

HBCSE's third Annual Research Meet (ARM)

The Annual Research Meet is conceived to be a kind of retreat which enables pleasant yet intense academic interactions among students and faculty. Its objective is to create and maintain a vigorous collaborative research ambience at HBCSE.

The first Annual Research Meet at HBCSE was held on February 11-13, 2010. Last year it was held during 19-21 April.

ARM features presentations and talks by Ph.D. students in their 2nd Year onwards. It is organised by the first year students. At present, the event is organised in the following way:

- After the event dates are finalised, and important dates in the run up to the event are announced, students first submit abstracts to indicate intent to present.
- Soon after, presenters suggest faculty discussants for their presentation, and initiate a dialogue with discussants to schedule their submission.
- Presenters arrange to provide a draft paper/ write-up to their discussants well in advance. This write-up may be a **draft** of a research publication (or leading towards a publication). In some cases students who have recently published research may present that work. It may also be work-in-progress, indicating clearly what aspects of analysis or discussions are yet to be completed.
- The student's write-up is read by the discussant before the presentation, and comments and suggestions are given by the discussant after the student's presentation.

The event can and should evolve in format, including scheduling, primarily through the active engagement of the research students, and other members of the research community at HBCSE.

I thank Gurinder Singh and Rosemary Varkey, the first year students for enthusiastically meeting the challenges of organising the event. That 15 research students will be presenting at ARM 2012, even though some felt highly pressured by other commitments, is an indication that the event is valued by the students. We, Gurinder, Rosemary and I, are grateful to all the students for their cooperation. We are thankful to Manoj for help with the abstract booklet layout and printing.

A big "thank you" to all faculty and post-doctoral colleagues who have supported the event and helped to bring seriousness and rigour to research at HBCSE. Look forward to ARM 2012, the academic festival for the students and of the students of HBCSE.

Chitra Natarajan
Dean, HBCSE Faculty



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1. Integrating Assessment in School Projects: On a Journey with Teachers



Saurav Shome

National Curriculum Framework – 2005 (NCF – 2005) has suggested reforms in assessment practices in education. These suggestions led to generation of guidelines for new student assessment practices by several school systems. However, these unfamiliar assessment practices pose multiple challenges to teachers and school authorities in terms of implementation.

The paper presents a journey of attempting to address issues of assessment in teacher professional development through a series of workshops carried out during 2010 – 11. The central aim of the workshops was to assist teachers in developing project based learning (PBL) modules for middle and high school students. The PBL modules developed by teachers would integrate a variety of assessment modes in meaningful ways, consistent with the suggestions in NCF-2005.

The narrative of the journey includes analysis of the assessment practices in school projects existing in 2010. It discusses the issues involved in integrating assessment while teachers developed their project plans. During the workshops teachers were introduced to different kinds of assessment practices including assessment using rubrics.

The framework for the workshops is influenced by Schon's idea of teachers as reflective practitioners. In line with Paulo Freire's ideas, teachers require to have ownership of their own struggle. The structured interactions followed a constructionism paradigm and engaged the teachers in developing their project and the rubrics for assessment. The assessment practices are analysed from the social-constructivist point of view. The conversations during interviews and researcher's interaction with students, teachers and others are analysed on the basis of a grounded theory framework.

The paper will explore the ideas, attitudes towards assessment and actual and evolving assessment practices among participating teachers evident during the workshop and in subsequent school visits. The views of students, school principal, teachers educators, and school management towards assessment were also explored through semi-structured interviews. The paper describes the iterative process of incorporating the experiences gained from each workshop in subsequent workshops either with the same teachers or among a new batch.

Keywords: *Project-based-learning, NCF-2005, assessment, teacher-professional-development, rubrics.*

Guide: Chitra Natarajan

Discussant: Sanjay Chandrasekharan

Publications

Shome, S., Shastri, V., Khunyakari, R. & Natarajan C. (2011). What do students learn from designing and making a playground model? In *Kay Stables, Clare Benson and Marc de Vries (Eds.) Proceedings of PATT 25 & CRIPT 8: Perspectives on learning in design and technology education*, pp. 357 – 366. London: Goldsmiths, University of London.

