

RESEARCH SEMINAR

Friday, May 2, 2014

2:30 – 3:15 · Ross 0220

Refreshments

Modeling the physics classroom as a complex-dynamical system: A path towards transformation.

Dr. David Brookes

(Candidate for UNC Physics Faculty Position)

The typical process of physics course transformation proceeds like this: A Physics professor becomes concerned when (s)he realizes how little his/her students have learned from “traditional” lecture-based instruction. Seeing the need for change, (s)he implements a new curriculum and/or teaching approach, choosing from a number of readily available research-based physics curricula and/or instructional techniques. Far too frequently the story has an unhappy ending. The instructor feels uncomfortable in the new situation and experiences pushback from his/her students. The once-popular physics professor experiences a sharp drop in his/her course evaluation scores. More significantly, students’ grades don’t improve, or the improvement is relatively small. The professor discards the changes and reverts back to lecturing.

This story is the motivation for my current research. In the current paradigm, physics education researchers develop physics curricula and instructional techniques that are disseminated to other professors. The resulting change in university physics courses is sporadic and often unsuccessful. In this talk I will present a model of the physics classroom as a complex system involving components connected by non-linear feedbacks. This model will both explain why substantial change is so difficult to achieve and how such change can be achieved through finding a new stable state of the system. I will suggest that in order for the system to find a new stable state where deep learning occurs, we have to attend to several interacting course components all at once. I will present a practical example of how a new stable state can be reached. With research data from my classroom I will make a case for how we could take a new approach to course transformation in physics. I will propose that we should take a dynamical systems approach to change by modeling each instructional setting according to its unique features. In order to achieve lasting, sustainable transformation, we need to encourage the purveyors of this change (the faculty) to think about the problem of course transformation as a problem in dynamical systems modeling.