

# MME Staff and Graduate Student Colloquium

Effectiveness of Teachers' Participation in  
a Mathematics Networked Learning Community  
in terms of Students' Classroom Environments  
and Attitudes to Mathematics in Singapore

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# Outline of Presentation

- Context of my Study
- Summary of literature on
  - Learning Environment
  - Networked Learning Community
- Research Questions
- Methodology
- Findings and Implications
- Discussions

# Context of the Study

- New initiative in teacher professional development  
Networked Learning Community (NLC)
  - Collaboration among teachers from different schools
    - Learning from
    - Learning with
  - Periodic surveys based on teachers' self-reports
- Learning Environment
  - Students' perceptions of the mathematics classroom
  - Students' attitudes to mathematics

# Literature : Learning Environment

- Lewin's (1936) work on field theory acknowledged that the environment and its interaction with individual's personal characteristics are strong determinants of human behaviour.

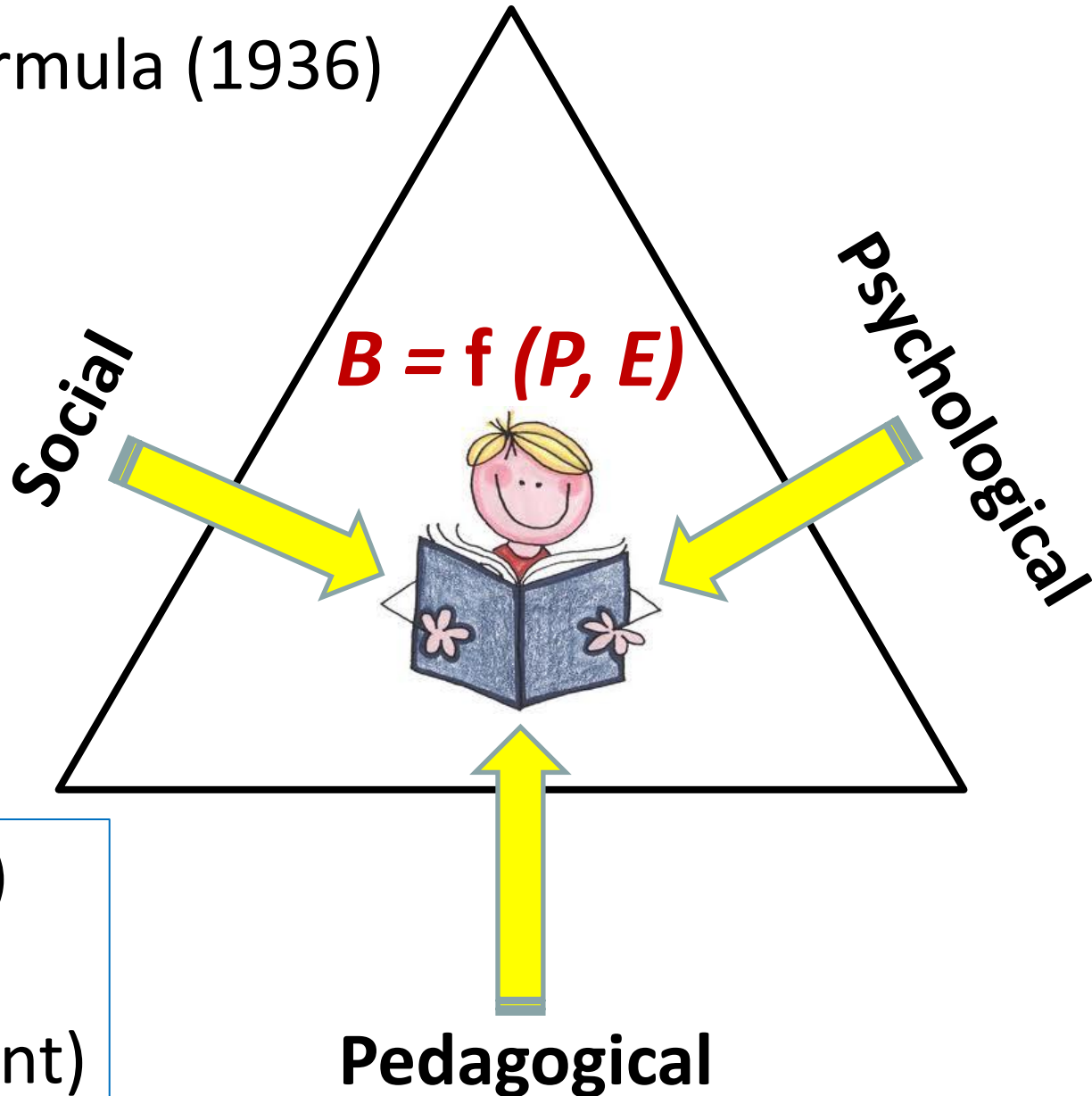
Lewinian formula:  $B = f(P, E)$

- The learning environment refers to the **social, psychological and pedagogical contexts** in which **learning occurs** and which **affects student achievement and attitudes**. (Fraser, 1998)

