SimScientists Assessments: Physical Science Links

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Matter | *Motion* | *Energy* | *Waves*

CONTEXT

The SimScientists program is developing a multilevel assessment system for middle school science. This PSL project will create formative and summative assessments and companion classroom reflection activities for four of the most widely taught topics in middle school physical science: *Matter, Motion, Energy,* and *Waves*. The project is in the design and development phase that includes feasibility studies of assessments for *Energy* and *Waves*, conducted in the classrooms of two teacher co-developers.

RESEARCH QUESTIONS

Validity of the assessments:

1. How well do the embedded, benchmark, and signature assessment tasks and items align with the *Framework for K-12 Science Education*, NGSS and state standards, and each other?
2. How well do assessment tasks and items meet standards for scientific accuracy, grade-level appropriateness, and task quality?
3. How well do the assessments meet technical standards for reliability and validity?

Classroom use of assessments:

4. Can teachers implement the assessments?
5. In what ways do teachers integrate the assessments into curricula to support learning?
6. Do teachers and students find the simulation-based assessments valuable for monitoring progress, adjusting instruction, and reporting?
7. Are students engaged in the assessments?

Policy implications:

8. Do the cross-validation studies of SimScientists assessments in multiple states support their appropriateness for testing the targeted science knowledge and practices across curricula and as components of a district or state science test?
9. Do state, county, and district representatives consider the simulation-based classroom and year-end assessments credible components of their state science assessment systems?

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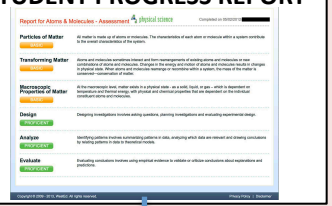
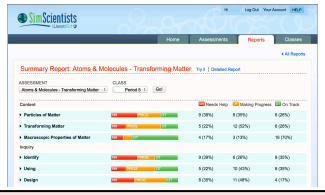
FORMATIVE ASSESSMENT PROCESS

EMBEDDED ASSESSMENT

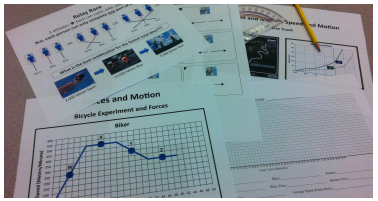
STUDENT PROGRESS REPORT



TEACHER REPORT

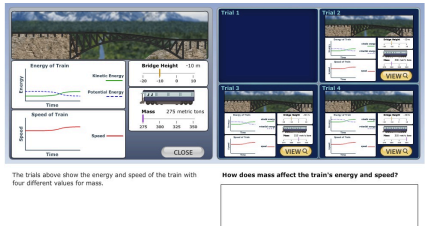


ADJUST & DIFFERENTIATE

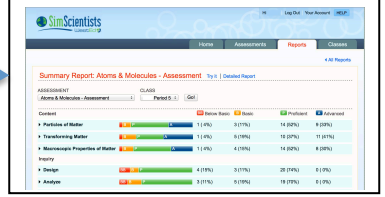


REFLECTION ACTIVITIES

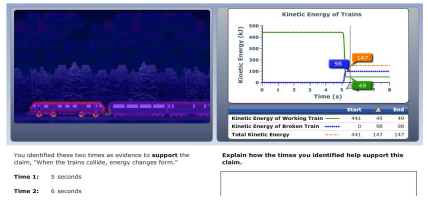
BENCHMARK ASSESSMENT



SUMMATIVE REPORT



YEAR-END ASSESSMENT



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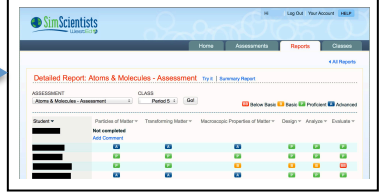

SIGNATURE TASKS

RESEARCH DESIGN

ASSESSMENT DEVELOPMENT (2012–14)

- Design and development
- Alignment and quality review
- Reflection activities
- Online PD
- Classroom feasibility testing

PILOT & VALIDATION STUDY (2015)

- Two samples of 5 teachers with 4 classes each, 500 students
  - Sample 1: Validate embedded, unit benchmark, pre/post, and year-end signature tasks
  - Sample 2: Post test and year-end signature tasks only

CROSS-VALIDATION STUDY (2016)

- Two samples of 40 teachers with 1 class each, 500 students
  - Sample 3: Full simulation suite
  - Sample 4: Post test and year-end signature tasks only

PHASE 1—ASSESSMENT DEVELOPMENT

DATA COLLECTION

- Alignment and quality reviews
  - Energy and Waves
- Classroom feasibility testing
  - 1 teacher, 5 classes, ~100 students
  - Two embedded assessments
  - Benchmark assessment

ANALYSES

- Descriptive statistics
- Data mining
- Classical psychometrics
- IRT

EVALUATION

- Classroom observations

RESULTS AND PRODUCTS

- Evidence of technical quality
- Inform revisions to assessments
- Inform planning for reflection activities

SimScientists WestEd