

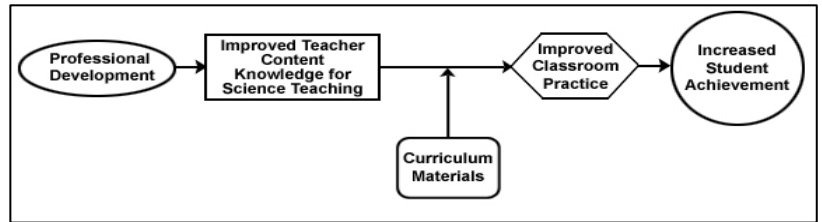
# Assessing Teacher Learning About Science Teaching (ATLAST)

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## Overview

ATLAST was funded as an MSP RETA to create instruments that would enable researchers to test a predominant model of professional development, depicted to the right. Briefly, the model asserts that teacher professional development leads to increases in teachers' content knowledge for teaching (i.e., disciplinary and pedagogical content knowledge); these increases in turn result in changes in classroom practice, which ultimately produce improvements in student achievement. In addition, professional developers increasingly recognize that curriculum materials may limit the extent to which changes in teacher knowledge and skill affect classroom practice. For this reason, the model shows curriculum materials as a factor that mediates the effect of professional development on classroom practice.



Testing this theory requires a coherent set of instruments that assess teacher opportunity to learn, and that measure changes in teacher knowledge and classroom practice, as well as changes in student achievement. ATLAST is developing three sets of instruments, one for each of three middle grades science areas.

## Content Areas

ATLAST is developing instruments to test the theory of professional development in three content settings. Each content area is central to its discipline, and each is found in both the NSES and Project 2061's Benchmarks for Scientific Literacy at the middle grades level. The content areas are:

- Forces and motion
- Processes that shape Earth
- Flow of matter and energy in living systems

## Instrument Development

ATLAST is developing the following instruments in each content area:

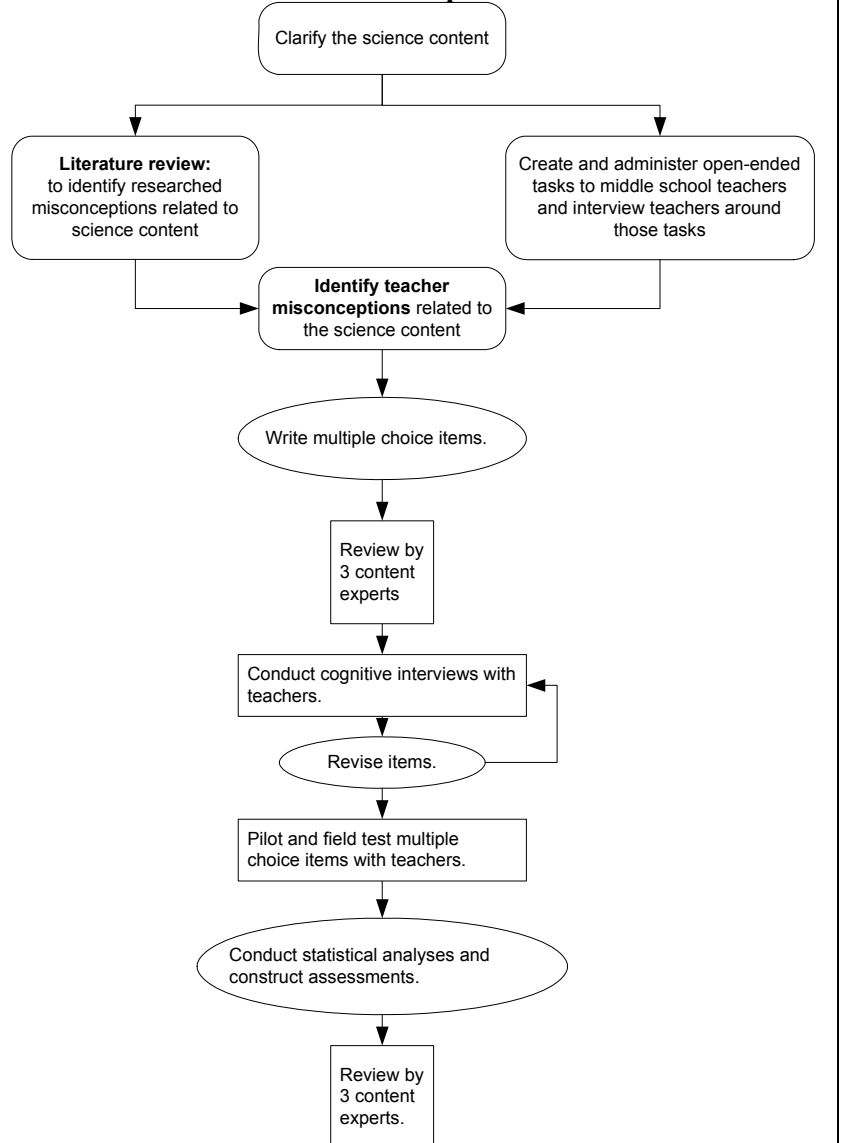
- Student science content knowledge assessments
- Teacher science content knowledge assessments
- Student opportunity to learn instruments
- Teacher opportunity to learn instruments

