Title: Introduction to Science and Mathematics Education Research

Credits: 4 (~44 hours, about 2 contact session per week of 2 hours each)

Instructors: K K Mashood, Shweta Naik

Semester 2: January to May, 2021

Objectives of the Course:

1. Understand broadly the motivation and rationale for research in science, technology and mathematics education (STME)
2. Introduction to research literature in science, technology and mathematics education
3. Exposure to research in science, technology and mathematics education at HBCSE
4. Introduction to some of the key themes and issues in science, technology and mathematics education research

Learning goals:

• Foster ability to search and identify research materials in STME (journal articles, book chapters etc.)
• Develop capacity to critically read and analyse research papers in STME
• Inculcate capacity to discuss, engage in argumentation and make presentations of research papers in STME
• Develop familiarity with key threads and themes in STME research and identify ones own areas of interest
• Cultivate ability to summarise arguments of research articles and eventually conduct literature reviews on chosen themes/topics in STME

Class Structure and Assessments:

The course will cover nine key themes in STME, which are mentioned below. Around two to three sessions will be devoted for discussing papers selected from each of the themes. Each session will discuss one paper and the crediting students will take turns in presenting the paper and leading the discussion. The auditing students can volunteer to present, but is not mandatory. In addition to the papers chosen for discussion in a session, instructors may assign background readings at instances where they deem it relevant. The presentation and discussion have to be structured in such a way
that maximum participation from all the participants is ensured and thereby discussion among them is enabled.

Assessment will be based on the following accounts:

1) Presentation of papers

2) Participation in discussion

3) Two term papers - a mid term and a final term paper. The topic of mid-term paper will be assigned by the instructors and the expected length is around 2000 words. It will have half the weightage in score compared to the final term paper, whose expected length is 4000 - 5000 words. For the final term paper students can choose a theme, in consultation with instructors, that they are interested in and is likely to work in future.

Readings:

Introductory Session:


Theme 1: Education and Society


**Theme 2: Out-of-school and connections to real world**


**Theme 3: Teacher Education**

**Theme 4: Classroom Interaction and Assessment**


**Theme 5: Student Conceptions Studies**

cognitive structure influence instructional perceptions and intentions. *The journal of the

**Theme 6: Epistemology and Science Education Research**


framework for helping teachers interpret and respond to their students’ epistemologies.
*Personal epistemology in the classroom: Theory, research, and implications for practice, 4*(1),
409-434.


sensemaking processes in introductory physics. *Physical Review Physics Education Research,
14*(2), 020122.

engineering students’ difficulties with mathematical sense-making. *International Journal of
Science Education, 33*(18), 2463-2488.

about hydrostatics. *Physical Review Special Topics-Physics Education Research, 9*(1), 010108.

Studies of Science Education, 14*(3), 643-697.

**Theme 7: Modelling and Representations in Science Education**

conference: Modeling in physics and physics education (Vol. 31, p. 27). Amsterdam:
University of Amsterdam.


**Theme 8: Conceptual Change**


Theme 9: Ontology and Science Education Research


