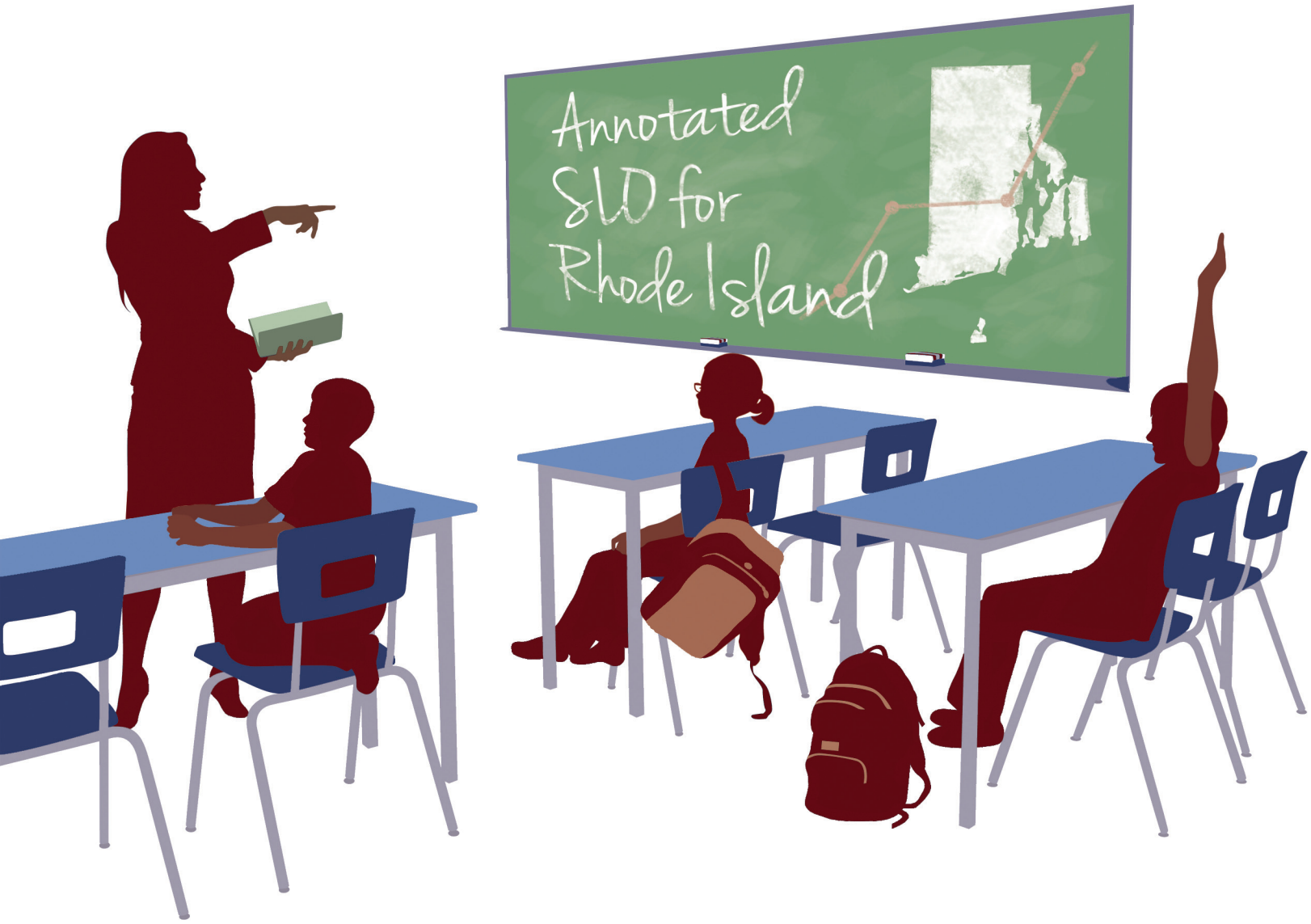
Reform Support Network



Rhode Island Student Learning Objective

Chemistry (Grade 11)

May 2013

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Introduction

What is an SLO?

As States and school districts implement educator evaluation systems that include measures of student growth, one of the challenges they face is identifying measures for non-tested grades and subjects. The use of student learning objectives (SLOs) is one promising approach to addressing this challenge. Structurally, an SLO consists of several "elements" that describe a specific learning objective for a particular student population as well as a specific, systematic process for how an educator can identify and implement strategies to track progress toward that goal and achieve it.

