Using RTOP to Assess Interactive Engagement in Two Widely Disparate Classroom Environments

Cathy Mariotti Ezrailson, USD, Teruki Kamon, TAMU, Cathleen C. Loving, TAMU, Peter McIntyre, TAMU

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Introduction
• In this study, the Reformed Teaching Observation Protocol (RTOP) was used to assess instructor attitudes about interactive engagement pre and post instruction

• Participants were drawn from *two* disparate disciplines with instruction occurring in two widely different classroom environments:
  – GTAs in intro physics recitation and
  – pre-service elementary teachers in elementary classrooms

• Each teacher/instructor participated in three hours of training with RTOP before stepping into their teaching assignments

• 6 Instructors in each group were observed randomly and during a pre, mid-point and post opportunity
Goals

The RTOP instrument was selected to facilitate familiarity with what constituted:

– interactive, student-centered learning

– the degree to which student-to-student and student-to-teacher communication was present

– If attitudes toward each of the elements of interactive engagement in a student-centered classroom had changed as the instructor became more familiar with student-centered methods and strategies

– Student interviews were also conducted both pre and post teaching
• Sample groups included:
  1) 6 pre-service elementary teachers (in senior science methods and teaching in a K-5 instructional setting)
  2) 6 physics graduate teaching assistants teaching introductory freshman physics recitation

• Each group was given weekly instruction in:
  – Socratic questioning
  – cognitive apprenticeship techniques
  – cooperative group dynamics and
  – context-rich activity design

• Observation times were randomly selected for both groups and carried out three times during the semester

• Tracked were changing attitudes toward interactive engagement teaching
Pre-Service Elementary Teachers

RTOP Scores in Various Types of Physics Courses *

- Traditional university lecture (passive)  
  Average Scores (%): < 20
- University lecture with demonstrations (some student participation)  
  Average Scores (%): < 30
- Traditional high school physics lecture (with student questions)  
  Average Scores (%): < 45
- Partial HS reform (some group work; most discourse still with teacher)  
  Average Scores (%): < 55
- Medium sized (n > 50) university lectures with Mazur-like group-work  
  (ConcepTests) and Personal Response System  
  Average Scores (%): 55-75
- Modeling curriculum (varies with amount and quality of discourse)  
  Average Scores (%): 75-99

*(Piburn et al., 2000; MacIsaac & Falconer, 2002)
Graduate Teaching Assistants

RTOP Scores in Various Types of Physics Courses *

⇒ Traditional university lecture (passive)  < 20
⇒ University lecture with demonstrations (some student participation)  < 30
⇒ Traditional high school physics lecture (with student questions)  < 45
⇒ Partial HS reform (some group work; most discourse still with teacher)  < 55
⇒ Medium sized (n > 50) university lectures with Mazur-like group-work (ConcepTests) and Personal Response System  55-75
⇒ Modeling curriculum (varies with amount and quality of discourse)  75-99

*(Piburn et al., 2000; MacIsaac & Falconer, 2002)
Comparisons of Pre/Mid/Post Results

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RTOP Pre/mid/post Mean Comparisons

Teacher means 72.56  GTA Means 60.28

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*(Piburn et al., 2000; MacIsaac & Falconer, 2002)
Further Analysis

• The t-test results for our sample yields a value of 5.22, with 5 degrees of freedom.
• And $p \sim 0.001$, making it likely that the means of the two populations are not the same.
Interview Excerpts:

Pre-service Teachers

1: “Is it fair to give everyone in the group the same grade?”

2: “I don’t know when I have given enough time to wait (after asking a question).”

GTAs

1: “I didn’t have a good teaching model. Always felt math was intuitive. Didn’t know about teaching but needed money. Wanted to try it and to do a good job and learn how to do it well. I am impressed with students’ desire to share ideas. Each person should be held responsible for his or her success.”

2: We all learned a lot about interaction. This is the first time that everyone knew student names. I used to be material-focused and now I am a lot more student-focused but we need to be able to quickly evaluate student level. There exists a gap between the ideal and what can be accomplished. There has been too much focus in the past on how to do “it” and not on “what “it” means. All parts of the course need to work together.”

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The Ideal Classroom Setting?

Teachers

GTAs

Black Board

1 2 3 4
5 6 7 8
Implications

• The pre-service teacher group had more rapid acceptance of the interactive engagement instructional method than the GTA group as reflected in the RTOP data.

• The teachers had some practical concerns about managing students at the outset but also the GTAs voiced some similar concerns, if not in a more philosophical and detailed manner.

• Both Pre-service teachers and GTAs talked about the need for a more student-friendly physical arrangement for classes.
Future Study: New Populations

• Use of the RTOP in teacher evaluation provides a concrete set of criteria for teachers/instructors to use in student-centered classrooms, K-20.

• An extension of this study is underway with a larger sample of preservice teachers taking science methods this spring.

• Additional data will be collected next fall with two groups of methods students, one 7-12 science methods and one K-5 science methods.
Selected References


• MacIsaac, D., Falconer, K. (August 2006) Encouraging students to explore, presentation, New York Academy of Sciences

• MacIsaac, D., Falconer, K. & Zawicki, J. (Summer, 2005) Using the Reformed Teaching Observation Protocol (RTOP) to facilitate novice teachers in sustaining extraordinary levels of student discourse in introductory physics. AAPT Presentation.

