PhysPort Implementation Guide: Reformed Teaching Observation Protocol (RTOP)

Version 1

PhysPort
Supporting physics teaching with research-based resources

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Implementation

Purpose of the RTOP

To measure the extent to which interactive and student-centered techniques are used in a given classroom.

Course Level: What kinds of courses is it appropriate for?

Graduate, Upper-level, Intermediate, Intro college, High school, Middle school, and Other

Content: What does it assess?

Teaching

Timing: How long should I give students to take it?

N/A minutes

Example Questions

The following is a sample of the RTOP (specifically, the first cluster):

I. Lesson Design and Implementation

1. The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.
2. The lesson was designed to engage students as members of a learning community.
3. In this lesson, student exploration preceded formal presentation.
4. This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.
5. The focus and direction of the lesson was often determined by ideas originating with students.

Access: Where do I get the assessment?

Download the assessment from physport at www.physport.org/assessments/RTOP.

Versions and Variations: Which version of the assessment should I use?

There is only one version of the RTOP.

Administering: How do I give the assessment?

1. Download the RTOP Training Manual and print a copy for yourself and a teaching colleague whom you trust and respect, ideally familiar with teaching your subject.
2. You and a colleague should read and discuss the instrument
3. Arrange for your colleague to visit your class to observe and RTOP an hour lesson
4. While your colleague observes your class, have a student or aide videotape your lesson.
5. RTOP this videotape yourself, before discussing your colleague's RTOP score of your lesson.
6. Reciprocate —perform an RTOP observation on your colleague in turn. This will provide more needed classroom observation material for discussion and genuine meaning in this experience for both of you.
7. Meet with your colleague to discuss and attempt to reconcile the scores on each of the 25 items. Inevitably, you will disagree with your colleague. Use the differences as a focus for reexamining your own teaching practice.

Scoring: How do I calculate my students' scores?

Each of the 25 RTOP items are scored on the following scale. The exact details of the intermediate scores differ for each of the 25 items and have been rigorously defined by researchers.

0: the behavior never occurred

1: the behavior occurred at least once

2: occurred more than once; very loosely describes the lesson

3: a frequent behavior or fairly descriptive of the lesson

4: pervasive or extremely descriptive of the lesson

The total RTOP score is the sum of scores for each of the 25 items, with total score ranging from 0 to 100.

Clusters: Does this assessment include clusters of questions by topic?

Subscale 1: Lesson Design and Implementation: What the teacher intended to do

1. *Instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.*
2. *The lesson was designed to engage students as members of a learning community.*
3. *In this lesson, student exploration preceded formal presentation.*
4. *This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.*
5. *The focus and direction of the lesson was often determined by ideas originating with students.*

Subscale 2: Propositional Pedagogic Knowledge: What the teacher knows, and how well they are able to organize and present material in a learner-oriented setting

1. *The lesson involved fundamental concepts of the subject.*
2. *The lesson promoted strongly coherent conceptual understanding.*
3. *The teacher had a solid grasp of the subject matter content inherent in the lesson.*
4. *Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so.*
5. *Connections with other content disciplines and/or real world phenomena were explored and valued.*

Subscale 3: Procedural Pedagogic Knowledge: What the students did

1. *Students used a variety of means (models, drawings, graphs, symbols, concrete materials, manipulatives, etc.) to represent phenomena.*
2. *Students made predictions, estimations, and/or hypotheses (PEH) and devised means for testing them.*
3. *Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures.*
4. *Students were reflective about their learning.*
5. *Intellectual rigor, constructive criticism, and* the challenging of ideas were valued.

Subscale 4: Student-student interaction

1. *Students were involved in the communication of their ideas to others using a variety of means and media.*
2. *The teacher's questions triggered divergent modes of thinking.*
3. *There was a high proportion of student talk and a significant amount of it occurred between and among students.*
4. *Student questions and comments often determined the focus and direction of classroom discourse.*
5. *There was a climate of respect for what others had to say.*

Subscale 5: Student-instructor interaction

1. *Active participation of students was encouraged and valued.*
2. *Students were encouraged to generate conjectures, (or) alternative solutions, and/or different ways of interpreting evidence.*
3. *In general the teacher was patient with the students.*
4. *The teacher acted as a resource person, working to support and enhance student investigations.*
5. *The metaphor "teacher as listener" was very characteristic of this classroom.*

You can also divide the questions according to the following clusters:

- **Lesson Design and Implementation**
  - Items 1-5

- **Content**
  - Propositional Knowledge
    - Items 6-10
  - Procedural Knowledge
    - Items 11-15
- **Classroom Culture**
  - Communicative Interactions
    - Items 16-20
  - Student/Teacher Relationships
    - Items 21-25

Typical Results: What scores are usually achieved?