What is an Annotated SLO?

The Reform Support Network (RSN) has developed a series of annotated SLOs to orient readers around their structure, provide analysis and suggest specific actions to strengthen the SLO's quality. Each annotated SLO, such as the one in this document, provides analysis and suggestions for improvement for each individual element within the SLO as well as the SLO as a whole. States, school districts, colleges, universities and others can use the RSN's collection of annotated SLOs, the "SLO Library," to prepare teachers and administrators to develop high-quality SLOs or to improve SLOs that they have already developed.

The SLO Library is not a collection of exemplary SLOs. The RSN designed the library as a teaching tool, so most of the jurisdictions intentionally provided the library with SLOs that vary in quality. They also vary in their subject areas and grade levels. Each SLO review identifies and discusses both strengths and areas for improvement. It is up to the reader, then, not to mimic the SLOs found in the library but to extrapolate lessons learned from them to produce new, original and high quality SLOs.

How to Use This Document

The RSN intends for the SLO Library to support any stakeholder actively engaged in learning about or implementing SLOs: State departments of education, school districts and schools, teachers implementing SLOs, administrators leading an SLO process and colleges of education interested in adding SLO coursework to their teacher or administrator preparation programs.

Each annotated SLO begins with contextual information for the jurisdiction that produced the SLO and then presents each element of the SLO in sequence. Each element begins with the jurisdiction's actual description of it, which is followed by the text of "an author" from the jurisdiction. Think of the author as the teacher(s) or school district administrator(s) who actually wrote the SLO. The language from the jurisdiction's description comes from the jurisdiction's SLO template or other guidance materials. The author's text comes from the SLO provided by the jurisdiction. Both sections are unedited.

The subsequent section, "Review of the Author's Text and Potential Improvements," is the focus of the library and should be of greatest interest to the reader. This section analyzes the text written by the author from the jurisdiction and provides considerations for improving the quality of the individual element.

An overall summary of the entire SLO follows the presentation of the elements and concludes the review of the SLO.

The appendix contains what the RSN calls an "element comparison tool," which links the name of the element used by this jurisdiction to the standardized term used in the SLO Library. The comparison table intends to provide readers with the means to compare elements across SLOs, even if they are called by different names.

Rhode Island Contextual Information

SLO Implementation Timeline	
School year the jurisdiction piloted or plans to pilot SLOs without stakes for teachers[1]	2011–2012 (piloted in schools and districts but not used as a component in evaluation)
School year the jurisdiction piloted or plans to pilot SLOs with stakes for teachers[2]	2012–2013 (used as a component in evaluation)
School year began or plans to begin large scale implementation	2012–2013 (used as a component in evaluation)
SLO Development and Approval	
Who develops SLOs?	Individual teachers, grade- or content-level teams of teachers and school administrators
Are collectively developed SLOs permitted (for example, by teams of teachers and administrators)?	Yes
Who approves SLOs?	School and district administrators
SLO Use in Evaluation	
Are SLOs required or optional for use in evaluating educators?	Required
Are SLOs the sole measure of student growth in the evaluation system? If not, what other measure(s) does the jurisdiction use?	No
Does the jurisdiction use SLOs to determine educator compensation?	No
What weight does the SLO carry in determining the summative rating for teachers in the jurisdiction's evaluation system?	N/A
What weight does the SLO carry in determining the summative rating for administrators in the jurisdiction's evaluation system?	N/A
SLO Implementation	
How many SLOs are required for most teachers?	2 to 4 SLOs per administrator per year
How many SLOs are required for most school administrators?	2 to 4 SLOs per administrator per year
Which teachers and administrators are required to use SLOs?	Teachers of non-tested subjects, teachers of tested subjects, teams of teachers and school administrators
SLO Assessment	
Who selects which assessments are used for SLOs?	Teachers, teams of teachers, school administrators and district administrators
Are there standards or required development processes for assessments created by teachers, schools, or districts? If so, what are they?	No, though the State is in the midst of creating standards as well as an assessment development process that school districts, schools, departments, or individual principals and teachers will have the option of adopting for the 2013–2014 school year.
What types of assessments are permitted?	Teacher-developed, school-developed and district-developed assessments
Are performance or portfolio-based assessments permitted for SLOs?	Yes
Are commercially available assessments permitted for SLOs?	Yes

[1] SLOs will not be used in educator evaluations
[2] SLOs may be used in educator evaluations

Student Learning Objective: Chemistry (Grade 11)

Element List

Objective Statement

Standardized Name
Learning Content

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Identifies specific knowledge and/or skills students should attain
- Focuses on appropriate knowledge and/or skills

AUTHOR'S TEXT FOR THE ELEMENT

Students will be able to describe the composition, structure, and properties of matter, draw conclusions about the interactions and conservation of matter and energy, and explain why matter and energy can neither be created nor destroyed in a given system and/or reaction.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

This statement delineates basic components of the course and indicates the learning content in actionable terms: describe, draw and explain — as opposed to more abstract terms such as believes or thinks.

