Empowering the Mathematics Teacher: Innovative practices to enliven the mathematics classroom

A Workshop for mathematics teachers

Organized by

Ramanujan Foundation for Initiatives in Mathematics Education
in collaboration with

Ramanujan Mathematical Society,

Azim Premji University and Sanskriti School

7th & 8th November 2014

A Report

A two – day workshop was conducted by the Ramanujan Foundation for Initiatives in Mathematics Education (RFIME) as a part of its ongoing professional development programmes for mathematics teachers of schools in Delhi. The workshop was organized in collaboration with Azim Premji University (APU) and the Ramanujan Mathematical Society (RMS) at Sanskriti School, New Delhi. 38 teachers from 17 schools across Delhi and Gurgaon participated in the workshop. The workshop focused on

- Problem solving sessions which excite the mathematical curiosity of the student.
- Discussion of applications of mathematics which highlight the relevance of mathematical concepts taught at the middle school and secondary school level.
- Assessment of mathematics learning with special reference to articlea from At Right Angles.
- Lectures on mathematical topics related to the curriculum.

The sessions of the workshop were conducted by Dr. Jonaki Ghosh, RFIME and Dr. Haneet Gandhi, RFIME and by Professor Geetha Venkataraman from the Ramanujan Mathematical Society (RMS). The programme schedule of the workshop is given at the end of the report. Articles from various issues of At Right Angles were used as the reference material for the sessions conducted by the RFIME resource persons.

Session1 : *Learning Mathematics Through Problem Solving* was conducted by Dr. Jonaki B Ghosh. It was an interactive session on exploring various approaches to problem solving. Many of the problems discussed in this session were taken from the problem corner section of the At Right Angles. The Tower of Hanoi problem discussed in detail and was conducted in an activity mode.

Session2 : *Assessment for learning mathematics* was conducted by Dr. Haneet Gandhi. It was based on posing open ended questions for assessing students' learning.

Session3 : *Developing algebraic thinking through fractal geometry* was conducted by Dr. Jonaki B Ghosh. It was a hands on interactive session on exploring basic concepts of fractal geometry and on enabling students to visualize various geometric sequences arising out of the properties of the fractals. A numerical exploration on Excel was also discussed.

Session 4 : *Presentation by teachers.* Teachers from Lotus Valley International School and Sanskriti school, who had attended the May workshop, presented their classroom experience of integrating the AtRiA activities with their students.

Session 5: *Understanding Symmetry* was conducted by Professor Geetha Venkataraman from Ambedkar university. The session focussed on four subareas: symmetry of finite planar objects, Symmetry of strip patterns, symmetry of wall paper patterns and a case study: Humayun's Tomb Through the lens of symmetry. The connections of symmetry to groups were briefly discussed. There was an exploratory session where participants were required to discover symmetries and symmetry types for cut-outs of geometric shapes and some
Strip and wall paper patterns.

Session 6: *Exploring mathematical concepts with dynamic software* was a hands-on workshop session on GeoGebra conducted By Ms. Sangeeta Gulati, Head, Mathematics Department, Sanskriti School. The session was held in the computer lab and participants tried out the GeoGebra explorations on the computers. The explorations focussed on concepts of the middle school. Sangeeta also demonstrated the use of Desmos, an online graphics calculator. The session ended with the discussion of a framework, using which meaningful exploratory tasks can be made on GeoGebra. This discussion was conducted by Dr. Jonaki Ghosh.

Session 7: *Open ended tasks in mathematics* was an interactive session conducted by Dr. Haneet Gandhi. Teachers were required to create problems and tasks and discuss them with the group. The discussion led to the preparation of mathematically rich tasks.

During the closing session a feedback was taken from the participating teachers. All the sessions of the workshop were well received and teachers showed keeness to integrate some of the activities in their classroom. Some were even motivated to contribute articles for At Right Angles. Dr. Jonaki Ghosh familiarised the teachers with the different sections of the magazine and suggested topics on which teachers could contribute articles.

Workshop programme schedule

Friday, 7th November 2014

8:30 am	**REGISTRATION OF PARTICIPANTS**

9:00 am	**INAUGURAL SESSION**
	• Welcome of participants
	• *About RFIME*, an introduction to the activities of the Foundation
	  by Dr. Jonaki B Ghosh, RFIME
	• Recap of the May workshop,
	  by Dr. Haneet Gandhi, RFIME

9:15 am	**Session 1 :** *Learning Mathematics Through Problem Solving* An interactive session on exploring approaches to problem solving by Jonaki B Ghosh, RFIME
10:30 am	TEA
10:45 am	**Session 2 :** *Assessment for learning mathematics* by Haneet Gandhi, RFIME
12:00	**Session 3 :** *Developing algebraic thinking through fractal geometry* An interactive hands on session by Jonaki B Ghosh, RFIME
1:00 pm	**LUNCH**
2:00 pm	**Session 3 :** *Developing algebraic thinking through fractal geometry (contd.)* An interactive hands on session by Jonaki B Ghosh, RFIME
2:30 pm	**Session 4 :** *Presentations by Teachers* A glimpse into innovative classroom activities conducted by participating teachers

Saturday, 8th November 2014

8:30 am	**Session 5:** *Exploring Symmetry* An Interactive Session by Professor Geetha Venkataraman, School of Undergraduate Studies, Ambedkar University
10:30 am	TEA
11:00 am	**Session 6:** *Exploring mathematical concepts with dynamic software* A hands on workshop session by Ms. Sangeeta Gulati, Head, Dept. of Mathematics, Sanskriti School
1:00 pm	**LUNCH**
2:00 pm	**Session 7:** *Open ended tasks in mathematics* by Dr. Haneet Gandhi
3:30 pm	**Valedictory Session** Summary of the programme Feedback session Vote of Thanks