Patel, A., Shome, S. & Natarajan C. (2009). A study of middle school students' ideas about photosynthesis through multiple interaction modes. *In Proceedings and papers of Panel on Ecological and Environmental Science Education in India of II People's education congress from 5-9 October 2009 at HBCSE, Mumbai.* Allahabad; Peoples Council of Education.

2. Concept Inventory in Rotational Kinematics



Mashood K. K.

A concept inventory is a set of carefully designed multiple choice questions aimed at probing misconceptions, revealing deficient understanding and eliciting ill suited reasoning patterns. Our research involves development of a comprehensive concept inventory in rotational kinematics. A brief overview of important existing inventories developed by the physics education research (PER) community will be presented. Our work is similar in characteristic to focussed inventories and pertain to the concepts angular velocity and angular acceleration. A formal knowledge of the domain is required to answer the questions/items. The processes involved in the construction of our inventory (and inventories in general) will be illustrated. We also discuss statistical indices which are employed in the analysis of the response pattern to the test. The significance of concept inventory in the Indian educational context will be briefly discussed.

Publications

K. K Mashood and Vijay A Singh (2012). Variation in angular velocity and angular acceleration of a particle in rectilinear motion, *European Journal of Physics*, 33, 473.

Guide: Vijay A. Singh

Discussant: Anwesh Mazumdar

3. Exploring the Connection between Multiplicative Thinking and Area-measurement



Jeenath Rahaman

The understanding of the area concept requires connecting multiplication to geometry. Multiplicative thinking is a well researched area in mathematics education and has applications in a broad range of topics, like understanding the inverse relation, part-whole relation, fractions, proportion, etc. On the other hand, the domain of measurement is relatively less researched, even few studies to explore the connection between measurement and multiplicative thinking.

Geometric measurement involves deriving a new quantity (the number of units), from two known quantities – magnitude of the unit and magnitude of the space to be measured. Lamon (2007) and several others have argued that the way measurement is handled in the elementary curriculum leads students to do an act of measuring, rather than developing the concept of measurement. She showed that very few students could understand that the unit of measure could be broken further into smaller subunits to make the measurement more precise. In the present study, we attempt an exploration of the different ways in which multiplicative thinking is involved in the geometric measurement of area, with a specific focus on developing tasks that elicit the use of multiplicative thinking in finding the area of geometric figures.

We report a task-based interview with a mixed group of 19 grade five students, where we try to explore the connections between numerical and geometrical aspects of area-measurement via multiplicative thinking.

Keywords: *multiplicative thinking, geometric measurement, area, unit.*

Publications

Rahaman, J. (2011). An Analysis of Students' Representation of Area and Perimeter , Paper presented at *National Initiative on Mathematics Education Western Regional Conference* held at IISER, Pune.

Rahaman, J. (2011). An Analysis of Students' Strategies for Area Measurement and its Curricular Implications , Paper presented at the 46th Annual conference of *the Association of Mathematics Teachers of India (AMTI)*, Vidya Prathishtan, Baramati.

Rahaman, J., Subramaniam, K., & Chandrasekhran, S. (forthcoming). Exploring the Connection between Multiplicative thinking and the Measurement of Area. The 12th International Congress on Mathematical Education. COEX, Seoul, Korea.

Guide: K. Subramaniam

Discussant: Rajesh B. Khaparde

4. Grade 3 Students' Measurement Experiences and Performance in Length Measurement Tasks



Prajakt P. Pande

Understanding spatial concepts like area, volume their derived quantities relies on understanding length measurement and the concepts underlying it. In many Indian curricula, learning length measurement is placed at the beginning in the trajectory of learning measurement of quantities in general (e.g. NCERT, Maharashtra State Board & Bihar SCERT Grade 1 to 8 science and mathematics textbooks).

In this study we started with analyzing the progression of the topic of length measurement through Grades 1-8 in the above mentioned textbooks to help develop a semi-structured whole class interaction. The study further attempted to explore measurement experiences of 24 students from Grade 3 at the a primary school in Patna and their responses to certain tasks viz. Comparison, seriation, estimation and measurement through a whole class interaction session, in relation to findings from the literature. In addition, the study also discusses in brief the situation of government primary schools in Patna.