A concise, focused objective statement would help make this SLO more manageable for teachers and evaluators, especially evaluators who might be monitoring more than 100 SLOs at a time.

Rationale

Standardized Name

Rationale

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Provides a clear explanation of why this content is an appropriate focus and/or area of need
- Aligns to district and/or school priorities, if applicable

AUTHOR'S TEXT FOR THE ELEMENT

Chemistry is the study of matter and its composition, structure, and properties. Understanding that matter makes up all substances both living and non-living, how matter interacts, and the concept of conservation of matter are central to this course. These enduring understandings are a bridge between the physical sciences, life science, and earth and space science.

This is a worthy focus because it encompasses the key understandings that students should have by the end of this course. Standard PS2-6, the standard on which this objective is based, is embedded throughout the scope and sequence for chemistry. Students will work on connecting one sub-standard to another throughout the course.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author makes the point that the objective is essential to this course and to future success in the sciences, including chemistry, physics, life science and earth and space science.

To strengthen this SLO, the author might consider elaborating on how this SLO aligns with school district and school priorities. This would help the teacher and the evaluator determine whether the focus of the SLO is appropriate.

Aligned Standards

Standardized Name

Learning Content

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Names exact standards or performance indicators (Common Core, GLEs, Grade Span Expectations (GSEs), national standards, etc.) Aligns to district and/or school priorities, if applicable
- Selected standards represent important content or skills for the grade level, course, or Objective Statement

AUTHOR'S TEXT FOR THE ELEMENT

This objective is aligned to the Rhode Island GSE for Physical Science: PS2 (9-11) INQ + SAE-6: Using information provided about chemical changes, draw conclusions about and explain the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).
Throughout the school year, students demonstrate an understanding of physical, chemical, and nuclear changes by:
6a: writing simple balanced chemical equations to represent chemical reactions and illustrate the conservation of matter.
6aa: using chemical equations and information about molar masses to predict quantitatively the masses of reactants and products in chemical reactions.
6b: identifying whether a given chemical reaction or a biological process will release or consume energy (endothermic and exothermic) based on the information provided (e.g. given a table of energy values for reactants and products or an energy diagram).
6bb: using quantitative heat flow or calorimetric investigations to determine the energy released or consumed in the process.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author identifies a standard and its specific components from grade-span.

The author might consider providing greater justification for the selection of this particular standard and its components. Do students have a more pronounced need for this standard as compared with other standards? If so, what evidence leads to this conclusion?

Students

Standardized Name

Student Population

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Includes all students in the selected course(s)
- Specific number of students are identified

AUTHOR'S TEXT FOR THE ELEMENT

This objective applies to the 71 students in my three sections of College Prep Chemistry.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author identifies all of her students for inclusion in the SLO. Including a roster with specific student baselines and targets would add clarity to the specific pre-assessment score distribution. Gathering and analyzing performance data from previous courses (such as portfolios and assessment data) would also enrich the analysis of student baselines.

Interval

Standardized Name

Interval of Instruction

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- The length of the interval of instruction is defined (e.g. year-long, semester, other)
- If interval of instruction is less than the length of the course (e.g. a year-long course which has two curricular-distinct semesters), justification is provided in the Rationale.

AUTHOR'S TEXT FOR THE ELEMENT

SY2012-2013

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author lists the entire 2012-2013 school year as the interval for teaching this objective.

To strengthen this element, the author might consider including specific beginning and end dates for the teaching period and explaining why this interval is appropriate for the key learning experiences. This level of specificity plays an important role in determining whether the interval provides enough time for the intended learning experiences and for teachers to prepare students for the final assessment(s).