In addition, ATLAST is developing a survey of teachers' opinions about effective science instruction.

## Attributes of Assessments

- 25-30 multiple choice items each
- Strong validity as judged by content experts
- Sensitive to instruction
- High reliability
- Minimal burden for test taker and scorer

## Assessment Development Process



## Successes

- ATLAST developed content-specific pairs of teacher and student assessments with strong validity, as judged by content experts, and high reliability. To our knowledge, these are the only such pairs of teacher and student assessments.
- Many projects are using the assessments, and we are particularly satisfied to see some projects using the teacher and student assessments in conjunction with one another.
- We recently completed data collection for a study in two of our content areas involving almost 200 teachers who:
  - Took the teacher assessment
  - Taught a unit on the same content
  - Administered the student assessment before and after the unit
  - Kept a detailed daily logWe are now analyzing these data.
- ATLAST has conducted item writing workshops for over 300 individuals from NSF- and state-funded MSP teams.
- ATLAST has published several articles and papers, including:
  - Ford, B. & Taylor M. (2007). Investigating Students' Ideas about Plate Tectonics Science Scope, 30(1), 38–43.
  - Smith P. S. (2009, April). Exploring the relationship between teacher content knowledge and student learning. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Garden Grove, CA.
  - Taylor, M. & Smith, S. (2009). How do you know if they're getting it? Writing assessment items that reveal student understanding. Science Scope, 32(5), 60–64.

## Challenges

- Much of our work necessitates data collection in multiple classroom settings. We are finding it increasingly difficult to gain access to classrooms. District offices are reluctant to approve research that makes any demands on instructional time. Further, they are very sensitive about any data collection that involves students. The demand for research-based practices is at an all-time high, but conducting that research has never been more difficult.
- ATLAST aims to develop a measure of student opportunity to learn that has high validity and inter-rater reliability but that can be completed in a reasonable amount of time. Currently, our analysis process is quite complex and time consuming, but necessary in order to see which aspects of the analysis are predictive of student learning. We are struggling to find an efficiently way to rate opportunity to learn.

## Learning from the MSPs

- How have projects collected daily classroom instruction data from teachers in ways that have neither influenced classroom instruction nor been too burdensome?
- Developing instruments in three different disciplines in science has given ATLAST a unique opportunity to think about whether the elements of effective instruction are the same in each content area. Have projects explored how much evidence teachers and/or students need to consider in order to learn a concept? Does this differ by content area?

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## For further information

Use of ATLAST's teacher and/or student assessments may be requested at:

<http://www.horizon-research.com/atlast>.

All other inquiries should be directed to Sean Smith by phone (919-489-1725) or email:

[atlast@horizon-research.com](mailto:atlast@horizon-research.com).

