Modeling Biology Instruction – Leaders in Science and Engineering

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INTRODUCTION

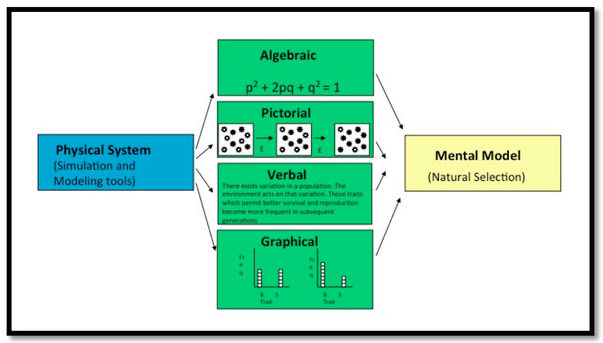
The Modeling Biology Instruction: Leaders in Science and Engineering (MoBILiSE) Project is a collaboration between

(i) 17 local educational agencies (LEAs),
(ii) the College of Education and Human Ecology,
(iii) the Department of Evolution, Ecology and Organismal Biology, and
(iv) the College of Engineering.

The project aims to:

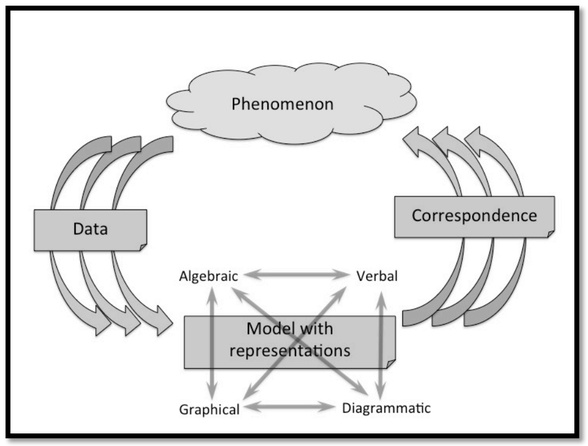
(i) Develop a full year biology curriculum focused on major biology models with modeling applications and bio-engineering deployments
  (i) Construct a reliable & valid Content assessment – Secondary – Biology Concept Inventory (S-BCI)
(ii) Train secondary level (6-12) life science teachers in Modeling Instruction pedagogy curriculum
(iii) Implement a full scale implementation in secondary school classrooms within the context of quasi-experimental design study.

Models as multiple representations



Use of models, modeling and engineering have shown increases in content knowledge.[1,4,6]

Models and Modeling Cycle



METHODS

Summer Workshop

1) Three-week workshop grounded in the use of the Modeling Instruction pedagogy in biology
2) Teachers designed experiments, gathered data, and analyzed that data to construct biology models

Participants

32 secondary teachers (grades 6-12)

- 5 middle school, 3 ELL, and 24 high school
- LEAs in urban, rural and suburban settings

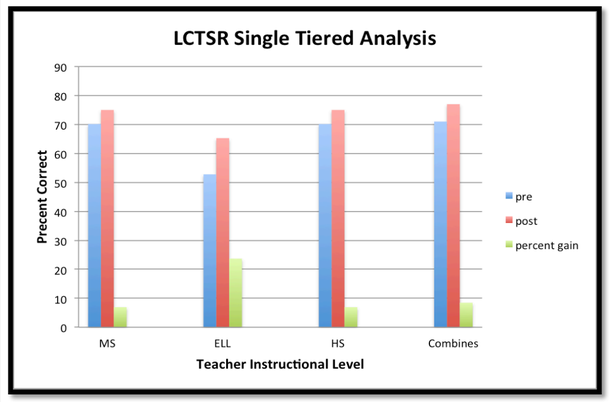
Instrumentation

1) Lawson's Classroom Test of Scientific Reasoning (LCTSR)[3] - both
2) Secondary – Biology Concept Inventory (S-BCI, students)[5,8] & BCI[2] (teachers)
2) Attitude surveys[9] (students)

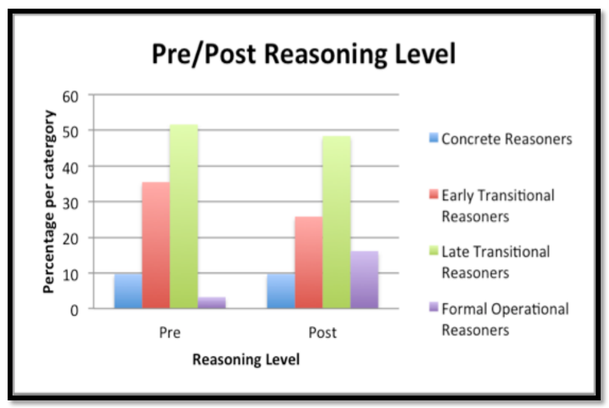
RESULTS - Teachers

Scientific Reasoning

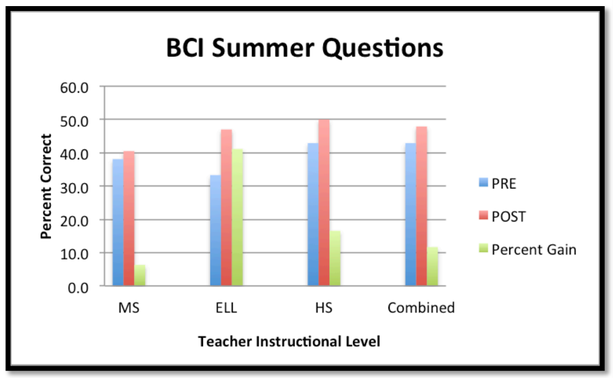
All of the teacher subgroups showed overall gains on the single tiered analysis of the LCTSR. The paired t-test gains were significant at $p<0.05$ (i.e., $p<0.037$).



The two-tiered analysis's paired t-test demonstrated that gains in reasoning were significant at $p<0.05$ (i.e., $p<0.044$).



The BCI paired t-test was significant at $p<0.1$. The reasoning for the concepts covered during the workshop.



CONCLUSIONS & NEXT STEPS

Both the single-tier, two-tiered, and subskill analysis suggest that teachers who participated in the MoBILiSE Project workshop increased their scientific reasoning ability. Content knowledge also increased. ELL teachers demonstrated the greatest gains.

During the academic year treatment teachers are implementing the curriculum with pre/post test comparisons. A matched set of comparison teachers are assessing their students for comparison.

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