The overall situation of government primary schools in Patna was found to be poor in terms of infrastructure, attendance of students and teachers, regularity of classes and motivation. Many of the students in schools are first generation learners and work to support their families financially. Students, in general, shared various out of school experiences of measurement and showed mixed performances in the length measurement tasks posed during the whole class interaction session.

Keywords: *Measurement, measurement experiences, length measurement, standard and non-standard units of measurement, comparison, seriation, estimation.*

Guide: Jayashree Ramadas

Discussant: K. Subramaniam

5. Chat Activity: Collaborative and Constructive Way of Learning in Social Environment



Rafikh Shaikh

In a regular Indian classroom, we expect children to become literate, but do not allow them to speak enough or communicate with each other. In a technology aided classroom, however, the barriers to different types of communication breaks down. For instance, communicating in writing in a virtual chat room allows children to become literate, as well as situate themselves in a social environment. Because of the latter possibility, children look forward to this activity with lots of motivation and interest.

Learning literacy skills is an obvious possibility with a chat room. Can it also help develop numeracy skills? To explore this question, we modified some rules of the virtual chat room in the XO Laptop. The modifications were needed to facilitate development of arithmetic skills like addition, subtraction and multiplication. We present the highlights of this chat room experiment, and outline the insights gained from the analysis of the logs collected for five months from a group of 15 tribal village students (3rd and 4th grade).

Based on these insights, we propose an effective strategy for teaching mathematics in a technology-aided classroom, using a collaborative and constructive mode of teaching/learning.

Keywords: *Social Environment, Virtual Chat, Numeracy skills, Technology aided education.*

Guide: Nagarjuna G.

Discussant: Sanjay Chandrashekaran

6. A case for External Representations and Epistemic Actions



Anveshna Srivastava

As part of my proposed research work on the cognitive role of external representations in understanding DNA structure, I present here a part of my ongoing literature review. My research seeks to answer specific questions related to the different cognitive mechanisms employed in the use of external representations and how internal representations are built up by interacting with different external representations. To answer these questions, I refer here to two works of David Kirsh, which gives an account of how using external representations, and performing epistemic actions in the world, enhance one's cognitive abilities. I aim to discuss author's view point on the subject matter while trying to explore connecting links with my proposed work.

Keywords: *External representation, internal representation, cognitive strategies, epistemic action.*

Publication

Srivastava, A. & Ramadas, J. (In press). Analogy and Gesture for Mental Visualization of DNA Structure. In Treagust, D.F. & Tsui, C.-Y. (Eds.), *Multiple Representations in Biological Education*. Dordrecht, The Netherlands: Springer.

Guide: Sanjay Chandrasekharan

Short Presentation

7. What Aspirations Do Students with Disabilities Have in Science?



Amit Sharma

For a democratic and egalitarian society, education needs to be inclusive so that equal opportunities are made available to all students. However it has been found that only a few students with disabilities get enrolled in higher levels of education (NCPEDP, 2005). One of the reason behind this may be the present state of education which does not fit into the aspirations of students with disabilities. Aspirations of children are “a reflection of what they wish to become and subsequently guide a number of factors that impact what they will eventually do in life.” (Bal & Wiley, 2005).

Aspirations develop a will in students to “invest time, effort or money to attain a goal” (Sherwood, 1989). The paper reports on a study of the aspirations of 31 students with respect to science. The students had different physical disabilities and were studying in classes Vth and Xth in 6 different schools. The study is important for science education as it throws light on the aspirations of students with disabilities and suggests ways to make science education more inclusive.

