
- Lack of voice recognition or translation support for regional accents.
- Insufficient teacher preparation to address linguistic diversity.

Impact on Learning Outcomes

Language barriers affect both comprehension and confidence. Students may struggle to follow instructions, misinterpret mathematical terminology, or disengage from collaborative digital activities. This not only increases cognitive load but also widens the digital divide—learners from non-dominant language backgrounds often lag behind due to unequal access to comprehensible resources.

Overcoming Language Barriers

To ensure inclusivity, the speaker highlighted several practical strategies:

- **Multilingual Interfaces:** Platforms such as *DIKSHA*, *Google Classroom*, and *Microsoft Teams* now offer multiple language options to enhance accessibility.
- **Visual and Interactive Learning Aids:** Incorporating icons, images, videos, and subtitles helps bridge comprehension gaps in Mathematics lessons.

- **Use of Language Converter Applications:**
  Tools like *Google Translate*, *Microsoft Translator*, *DeepL*, and *Papago* support text, speech, and image translation—enabling both teachers and students to navigate resources effectively.

- **Teacher Training:** Continuous professional development should focus on inclusive digital practices, ensuring educators are equipped to assist linguistically diverse learners.

The resource person stressed that technology should act as a bridge—not a barrier—to learning. Proper use of translation tools, visual representations, and multilingual content can make ICT an empowering medium even in linguistically diverse classrooms.

Age-Appropriateness in ICT Integration

The second part of the session addressed the importance of aligning ICT tools with learners' **age, cognitive development, and emotional maturity.**
Age-appropriate ICT ensures that digital content, interface design, and interactivity match the developmental needs of students, making learning both engaging and safe.

Developmental Considerations

Different age groups require distinct approaches:

- **Early Childhood (Ages 3–7):** Use simple, interactive, and visually stimulating tools such as *Tux Paint*, *Endless Alphabet*, or *ScratchJr.* with guided adult supervision.

- **Primary Stage (Ages 7–12):** Introduce gamified platforms like *Kahoot!*, *Prodigy*, or *Code.org* to build digital literacy and creativity, while reinforcing online safety.

- **Secondary Stage (Ages 13–18):** Integrate productivity tools (*Google Classroom*, *GeoGebra*, *Desmos*) to promote collaboration, research, and digital citizenship.

- **Higher Education (18+):** Encourage independent learning using advanced tools such as *MOOCs*, *Canva*, and *Python*-based platforms for skill development.

Risks and Safeguards

The presenter also cautioned that inappropriate content, screen overuse, or overly complex interfaces may hinder learning and affect students' well-being. Teachers must therefore:

- Monitor screen time and ensure a balanced approach between traditional and digital learning.

- Evaluate ICT content for relevance, age-suitability, and educational value.

- Promote **digital well-being** by encouraging mindful, purposeful, and safe technology use.

Best Practices for Teachers

To effectively manage age appropriateness in ICT classrooms, the following practices were recommended:

1. **Match Tools with Cognitive Levels:** Select digital applications that complement students' comprehension ability.
2. **Encourage Creativity, Not Just Consumption:** Guide students to create content—presentations, models, or digital stories—rather than only consume it.
3. **Prioritize Digital Citizenship:** Teach cyber safety, privacy protection, and responsible online behaviour early.
4. **Collaborative Learning:** Pair students of different abilities and linguistic backgrounds for peer learning and problem-solving.
5. **Continuous Feedback:** Regularly assess learners' understanding and comfort level with digital tools.

Key Takeaways

The session concluded with a set of actionable recommendations:

1. **Prioritize Inclusion:** ICT design and implementation should consider both language and age factors from the planning stage.
2. **Involve Experts:** Collaboration among educators, linguists, and child development specialists ensures that ICT content is culturally and developmentally relevant.
3. **Invest in Teacher Training:** Teachers should be empowered to select appropriate ICT tools, design inclusive lessons, and adapt to diverse learner needs.
4. **Encourage Student Agency:** Students should be active participants—exploring, questioning, and co-creating through ICT rather than being passive recipients.

Conclusion

The session on *Language Barriers and Age-Appropriateness in the Use of ICT in Classrooms* was an eye-opening and practical discourse that connected digital pedagogy with inclusivity and child-centered learning.
It emphasized that ICT, when thoughtfully adapted, can enhance Mathematics teaching by making abstract concepts more visual and interactive. However, without sensitivity to linguistic diversity and age-specific needs, technology can inadvertently alienate learners.
The resource person urged educators to adopt a balanced, inclusive, and reflective approach—where ICT serves as a tool to *empower every learner*, regardless of language or age.