Typical scores for physics class taught with different teaching methods from MacIsaac and Falconer 2002:

- traditional university lecture (passive) < 20
- university lecture with demonstrations (some student participation) < 30
- traditional high school physics lecture (with student questions) < 45
- partial high school reform (some group work; most discourse still with teacher) < 55
- medium sized (100 > n > 50) university lectures with Mazur-like group work (ConcepTests) and a student personal response system 65–75
- the author's modified (whiteboards, etc.) large (170 > n > 75) lectures 70–75
- modeling curriculum (varies with amount and quality of discourse) 65–99

Typical scores for math and science classes at different types of institutions from Sawada et al. 2002:

Table 3
Norms for RTOP Scores in Mathematics and Science Classrooms by Subject and Educational Level

	Mathematics			Science			Total		
	n	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*
University	10	63.9	22.0	40	58.25	21.3	50	59.4	21.3
Community College	3	48.0	11.8	23	50.1	21.6	26	49.9	20.6
High Sch	12	48.8	10.8	25	41.8	20.2	37	44.1	17.8
Middle Sch	13	46.8	19.0	15	50.0	14.1	28	48.5	16.3
Total	38	52.0	18.1	103	51.0	20.9	141	51.3	20.1

Interpretation: How do I interpret my students' scores in light of typical results?

You can understand more about your RTOP score by looking at classroom vignettes that are meant to characterize your teaching style on the Classroom Observation Project website (http://serc.carleton.edu/NAGTWorkshops/certop/vignettes.html). These vignettes describe different teaching styles based on your RTOP score:

Traditional/teacher-centered (RTOP score 0-30)

Transitional/teacher-guided (RTOP score 31-45)

Transitional/student-influenced (RTOP score 46-60)

Reformed/student-centered (RTOP score 60-100)

Resources

Where can I learn more about this assessment?

D. Sawada, M. Piburn, E. Judson, J. Turley, K. Falconer, R. Benford, and I. Bloom, Measuring Reform Practices in Science and Mathematics Classrooms: The Reformed Teaching Observation Protocol, Sch. Sci. & Math. **102** (6), 245 (2002).

RTOP Developers Website, including the online version of an RTOP teacher workshop

RTOP Reference Manual

RTOP YouTube channel, with training videos

Translations: Where can I find translations of this assessment in other languages?

You can download translations of this assessment in the following languages from PhysPort:

- **Chinese** translated by Weining Wu
- **English**
- **Japanese** translated by Sachiko Tosa

If you know of a translation that we don't have yet, or if you would like to translate this assessment, please contact us!

Background

Similar Assessments

COPUS, TDOP

Research: What research has been done to create and validate the assessment?

Research Validation: Gold Star ★

This is the highest level of research validation, corresponding to all seven of the validation categories below.

- Based on research into **classroom behavior**
- Studied using **iterative observations**
- Studied using **inter-rater reliability**
- Studied using **training materials**
- Research conducted **at multiple institutions**
- Research conducted **by multiple research groups**
- **Peer-reviewed publication**

Research Overview

The items on the RTOP were developed based on previous research and existing instruments. These initial items were used to observe video of classrooms by five experts, and the items were revised. The RTOP was tested with math faculty, and then substantially revised based on their feedback. The revised version was used to assess 17 twenty minute videotaped mathematics or science lessons, and inter-rater reliability calculated. The developers also created an "Annotated RTOP Guide" to document the growing inter-rater consensus about how each item should be interpreted. The RTOP was pilot tested with with 16 pairs of observations and inter-rater reliability calculated for the total score and the sub-scales. The RTOP has been used to observe over 400 K–20 science and mathematics classrooms, and the results are published in many peer-reviewed publications.

Developer: Who developed this assessment?

Daiyo Sawada, Michael D. Piburn, Kathleen Falconer, Jeff Turley, and Irene Bloom

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