

## An External Evaluation Summative Report: RTOP Observations over Time

### Improving the Quality of Arizona Teachers of Physics, Chemistry, Physical Science and Mathematics Arizona State University

#### Introduction

The **Reformed Teaching Observation Protocol (RTOP)** was developed as an observation instrument to provide a standardized means for detecting the degree to which K-20 classroom instruction in mathematics or science is reformed.<sup>1</sup> The protocol was used to assess levels of implementation of reformed science instruction by 10 ITQ project teachers from the partner district, Phoenix Union High School District (PUHSD). To ensure confidentiality, after the observations, no information about the observations was shared with PUHSD or the teachers. The External Evaluation contacted Deedee Falls of PUHSD about the observations; teachers and their principals approved the observations. The following table summarizes when the ten teachers were observed. Note that four teachers (A, B, C and D) were observed all three times.

Table 1: PUHSD chemistry, physics and physical science teachers observed during project years 1 and 2

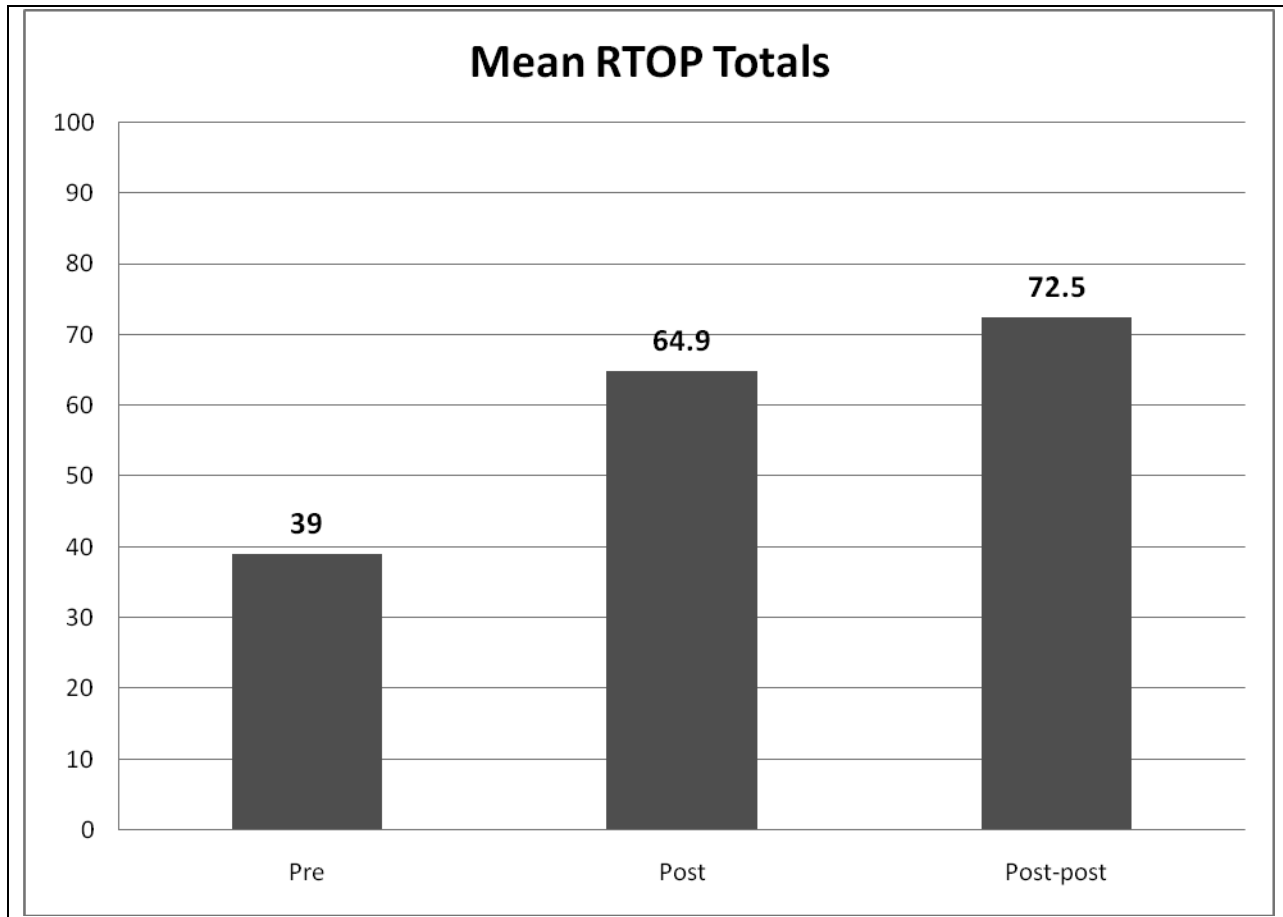
Teacher by Code	Spring 2007 Pre-	Fall 2007 Post-	Spring 2008 Post-post
A	X	X	X
B	X	X	X
C	X	X	X
D	X	X	X
E		X	X
F	X		
G	X	X	
H		X	
I		X	X
J	X		