21ST CENTURY SKILLS FOR HOLISTIC DEVELOPMENT

Ms. ANISHA N
TGT(MATHS)
PM SHRI KV NO.2 CALICUT

Understanding 21st Century Skills

The resource person began by defining 21st Century Skills as a comprehensive set of knowledge, habits, and traits that enable learners to navigate the complex, interconnected, and technology-driven world with confidence and competence.
These skills go beyond traditional academics and focus on developing the learner as a whole—preparing them for careers, citizenship, and lifelong learning.

The 21st Century Skills framework can be broadly categorized into three domains:

1. **Learning Skills (4Cs)** – the core cognitive abilities essential for problem-solving.
2. **Literacy Skills** – competencies related to digital, information, and media understanding.
3. **Life Skills** – personal and social capabilities required for responsible and balanced living.

Learning Skills: The 4Cs

The heart of 21st-century learning lies in the **4Cs**—Critical Thinking, Creativity, Collaboration, and Communication.

- **Critical Thinking:** The ability to analyze information, question assumptions, and solve problems through logical reasoning. In Mathematics classrooms, it means encouraging students to explore multiple approaches to a problem and justify their reasoning.
- **Creativity:** Thinking beyond conventional methods to generate innovative solutions. Creative use of ICT tools in Math teaching, such as simulations and dynamic geometry software, helps students visualize and experiment with concepts.
- **Collaboration:** The capacity to work effectively with diverse teams, share ideas, and resolve conflicts constructively. ICT-enabled group activities, online discussions, and project-based learning cultivate this skill.
- **Communication:** Expressing ideas clearly and listening actively. In ICT classrooms, this involves written, oral, and visual communication through presentations, videos, and collaborative online tools.

These skills prepare learners not just for examinations but for real-life challenges where adaptability, empathy, and teamwork are crucial.

Beyond the 4Cs: Literacy and Life Skills

The session expanded further on Literacy Skills and Life Skills, which are equally vital for holistic growth.

Literacy Skills

- **Information Literacy:** The ability to locate, evaluate, and use information ethically and effectively.
- **Media Literacy:** Understanding and analyzing the influence of media and digital content on society.
- **Technology Literacy:** Using digital tools responsibly for learning, creation, and communication.

In Mathematics teaching, these literacies empower students to explore authentic data, use online resources judiciously, and create knowledge rather than simply consume it.

Life Skills

Life skills form the emotional and interpersonal backbone of holistic development.
Key attributes include:

- **Emotional Intelligence:** Recognizing and managing one's emotions, fostering empathy, and building resilience.
- **Leadership and Initiative:** Taking charge of learning tasks, inspiring peers, and contributing positively to communities.
- **Social and Cross-Cultural Skills:** Respecting diversity and communicating effectively across cultural and linguistic boundaries.

Together, literacy and life skills nurture students who are not only academically sound but also emotionally balanced, socially aware, and ethically grounded.

Holistic Development through Experiential Learning

A highlight of the session was the discussion on **experiential learning**—learning through play, projects, and real-world applications. The resource person emphasized that ICT tools can

facilitate hands-on and activity-based experiences that develop multiple domains of intelligence simultaneously—cognitive, emotional, and creative.

- **Game-Based Learning:** Platforms such as *Kahoot!* and *Prodigy* were cited as examples that promote teamwork, healthy competition, and problem-solving.
- **Post-Pandemic Focus:** The speaker underscored the importance of mental health and emotional well-being as integral components of education, especially after the pandemic years.

Holistic development, she explained, is achieved when the mind, heart, and hand work together—creating learners who can think critically, feel compassionately, and act responsibly.

Frameworks Guiding Skill Integration

Two major frameworks were discussed during the session:

1. **The P21 Framework (Partnership for 21st Century Learning):**
   This globally recognized model integrates *content knowledge* with essential competencies. It outlines two components:
   - *Student Outcomes* – the knowledge and skills learners should acquire.
   - *Support Systems* – the environment, curriculum, and teacher training required to nurture those skills.
2. **The Khel Planet Framework:**
   An Indian initiative promoting emotional, cognitive, social, and civic leadership skills through experiential education. It focuses on the belief that *"Every child should have the skills to create a happy life for self and community."*

Both frameworks encourage schools to **customize their approaches** based on local needs while maintaining a balance between global relevance and individual well-being.

Preparing Learners for an Evolving Future

The resource person highlighted that today's students will face **jobs that do not yet exist**, making adaptability, creativity, and continuous learning the most valuable traits.
ICT integration plays a vital role in this preparation—it builds digital empowerment, combats misinformation, and fosters informed citizenship.