Baseline Data

Standardized Name
Baseline

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Data about current student performance is included
- Data is from multiple evidence sources, when necessary, and of the highest-quality sources possible
- Data source(s) align to the skills/and or content focus of the SLO
- Data may be included about subgroups of students, individual students, or a similar group of students (i.e., students in same grade/course in previous years, or students' past performance)

AUTHOR'S TEXT FOR THE ELEMENT

In order to gauge students' incoming content knowledge, I administered the Chemical Concepts Inventory during the first week of school. It is a multiple choice instrument composed of one- and two-tiered non-mathematical conceptual questions based on common student misconceptions about general chemistry topics (ex. Does the rust from a completely rusted iron nail weigh more, less, or the same as the nail it came from?). I adapted the inventory from one that was created for first year college students, so I expected student scores to be quite low. Not surprisingly, the average across my three sections of CP Chemistry was 36%. From these results I was able to determine that most students are coming into this course with limited knowledge of concepts central to chemistry as well as some misconceptions about properties of matter, behavior of atoms and molecules, etc. However, I did find that 9 students scored significantly higher than their peers (scores of 60% or better) and that 12 students scored significantly lower than their peers (scores of 10% or lower). Based on this, I have created three groups:

Group A = 12 students who scored <10% on chemistry inventory

Group B = students who scored between 11% and 49% on chemistry inventory

Group C = students who scored > 50% on chemistry inventory

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author uses an assessment adapted from a college-level inventory, an approach approved by an administrator. The pre-assessment results reveal a wide range of abilities in this class. The author uses tiers to group baseline results, acknowledging differences in starting points.

The author might consider using additional sources of data to indicate how students performed on previous science assessments for specific and general knowledge. Student performance in other content areas (for example, math and English language arts) might provide relevant information when prior science data is unavailable.

Targets

Standardized Name
Student Growth Targets

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Target(s) are measurable
- Target(s) are rigorous, yet attainable for all students
- Target(s) are tiered, if appropriate

AUTHOR'S TEXT FOR THE ELEMENT

1. Unit tests:
    a. Group A = students will pass 4 out of 5 unit tests with a score of 65% or better.
    b. Group B = students will pass 4 out of 5 unit tests with a score of 75% or better.
    c. Group C = students will pass 4 out of 5 unit tests with a score of 85% or better.
2. Performance task:
    a. Group A = students will demonstrate basic proficiency (a score of 3 or better)
    b. Group B = students will demonstrate proficiency (a score of 4 or better)
    c. Group C = students will demonstrate advanced understanding (a score of 5 or better)

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The tiered target setting allows all students to demonstrate learning and recognizes individual performance on the pre-assessment. The author lists targets for both assessments concisely. Although the use of multiple assessments adds rigor, it is unclear how they combine to yield a student achievement score.

The author could strengthen this SLO by providing information about how she will combine assessment results to yield a student achievement score. The author might also consider clarifying the following: If each of the unit tests cover a portion of the standards selected, do they, as a whole, measure all of the standards selected?

Rationale for Targets

Standardized Name

Rationale

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Target(s) are aligned with expectations for academic growth or mastery within the interval of instruction
- Students will be "on track" and/or gaps in achievement will be reduced if they meet the target(s)
- Rationale describes how the target(s) are rigorous, yet still attainable for all students

AUTHOR'S TEXT FOR THE ELEMENT

These targets are tiered to reflect students' varying levels of prior knowledge upon entry into CP Chemistry. They are rigorous in that all students are expected to be able to demonstrate basic proficiency on almost every unit test *and* on the performance task. Based on what I have seen similar students accomplish on similar assessments in past years, I am confident that my students will show significant progress in their understanding of these core chemistry concepts, and be able to demonstrate that understanding, by the end of the interval of instruction.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author bases the decision to select the particular targets on what similar students have accomplished in previous years and the expectation that students will be able to demonstrate basic proficiency on a unit test and a performance task.

The author should consider explaining why a single college-level assessment justifies fairly low expectations for Group A. For example, group A students can at minimum achievement levels fail to master 35 percent of the material on unit tests and still meet the expectations of this SLO. This is where the author's inclusion of additional assessment data would help evaluators and teachers alike determine if the achievement target establishes rigorous expectations. Finally, the author might consider including actual pre-and post-test results from previous years to justify the targets, especially for those in group A.

