

SY, Clarence loakim, T.

SN: 2020-08023

BS Applied Physics (Instrumentation Physics)

Tentative / Working Thesis Title:

Classroom learning dynamics using a cellular automata spatiotemporal model comparing peer instruction and traditional instruction

PACS: [give at least three from different branches]

01.40.Ha *Learning in education*

05.45.Pq *Numerical Simulations*

89.75.-k *Complex systems*

Problem Statement. How do student learning rates, seating arrangement, and heterogeneity affect the class's learning dynamics? How do the dynamical properties in peer instruction differ from the traditional teaching set up? When does peer instruction perform better than traditional instruction based on this model?

Significance. The study provides insights in choosing which instruction method is better given the classroom condition. The dynamical analysis also yields deeper understanding on the spatiotemporal patterns that can help analyze the learning process in the classroom for these two instruction methods.

Methodology. The classrooms are modeled as a probabilistic cellular automata model with binary states on a rectangular lattice. Each lattice point represents a student that is either learned or unlearned. In peer instruction, the probability for a student to learn in each time step is dictated by how many learned seatmates the student has, while the learning probability in traditional instruction is set to be a constant or a set of constants. Class performance is measured based on the class's rate of learning and the time it takes for the entire classroom to transition to a fully learned state.

Major References:

1. R. M. Roxas, S. L. Carreon-Monterola, C. Monterola; Seating Arrangement, Group Composition and Competition-driven Interaction: Effects on Students' Performance in Physics. AIP Conf. Proc. 28 July 2010; 1263 (1): 155–158. <https://doi.org/10.1063/1.3479856>
2. Pierre-Yves Louis, Francesca R. Nardi; Probabilistic Cellular Automata: Theory, Applications and Future Perspectives. Emergence, Complexity and Computation. 21 February 2018. <https://doi.org/10.1007/978-3-319-65558-1>
3. Nathaniel Lasry, Eric Mazur, Jessica Watkins; Peer instruction: From Harvard to the two-year college. Am. J. Phys. 1 November 2008; 76 (11): 1066–1069. <https://doi.org/10.1119/1.2978182>


Submitted by:



Sy, Clarence loakim T.

2020-08023

Endorsed by:



Johnrob Y. Bantang
Thesis Adviser