In a world where social media and artificial intelligence are reshaping human interactions, **empathy, collaboration, and digital ethics** have become indispensable life skills.

The Role of Educators

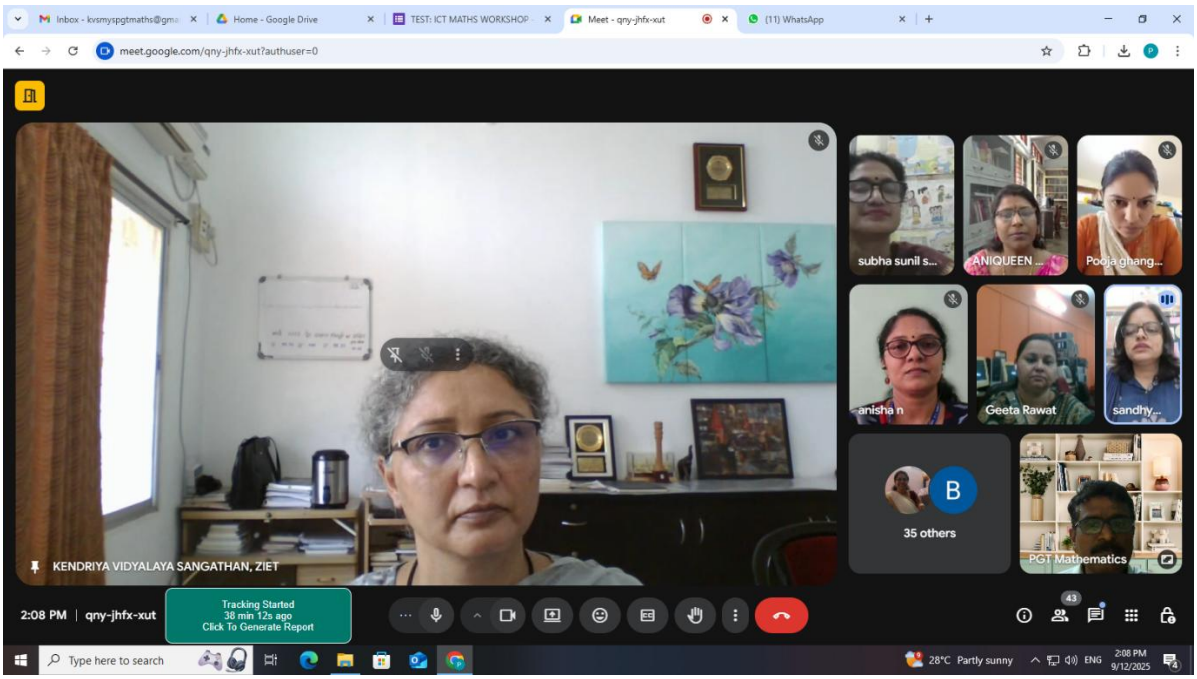
To nurture these 21st-century competencies, educators must act as facilitators rather than mere transmitters of knowledge. The session recommended several approaches:

- **Curriculum Integration:** Embed 21st-century skills within existing subjects, rather than treating them as separate components.
- **Active Learning Strategies:** Use debates, projects, role-plays, and inquiry-based approaches to stimulate higher-order thinking.
- **Professional Development:** Equip teachers with ongoing training in ICT integration, digital pedagogy, and skill-based assessment.
- **Reflective Practice:** Encourage educators to reflect on their teaching methods and adapt them to the diverse learning needs of students.

The session concluded with a powerful reminder: **education in the 21st century is about "learning how to learn" and "learning how to live."**
It is not confined to textbooks or exams but extends to developing curiosity, compassion, creativity, and critical judgment.

By combining **ICT integration with 21st-century skills**, teachers can transform classrooms into dynamic spaces that cultivate intellectual curiosity, emotional intelligence, and social responsibility.
The resource person urged educators to embrace the shared mission of preparing students not just to *survive* but to *thrive*—as capable, confident, and conscientious citizens of the digital world.