Guide: Sugra Chunawala

Discussant: G. Nagarjuna

8. Knowledge of Non-formal Measurement Units Among Working-class Middle-graders: An Exploration



Arindam Bose

Measurement is a topic area that makes strong connections between school mathematics and real life. In most countries around the world, the international system of units prevails and this is the only system that is included in the school mathematics and science curriculum. This was not the situation around a hundred years ago. For example, in India, multiple systems of units were used for currencies, weight, volume and time measurement up to the 19th Century. These included both indigenous units and their local variations and the units introduced by the British colonial power. Even now the measurement units used in small-scale manufacturing and in the informal sector of the industry are different from the standard international units. Besides formal, non-standard units, informal units of convenience which are not precisely quantified are used. Similarly non-standard instruments of convenience are also used. A study of such instruments and units, the modes of their use and the manner in which quantification is achieved tell us about the interaction of mathematics with the real world.

In this paper, we describe some of the units that are still being used in the informal sector of the industry, in which many children from low-income families participate in various ways and are often exposed to a variety of such units. Data was collected as part of an ongoing study in a large low-income area in central Mumbai to understand the variation in children's out-of-school mathematical knowledge as well as their involvement in the economic activity. The data used for this paper is drawn from semi-structured interviews, informal visits to the house-holds and small manufacturing units, and discussions held with adults in these locations.

Keywords: *standard, non-standard units, non-formal units, informal sector*

Refereed papers:

Bose, A. & Subramaniam, K. (*forthcoming*). Profile of Students' Arithmetical Knowledge Acquired In and Outside School. (Poster Presentation). In *Proceedings of the Twelfth Conference of International Congress of Mathematics Education*, Seoul: ICME.

Subramaniam, K. & Bose, A. (*forthcoming*). Measurement Units and Instruments – The Indian context. In *Proceedings of the Twelfth Conference of International Congress of Mathematics Education*, Seoul: ICME.

Prediger, S., Clarkson, P. & Bose, A. (*forthcoming*). A Way Forward for Teaching in Multilingual Contexts: Purposefully Relating Multilingual Registers. In *Proceedings of the Twelfth Conference of International Congress of Mathematics Education*, Seoul: ICME.

Choudhury, M. & Bose, A. (2011). An Investigation of the Role of Language-negotiations in a Multilingual Mathematics Classroom. In M. Setati, T. Nkambule, & L. Goosen (Eds.). *Mathematics and language diversity: Proceedings of the ICMI Study-21 Conference*, São Paulo, Brazil. (pp. 28-37).

Bose, A. & Subramaniam, K. (2011). Exploring school children's out of school mathematics. In Ubuz, B. (Ed.). *Proceedings of the 35th Conference of the International Group for the Psychology of Mathematics Education*, Vol. 2, pp. 177-184, Ankara, Turkey: PME.

Bose, A. & Subramaniam, K. (2011). Exploring school children's 'everyday' mathematical knowledge. Poster Presentation. In Ubuz, B. (Ed.). *Proceedings of the 35th Conference of the International Group for*

the Psychology of Mathematics Education, Vol. 1, p. 477, Ankara, Turkey: PME.

Bose, A. & Choudhury, M. (2010). Language Negotiation in a Multilingual Mathematics Classroom: An Analysis. In L. Sparrow, B. Kissane, & C. Hurst (Eds.), *Shaping the future of mathematics education: Proceedings of the 33rd Conference of the Mathematics Education Research Group of Australasia, Inc.*, Fremantle, Australia: MERGA. (pp. 93-100). Available at http://www.merga.net.au/documents/MERGA33_Bose&Choudhury.pdf

Bose, A. (2009). Mathematical Riddles among the Mushars: Linked to a Historical Tradition? In M. Tzekaki, M. Kaldrimidou, & H. Sakonidis (Eds.). *Proceedings of the 33rd Conference of the International Group for the Psychology of Mathematics Education*, Vol. 5, pp. 439. Thessaloniki, Greece: PME.

In Science Communication Journal:

Bose, A., Sharma, A., & Mishra, K. K. (2011). Samachar-patron mein surya-grahan: Ek shaikshik evam vishleshanatmak adhyayan. *Vigyan Parishad Anusandhan Patrika*, 54 (2), 37-44. Vigyan Parishad: Prayag. ISSN: 0505-5806.