#### Summative RTOP Evaluation: Mean Ratings

The highest possible total score on the RTOP is 100. Ratings are 0 to 4 (0-never occurred; 4-very descriptive) for 25 dimensions of effective instruction grouped into five categories: Lesson Design and Implementation, Propositional Knowledge, Procedural Knowledge, Communicative Interactions and Student/Teacher Relationships. The following bar graph displays the mean total scores for pre-, post- and post-post time frames. The mean ratings for each dimension for each

<sup>1</sup> [http://physicsed.buffalostate.edu/AZTEC/RTOP/RTOP\\_full/about\\_RTOP.html](http://physicsed.buffalostate.edu/AZTEC/RTOP/RTOP_full/about_RTOP.html)

of the three observations are displayed in the tables that follow the bar graph. The means of the subtotals for each of the five categories are also displayed in the five tables.



<b>Lesson Design and Implementation</b>	<b>Pre-Mean</b>	<b>Post-Mean</b>	<b>Post-post Mean</b>
1) The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.	1.7	3.0	3.7
2) The lesson was designed to engage students as members of a learning community.	1.7	3.3	3.0
3) In this lesson, student exploration preceded formal presentation.	1.0	2.5	2.2
4) This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.	1.6	1.4	2.0
5) The focus and direction of the lesson was often determined by ideas originating with students.	1.1	2.1	3.0
SUBTOTAL	7.1	12.3	13.8

<b>Content: Propositional Knowledge</b>	<b>Pre-Mean</b>	<b>Post-Mean</b>	<b>Post-post Mean</b>
6) The lesson involved fundamental concepts of the subject.	2.3	4.0	3.3
7) The lesson promoted strongly coherent conceptual understanding.	1.4	1.9	3.0
8) The teacher had a solid grasp of the subject matter content inherent in the lesson.	2.6	4.0	4.0
9) Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so.	1.9	2.5	3.0
10) Connections with other content disciplines and/or real world phenomena were explored and valued.	1.1	2.4	2.3
SUBTOTAL	9.3	14.7	15.7

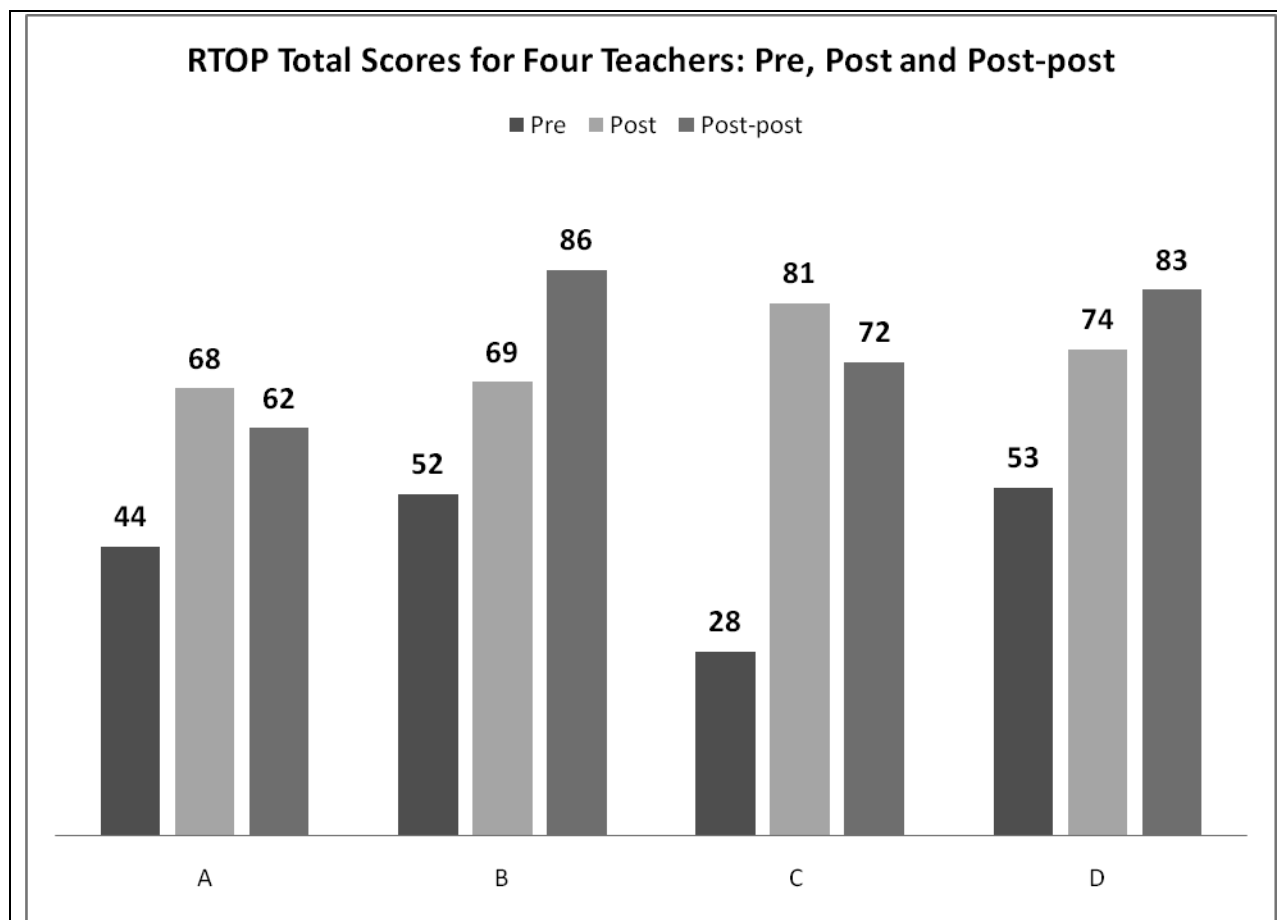
<b>Content: Procedural Knowledge</b>	<b>Pre-Mean</b>	<b>Post-Mean</b>	<b>Post-post Mean</b>
11) Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena.	1.6	1.6	2.2
12) Students made predictions, estimations and/or hypotheses and devised means for testing them.	0.3	1.5	2.5
13) Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures.	2.1	2.4	3.2
14) Students were reflective about their learning.	1.9	2.7	2.8
15) Intellectual rigor, constructive criticism and the challenging of ideas were valued.	1.3	2.6	2.7
SUBTOTAL	7.1	10.9	13.3