PHOTOS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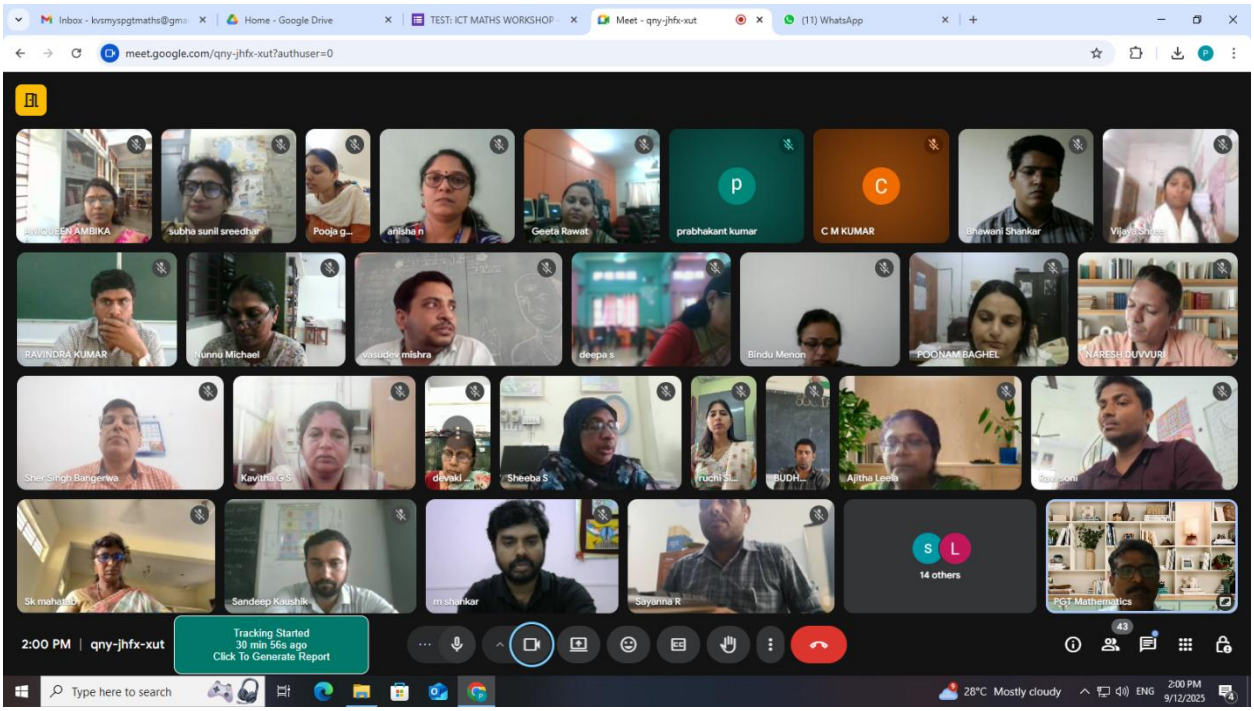
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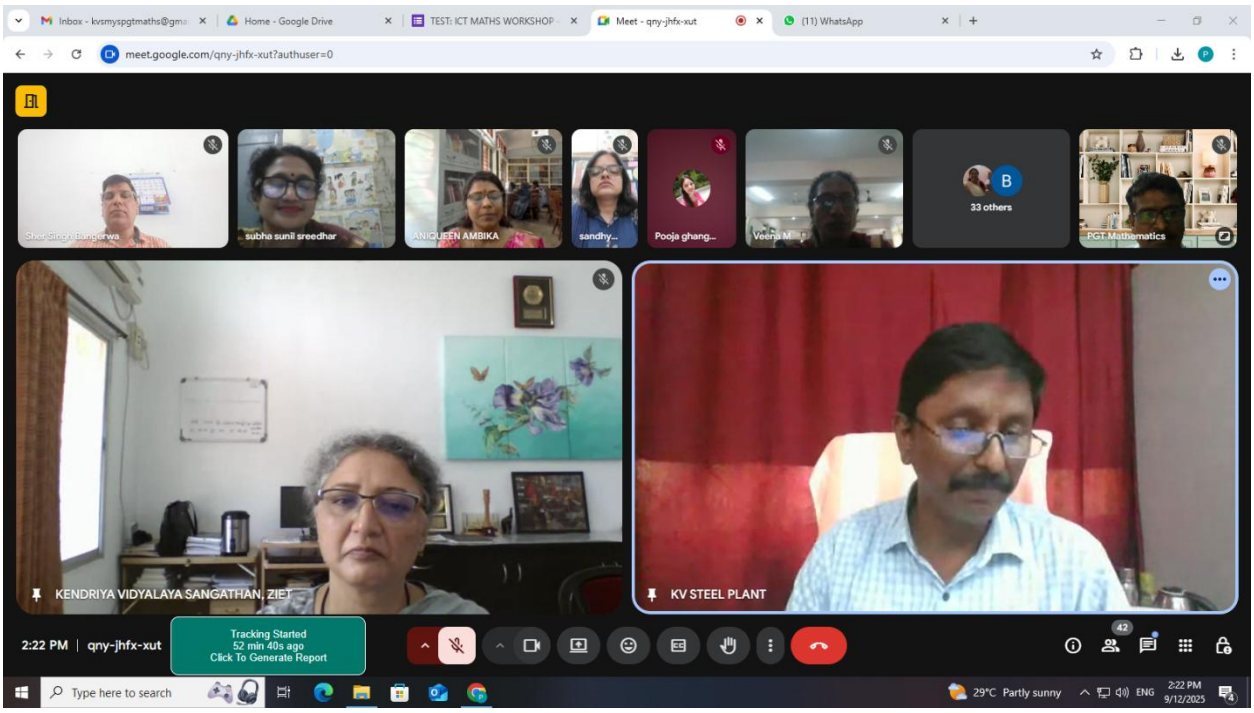
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