Other papers:

Bose, A. (2010). Knowing the World better through Mathematics: Bringing together Critical Mathematics Education and Everyday Mathematics. *Prof. A. Narasinga Rao Memorial Lecture. In the proceedings of the 45th Annual Conference of the Association of Mathematics Teachers of India (AMTI)*, Calcutta, India. (pp. 51-62).

Guide: K. Subramaniam

Discussant: Sugra Chunawala

9. Reviewing Research on Teaching Contexts that Support Algebraic Thinking in Children



Shikha Takker

Algebra is identified as a difficult concept in middle school mathematics. There exists plenty of research on developing students' algebraic thinking and their difficulty in moving from arithmetic to algebra. Different suggestions have been made to build the gap between arithmetic and algebra like considering algebra as an extension of arithmetic or algebraization of arithmetic. However, most of research in the field of teaching and learning algebra has remained far from the purview of teachers, who are actually teaching algebra to students in classrooms.

The larger objective of the study is to explore and (later) strengthen teachers' knowledge about students' algebraic thinking. Students' algebraic thinking is accessed through the contexts being used to introduce algebra in classroom. These contexts would address generalisation, justification, or proving, which are central to algebra teaching and learning.

In this paper, I intend to review the research on algebra teaching and learning with a specific focus on the contexts being used to introduce algebra to students and ways in which students respond to them. I will also try to look at the researches that have supported teachers' understanding of students' thinking and learning of algebra. In the process of this review, I intend to gain insights about the nature of work that has happened in the field and draw implications for teaching and learning. This would mean identifying selected parts from review which can be shared or experienced with the teachers to build on their understanding of students' algebraic thinking.

Keywords: *algebraization of arithmetic, students' algebraic thinking, teacher knowledge, algebra contexts*

Publications

Takker, S. (2011). Reformed Curriculum Framework: Insights from Teachers' Perspectives, *Journal of Mathematics Education at Teachers College: Mathematics Curriculum Issue*, Vol 2, pp 34-39

Takker, S. & Subramaniam, K. (2011). Potential of Classroom-based Tasks for Eliciting Teachers' Knowledge about Students' Mathematics, Paper presented at *National Initiative on Mathematics Education Western Regional Conference* held at IISER, Pune

Takker, S. (2011). Using Classroom-based Tasks as Contexts for Reflection and Situating Teacher Learning. *Proceedings of National Seminar on Preparation and Professional Development of Teacher Educators: A Report*. Regional Institute of Education (NCERT), Mysore

Takker, S. & Subramaniam, K. (forthcoming). *Understanding Teachers' Knowledge of and Responses to Students' Mathematical Thinking*. Paper (to be) presented at *The 12th International Congress on Mathematical Education, Seoul, Korea: ICME*

Guide: K. Subramaniam

Discussant: Jayashree Ramadas

10. Several Lines of Inquiry into Inquiry Teaching and Learning: Exploring the Affective Outcomes of Inquiry-Oriented Science Teaching



Aisha Kawalkar

In this paper, we report our explorations of some affective outcomes of teaching science through inquiry. In the process of developing an innovative inquiry-oriented science curriculum, we conducted classes with middle school students (Grades 6 through 8) over several years. In these classes, we discovered some notable affective changes in students, although the focus of teaching in these classes was on conceptual understanding. At the end of our four year intervention with them, we administered self-report questionnaires to the students, and conducted follow-up interviews. We also administered questionnaires to students' parents and peer group to obtain richer data and for triangulation of students' responses. The self-reports and interviews indicate, among other positive changes, increase in students' engagement levels with the topic at hand, their interest in science, self-confidence and participation in science classes. In this paper, we report some of the preliminary qualitative analysis from this study. We also briefly discuss how

it informed the design of a subsequent in-depth exploration of affective changes in students in response to inquiry-oriented science teaching.