<b>Classroom Culture: Communicative Interactions</b>	<b>Pre-Mean</b>	<b>Post-Mean</b>	<b>Post-post Mean</b>
16) Students were involved in the communication of their ideas to others using a variety of means and media.	1.0	2.1	2.7
17) The teacher's questions triggered divergent modes of thinking.	1.7	1.7	2.5
18) There was a high proportion of student talk and a significant amount of it occurred between and among students.	2.0	3.0	2.8
19) Student questions and comments often determined the focus and direction of classroom discourse.	1.6	2.6	2.5
20) There was a climate of respect for what others had to say.	1.3	3.0	3.0
SUBTOTAL	7.6	12.5	13.5

<b>Classroom Culture: Student/Teacher Relationships</b>	<b>Pre-Mean</b>	<b>Post-Mean</b>	<b>Post-post Mean</b>
21) Active participation of students was encouraged and valued.	2.0	3.6	3.5
22) Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence.	1.0	1.5	2.5
23) In general the teacher was patient with students.	1.6	3.5	3.8
24) The teacher acted as a resource person, working to support and enhance student investigations.	1.9	3.1	3.3
25) The metaphor “teacher as listener” was very characteristic of this classroom.	1.4	2.7	3.0
SUBTOTAL	7.9	14.5	16.2

**RTOP Ratings for Teachers A, B, C and D from Pre to Post-post**

Teachers coded as A, B, C and D were observed pre, post and post-post. The total RTOP scores for these three teachers are displayed in the following bar graph. Total RTOP scores increased significantly over time (repeated measures AOV,  $F = 13.59$ ,  $p = .0059$ ).



Mean pre, post and post-post scores for each of the category subtotals are displayed in Table 2 for the group consisting of the four teachers who were observed all three times. All five mean subtotal (highest possible score was 20) and the total scores (highest possible score was 100) increased significantly from pre to post-post.

Table 2: Mean RTOP Category Subtotals and Totals of Four Teachers Pre, Post and Post-post

<b>Category</b>	<b>Pre</b>	<b>Post</b>	<b>Post-post</b>
<b>Lesson Design and Implementation</b>	8.7	14.3	14.5
<b>Content: Propositional Knowledge</b>	10.0	14.3	16.0
<b>Content: Procedural Knowledge</b>	8.0	13.0	14.0
<b>Classroom Culture: Communicative Interactions</b>	8.5	14.7	14.3
<b>Classroom Culture: Student/Teacher Relationships</b>	9.0	16.7	17.0
<b>TOTAL SCORE</b>	44.3	73.0	75.7

### **Conclusions**

RTOP ratings recorded by certified RTOP observations of project teachers during project years 1 and 2 indicated that project participation increased the use of effective teaching strategies.

Shaw (5/29/08)