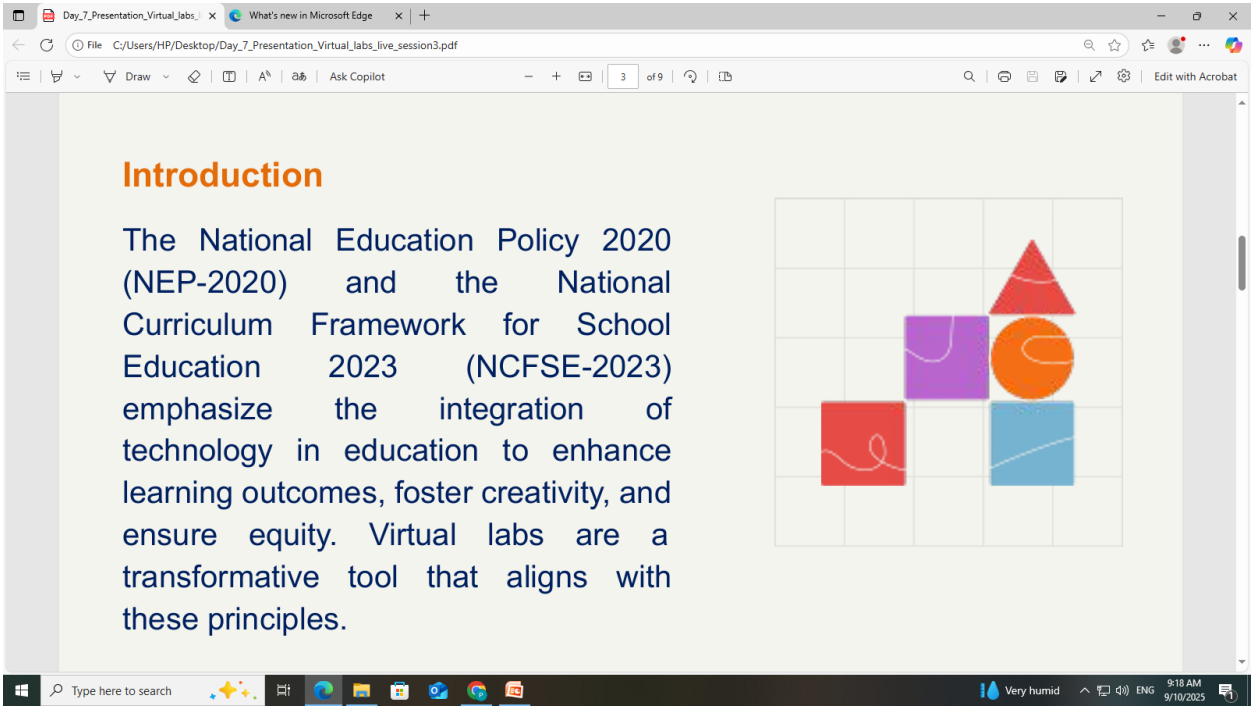
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Introduction
The National Education Policy 2020 (NEP-2020) and the National Curriculum Framework for School Education 2023 (NCFSE-2023) emphasize