Keywords: *Inquiry-based science teaching, affective outcomes, students' self-reports, middle school*

Guide: Jyotsna Vijapurkar

Discussant: Karen Haydock

11. An Exploration for a Theoretical Framework to Understand and Design Learning Ecologies for Facilitating Quantitative Knowledge



Shradha Ghumre

The discussion is an attempt to elaborate on the core issue of my research project- an inquiry into the causes that help learners to reorganize their knowledge structure, facilitating an iterative adaptive shift from qualitative to quantitative knowledge. For purposes of organizational clarity, I will discuss the causes of restructuring through the interdependent categories of agent-related and environment-related cognitive resources. Such an interdependence highlights an important aspect that in order to understand the cognitive process of knowledge restructuring one has to look for a broader class of events and structures as the factors of analysis. These factors transcend the view that cognitive processes are fully embodied to ones that are actively distributed and reliably coupled between agent and the environment (material means, social groups, through time). Such a distributed and active externalization of cognitive processes strengthens the notion of the environment being composed of semiotic action objects. Consequently, these processes are essentially action-dependent and dynamic and the structures involved are plastic.

An understanding of how the agent and the environment based resources aid in the adaptive shift is expected to feed into the characterization and design of learning ecologies.

Lastly, the dynamics of coupling between the agent and the environment is expected to throw light on how such interactions could have favored the construction of knowledge.

Guide: Nagarjuna G.

Short Presentation

12. Interaction between Belief and Pedagogical Content Knowledge of Teachers While Discussing Use of Algorithms



Ruchi S. Kumar

Elementary education in India has long held teaching of algorithms as the prime focus of teaching mathematics at this level. Likewise there is co-occurrence of widespread belief among teachers that there is just one best algorithm for each operation that should be focused while teaching in the classroom. This has been challenged in the new curriculum framework (NCERT, 2006, p.19) by providing space for alternative methods that students come up and engaging students in understanding why algorithms work.

In this poster we will graphically display the results of thematic analysis of a session conducted in a workshop as part of a 2 year long professional development program involving 4 primary and 8 middle school mathematics teachers from a public school system. The session involved discussion about subtraction algorithm followed by multiplication where in teachers engagement with belief about teaching algorithm was witnessed. For some teachers the engagement was in form of resistance to engage with alternative methods and questions about how they work, as they perceived it to cause confusion among students since they would not be able to understand the concepts. Resistance was also on account of the rules related to algorithm which teachers felt cannot be broken like “borrowing from left from the same number”. Teachers also engaged by sharing the explanation of algorithms which ranged from procedures involving numbers to use of concepts like place value and distributivity for understanding the algorithm. Teachers voiced their challenges to these explanations using students' thinking and understanding as proxy. In comparison to subtraction, discussion of multiplication involved sharing of alternative methods, but teachers stressed the importance of students getting correct answers and speed or ease of calculation rather than conceptual clarity. These forms of engagement resulted in interaction between beliefs held by participating teachers and the pedagogical content knowledge related to algorithm leading towards engagement of teachers in understanding how algorithms work by teacher educators and why different algorithms give correct answers. These engagements might be the first steps towards teachers engaging with alternative ways to find solutions and evaluating generality of the alternative methods.

References

NCERT (2006). National focus group on Teaching of Mathematics Report, NCERT, New Delhi.

Guide: K. Subramaniam

Discussant: Jayashree Ramadas

13. **Biology Graduate Students' Critical Examination of Deterministic Claims in a Neurogenetics Media Article**



Aswathy Raveendran

The term 'genetic determinism' refers to the belief system that attributes substantial weight to genes in shaping human traits. Since the advent of the Human genome project- a spate of projects have started researching genetic causes of phenotypes ranging from disease conditions to qualities like happiness. This framework has been criticized for its conceptual limitations as well as for its ethical implications.

Since genetic determinism is a rich topic that opens up intellectual exploration in multiple areas- philosophical, methodological and ethical, we take the standpoint that biology students pursuing higher education in biological sciences will educationally benefit from critically evaluating deterministic claims in genetics research.

In this paper, we detail criteria used by 25 biology graduate students in their critical evaluation of deterministic claims in a neurogenetics media article.

We derive these criteria inductively based on our analysis of the responses and make sense of these criteria in the light of a theoretical framework drawing from literature in the Philosophy of Science that discusses the role of values in scientific theory building. Implications for teaching Nature of Science in higher education will be discussed.