Evidence

Standardized Name

Assessments

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Assessment(s) measure the identified content/skills of the objective
- Assessment(s) provide the specific data needed to determine whether the objective is met
- Description includes details about design of Evidence Source(s) (e.g. who created the assessment, its focus, item-types, and what it requires of students)
- Multiple Evidence Sources are used, when necessary

AUTHOR'S TEXT FOR THE ELEMENT

1. Unit Tests: Students will complete a written assessment at the end of each unit. Assessments will include multiple choice, short answer, and constructed response items. There are five units in total: Atoms, Molecules and Ions, Chemical Reactions, Calculations with Chemical Formulas and Equations, Ionic and Covalent Bonding, and Solutions. The unit assessments were created in collaboration with members of the Science Department and approved by the Science Department Chairperson.

2. *Hydrated Salt* performance task: This assessment requires students to plan, design, and carry out an experiment to determine the empirical formula for a hydrated salt that will tell students when all of the water has been removed. This task requires students to develop procedures for an investigation and plan for recording and organizing observations and data. It requires students to draw upon their understanding of the crystalline structure of ionic slat, the application of conservation of matter to calculate the coefficient of H2O in the empirical formula of the hydrated salt, and making conclusions consistent with the use of chemical equations to predict quantitatively the molar masses of reactants and products in chemical reactions. This task was informed by a performance task designed for grade 9-12 students by the New York State Education Department (NYSED).

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

To assess student mastery, the author proposes using five separate unit tests that correspond to five distinct units of the curriculum. Constructed-response and short-answer items embedded in the unit test assess higher order thinking skills. The author supplements the unit tests with a performance measure, an authentic way to assess student learning that also requires the demonstration of higher order thinking skills.

Administration

Standardized Name

Assessments

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Detailed explanation of assessment administration is provided, including how often, when it is administered, and by whom

AUTHOR'S TEXT FOR THE ELEMENT

1. Unit Tests: The end-of-unit assessments will be administered in class by the teacher at the conclusion of each unit.
2. *Hydrated Salt* performance task: The performance task will be administered during the final week of classes in June. It is designed to be completed by students individually in an 80-minute block.

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author describes some specifics (for example, who administers the unit tests and when someone will administer the performance task); however, the author does not indicate who will administer the performance task.

The author might consider identifying a range of dates for the administration of each unit test and which school personnel will administer and monitor the performance tasks.

Scoring

Standardized Name
Assessments

JURISDICTION'S DESCRIPTION OF THE ELEMENT

- Description articulates how the evidence will be collected and scored (including description of scoring guides, rubrics, or instructions).
- A collaborative scoring process is used when possible (e.g., a percentage of the evidence will be scored by more than one educator through collaborative scoring, double scoring, or blind scoring)

AUTHOR'S TEXT FOR THE ELEMENT

1. The unit tests will be scored by the two chemistry teachers, using the scoring guide developed with the assessments. Our Department Chair has agreed to double-score one test from each section of CP Chemistry for each unit (6 per unit, 30 per year).
2. The performance task will be scored by the two chemistry teachers on a rubric developed with the task. The Department Chair will co-score 5% of the performance tasks from the 6 sections of CP Chemistry (approximately 8).

REVIEW OF AUTHOR'S TEXT AND POTENTIAL IMPROVEMENTS

The author's scoring plan indicates that multiple reviewers will score each assessment. The author indicates that reviewers will use a rubric to score the performance task but does not provide a copy of the rubric. The author in an earlier element describes the assessments, though the SLO does not provide a copy of one as an example. Employing multiple reviewers increases the integrity and reliability of scoring.

The author might consider providing a sample unit test and corresponding scoring guide as well as the rubric for assessing the performance task. This would help teachers and evaluators ensure that assessments and learning content are aligned and that the assessments themselves are in fact rigorous.

Overview of Rhode Island Chemistry (Grade 11)

This chemistry SLO pinpoints specific, aligned standards and identifies reasons for the content selection. The pre-assessment focuses on advanced, college-level content and the author uses pre-assessment scores to set separate goals for three distinct units of students. The inclusion of additional achievement data would help ensure that targets the author sets are rigorous for all students. The author uses multiple measures to assess student learning in this SLO: five unit tests and one performance task. It is not clear, however, how the author plans to combine results from unit test with those from the performance task to create a final score for the SLO, though it is possible that this judgment will be left to an evaluator.

Appendix: Tool for Comparing SLO Elements Across Jurisdictions

Rhode Island Element Name	Standardized Name
Objective Statement	Learning Content
Rationale	Rationale
Aligned Standards	Learning Content
Students	Student Population
Interval	Interval of Instruction
Baseline Data	Baseline
Targets	Student Growth Targets
Rationale for Targets	Rationale
Evidence	Assessments
Administration	Assessments
Scoring	Assessments

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