the integration of technology in education to enhance learning outcomes, foster creativity, and ensure equity. Virtual labs are a transformative tool that aligns with these principles.
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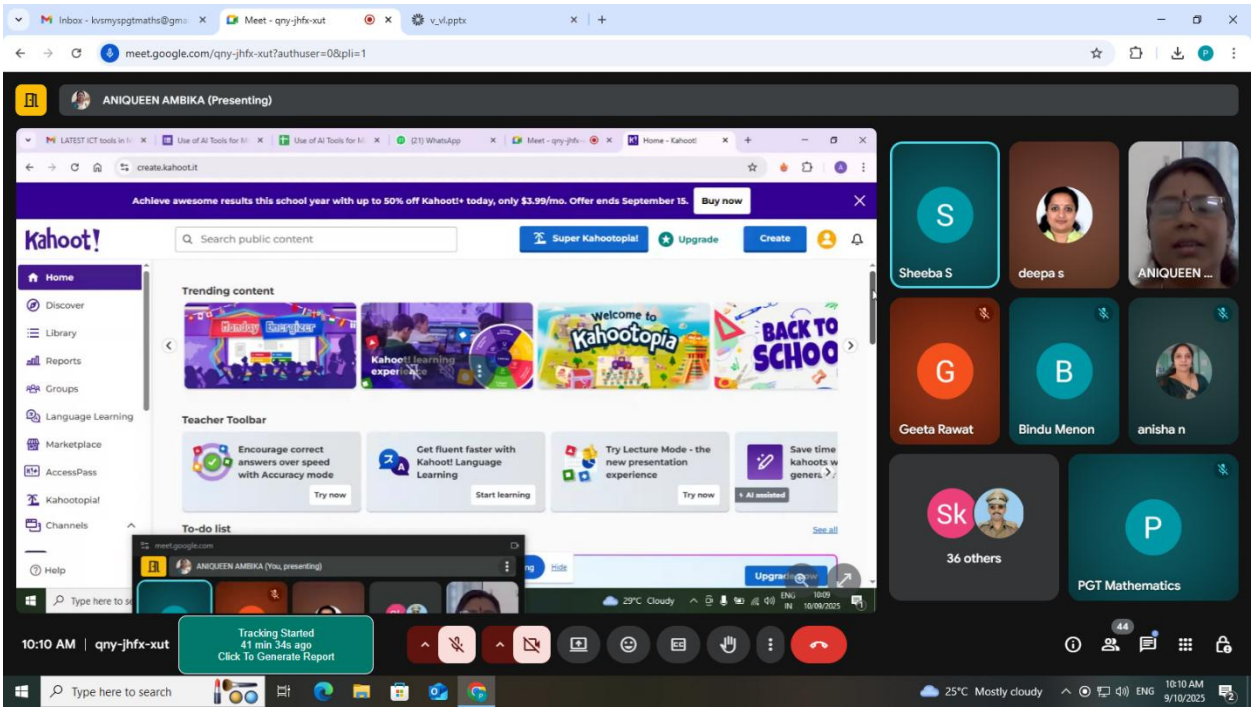
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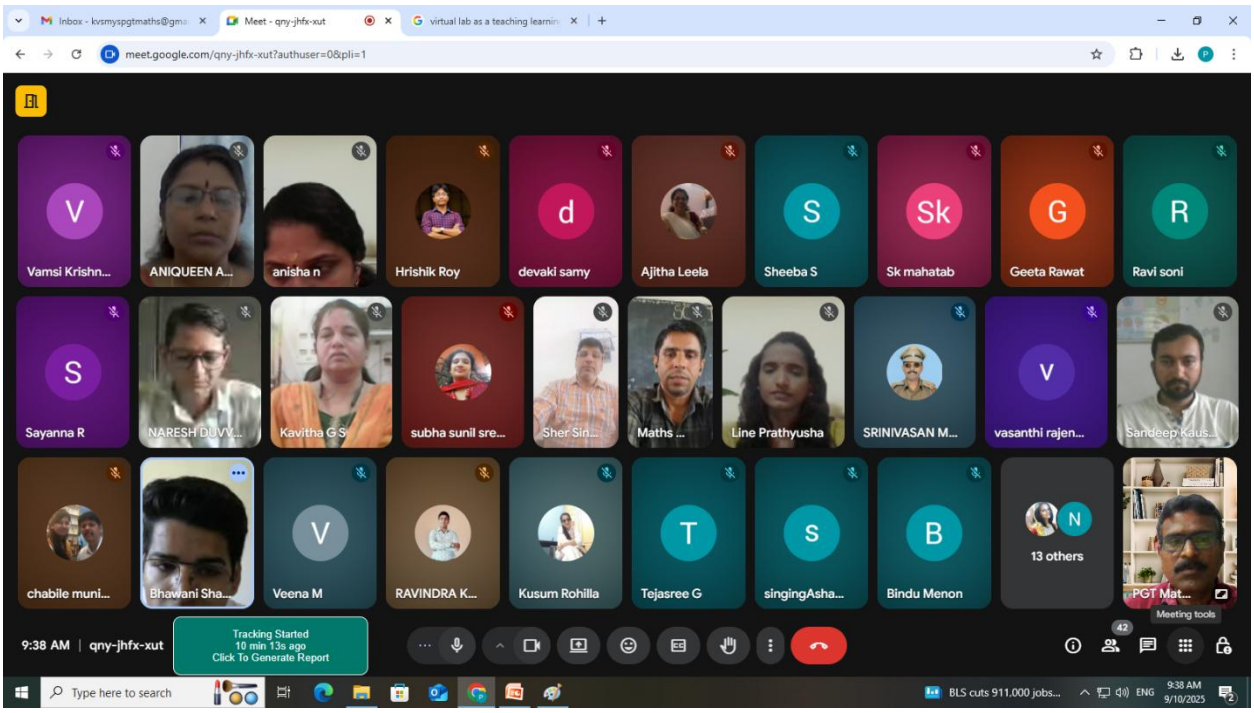
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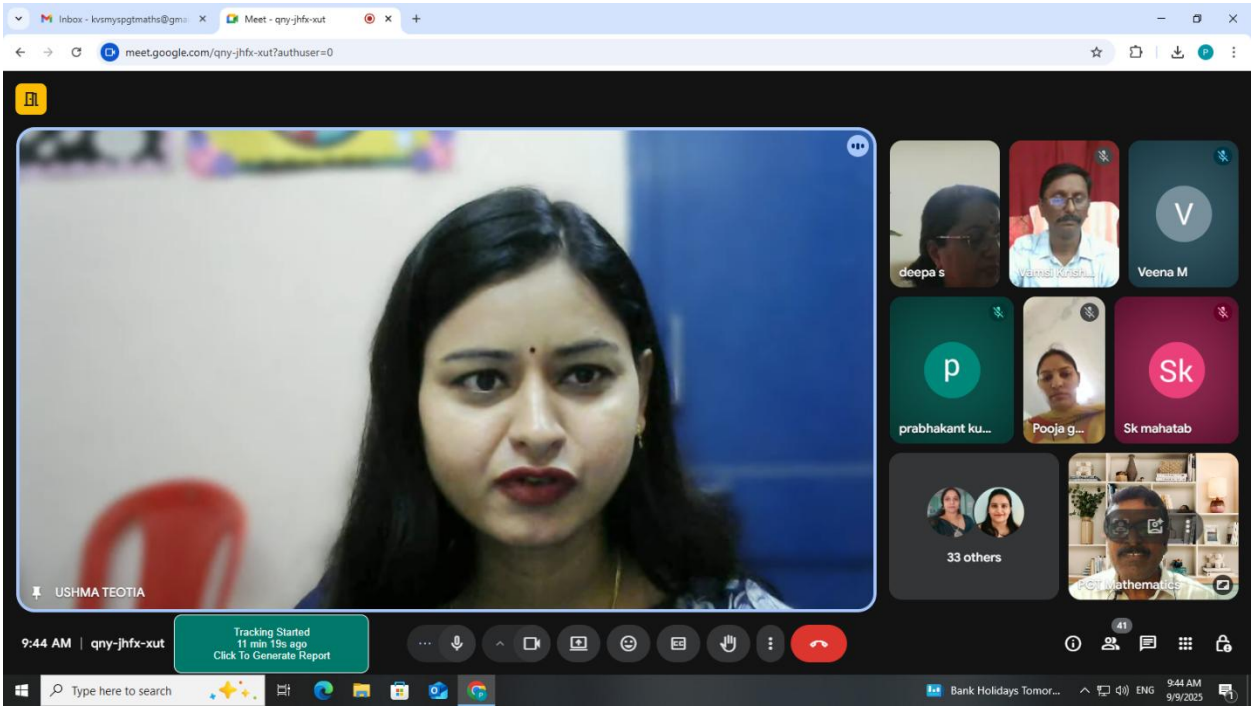