Guide: Sugra Chunawala

Discussant: Karen Haydock

14. Students' Perceptions of Biology as a Subject of Learning



Meena Kharatmal

Understanding of students' perceptions of biology is important as these could throw some light on conceptual understanding in the subject, teaching-learning strategies, and career choices of students. While the attitudes of science in general have been extensively studied, in the disciplines of physical sciences, biological sciences have been less charted. As science is a heterogeneous mixture of its sub-disciplines, the results of a sub-discipline may not be a good indicator of the situation with respect to another sub-discipline and hence generalization may be problematic. There is a need of research studies on students' interests and attitudes toward biology. A study on students' perceptions of biology in the Indian context would be an important addition to knowledge. The aim of the current study is to investigate secondary students' perception of biology as a subject of learning. In the presentation, the methodology and some preliminary findings will be discussed.

Short Presentation

ARM 2012 SCHEDULE

Time	Speaker	Title	Discussant	Chair person
Tuesday, April 17				
09:30	Breakfast			
10:30	Jayashree Ramadas	Welcome		
10:45	Saurav Shome	Integrating assessment in school projects: On a journey with teachers	Sanjay C.	Aniket Sule
11:45	Tea			
12:00	Mashood K. K.	Concept inventory in rotational kinematics	Anvesh M.	Aniket Sule
01:00	Lunch			
02:30	Jeenath Rahaman	Exploring the connection between multiplicative thinking and area- measurement	Rajesh B Khaparde	K. Subramaniam
03:30	Tea			
04:00	Prajakt P Pande	Grade 3 students' measurement experiences and performance in length measurement tasks	K Subramaniam	K. Subramaniam
05:00	<i>Chitra Natarajan</i>	<i>Daily summary</i>		
08:00	Dinner			
Wednesday, April 18				
09:30	Breakfast			
10:00	Rafikh Shaikh	Chat activity: collaborative and constructive way of learning in Social environment.	Sanjay C.	Karen Haydock
11:00	Anveshna Srivastava	A case for external representations and epistemic actions	Short Presentation	Karen Haydock
11:30	Tea			
12:00	Amit Sharma	What aspirations do students with disabilities have in science?	G. Nagarjuna	Karen Haydock
01:00	Lunch			
02:30	Arindam Bose	Knowledge of non-formal measurement units among working-class middle-graders: an exploration	Sugra Chunawala	J. Vijapurkar
03:30	Tea			
04:00	Shikha Takker	Reviewing research on teaching contexts that support algebraic thinking in children	Jayashree Ramadas	J. Vijapurkar
05:00	<i>Chitra Natarajan</i>	<i>Daily summary</i>		
08:00	Dinner			
Thursday, April 19				
09:30	Breakfast			
10:00	Aisha Kawalkar	Several lines of inquiry into inquiry teaching and learning: exploring the Affective outcomes of inquiry-oriented science teaching	Karen Haydock	G. Nagarjuna
11:00	Shraddha Ghumre	An exploration for a theoretical framework to understand and design learning ecologies for facilitating quantitative knowledge	Short Presentation	G. Nagarjuna

11:30 Tea				
12:00	Ruchi S Kumar	Interaction between belief and pedagogical content knowledge of teachers while discussing use of algorithms	Jayashree Ramadas	G. Nagarjuna
01:00 Lunch				
02:30	Aswathy Raveendran	Biology graduate students' critical examination of deterministic claims in a neurogenetics media article	Karen Haydock	Prithwijiit De
03:30 Tea				
04:00	Meena Kharatmal	Students' perceptions of biology as a subject of learning	Short Presentation	Prithwijiit De
04:30	Amit Dhakulkar	Intergrating ExpEYES/Phoenix with GeoGebra	Short Presentation	Prithwijiit De
05:00		Concluding Remarks (Organisers & Chair persons)		

Image on cover adapted from:

Tharp and Gallimore (1988) emphasize scaffolding in an approach they call "assisted discovery," which calls for explicitly teaching students to use private speech to talk themselves through problem solving.

<http://www.abacon.com/slavin/t14.html>

Notes