# Learning Environment

Lewinian Formula (1936)

$$B = f(P, E)$$



# Literature: Learning Environment

Advantages in using perceptual measures with students for assessing classroom environment relative to observations made by external observers:

- Participants within the classroom are the best people for assessing the classroom environment
- Students' observations are based on a longer period than those of an external observer
- Perceptions of the whole class are gathered rather than those of only or two observers

# Learning Environment Instrument

## What Is Happening In this Class? (WIHIC)

- Developed by Fraser, Fisher and McRobbie (1996)
- Original WIHIC had 90 items in 9 scales
- Final version had 56 items in 7 scales
- Has shown sound factorial validity and internal consistency reliability in numerous studies in different countries and grade levels

WIHIC Scale	Description of Scale	Sample Item
Student Cohesiveness	Extent to which students know, help and are supportive of one another.	In this class, I get help from other students.
Teacher Support	Extent to which the teacher helps, befriends, and is interested in students.	The teacher takes a personal interest in me.
Involvement	Extent to which students have attentive interest and participate in discussions.	I explain my ideas to other students.
Investigation	Emphasis on the skills and processes of inquiry and their use in problem solving and investigation.	I carry out investigations to answer questions which puzzle me.
Task Orientation	Extent to which it is important to complete activities planned and to stay on the subject matter.	I know what I am trying to accomplish in this class
Cooperation	Extent to which students cooperate rather than compete with one another on learning tasks.	When I work in groups in this class, there is teamwork
Equity	Extent to which students are	I get to use the



# Literature: NLC

Networked Learning Communities (NLC) promote the dissemination of good practice, enhance the professional development of teachers, support capacity building in schools, mediate between centralised and decentralised structures, and assist in the process of restructuring and re-culturing educational organisational systems.

(OECD, 2000)

# Literature : NLC

- Collaborative capacity building (Hopkins & Jackson, 2002)
- Based on the beliefs that you cannot improve student learning without improving teacher learning (Fullan, 1993)

According to Jackson (2004), networked learning occurs when people from different schools in a network engage with one another to enquire into their practice, to innovate, to exchange knowledge and to learn together.

# Literature : NLC

- Networks contribute to teacher motivation (Firestone & Pennell, 1997)
- Involvement in teacher networks promotes learning for teachers, feelings of empowerment and a sense of belonging (Lieberman & Wood, 2003)

# Literature : NLC

- Very few studies that **address the impact of network participation on pupil learning** (Hwang et al., 2004) and Bell et al. (2005) found only 11 studies of networked learning communities with evidence of impact on pupils (pupils' engagement, motivation, social skills and attendance)
- Katz and Earl (2010, p.43) reported that they were surprised that fewer than half of the teachers in 662 schools indicated that there had been changes in thinking about teaching and classroom practices.

# Research Questions

1. Ascertain if a questionnaire assessing classroom learning environment and attitudes to mathematics is valid when used with Primary 5 mathematics students in Singapore
2. Investigate associations between students' perceptions of their classroom environment and their attitudes to mathematics
3. Evaluate the effectiveness of teachers' participation in a mathematics networked learning community in terms of their students':
  - perceptions of classroom learning environment
  - attitudes to mathematics

# Methodology: Design of the Study

- Pretest–posttest quasi-experimental design
  - Compare the changes in classroom environment and attitudes of those classes whose teachers participated in NLC with those classes those teachers were not in NLC
- Mathematics Classroom Environment and Attitude (MCEA) Questionnaire
  - 3 scales extracted from WIHIC
  - Cooperation, Teacher Support and Involvement
  - 1 new scale on problem-solving
  - Attitude scale modified from TOSRA

# Methodology: Sample

Involved 5 teachers from a NLC who volunteered to participate in this study:

## **Experimental Group:**

5 classes whose teachers were in the NLC

## **Comparison Group:**

5 classes whose teachers were not in the NLC

375 Primary 5 students from 10 mathematics classes in 5 schools in Singapore

# Findings: Research Question 1 (Instrument)

- Factor analysis for the learning environment scale and attitude scales for pretest and posttest support the factorial validity of the questionnaire
- Values for the internal consistency reliability for all the MCEA scales are satisfactory (0.85 to 0.94)
  - very similar to those reported by Aldridge et al. (1999) for WIHIC, which ranged from 0.85 to 0.90 with a sample of 1879 Grade 7–9 students from 50 classes in Taiwan



# Summary

1. Data analyses supported the factor structure, internal consistency reliability and discriminant validity of the questionnaire.
2. Each scale of the questionnaire was able to differentiate between the perceptions of students in the different classes.
3. There was positive associations between the learning environment and students' attitudes towards mathematics. All the 4 learning environment scales were significantly correlated with mathematics.

# Summary

4. Teacher support and problem solving scales were significant independent predictors of students' attitudes towards mathematics for both the pretest and posttest data.
5. Overall, pretest-posttest changes were larger in magnitude for the experimental group than for the comparison group for every learning environment and attitude scale.

# Implications

- Teachers' participation in NLCs is likely to lead to positive learning environments in these teachers' classrooms.
- Creating positive classroom environments is likely to promote positive student attitudes to mathematics.



# Discussions