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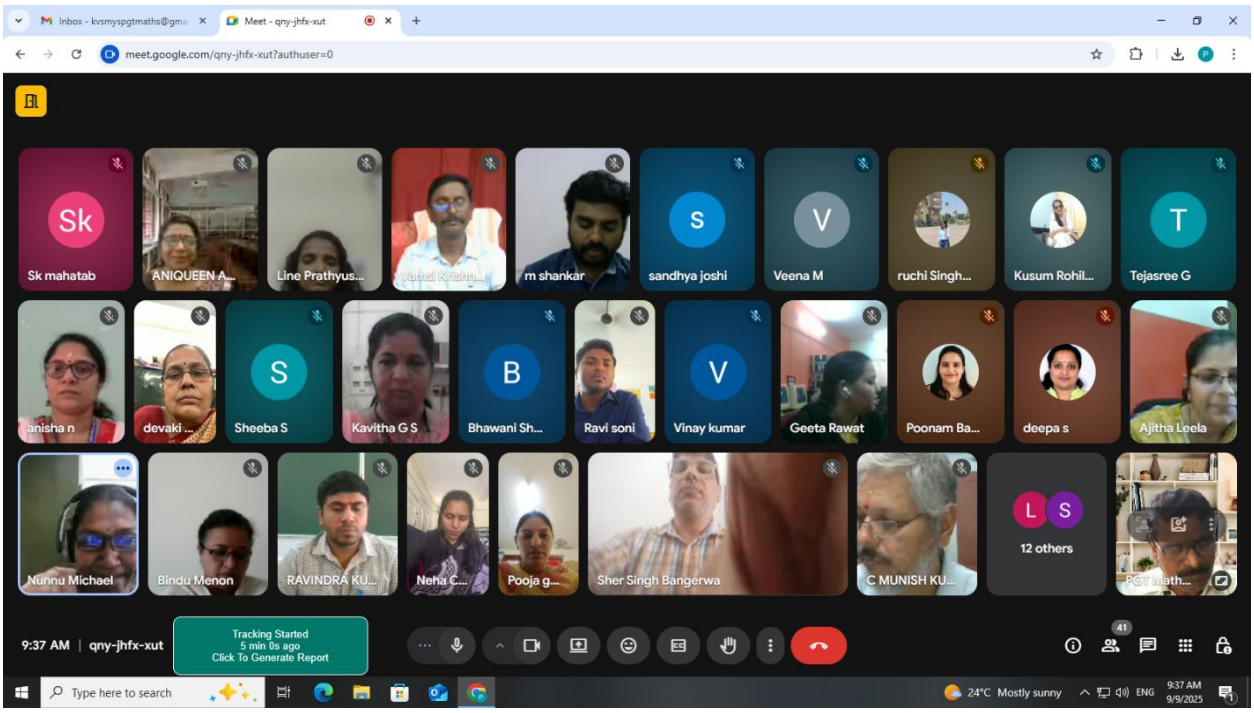
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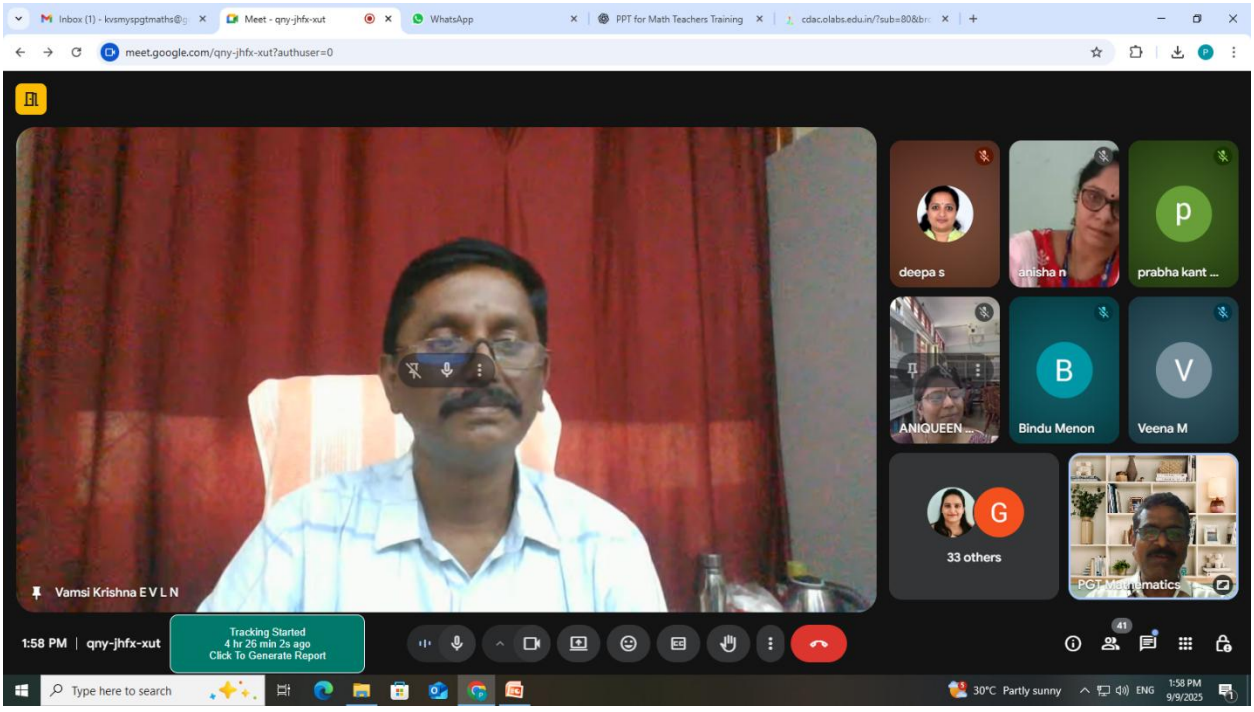
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