ATLAST Force and Motion Teacher Assessment
User Manual

1. Overview

The ATLAST Force and Motion Teacher Assessment is a 29-item multiple-choice assessment for middle grades science teachers. The assessment measures understanding of the concept that "an unbalanced force acting on an object changes the object's speed, or direction of motion, or both" (American Association for the Advancement of Science/Project 2061, 1993). This user manual describes the background, development, measurement properties, and appropriate uses of the assessment. User manuals for other ATLAST assessments may be found at www.horizon-research.com/atlast.

2. Background

Horizon Research, Inc. (HRI) developed the ATLAST Force and Motion Teacher Assessment as part of a larger study. The project—Assessing Teacher Learning About Science Teaching (ATLAST)—was funded by the National Science Foundation under Grant no. DUE-0335328[1]. The goal of ATLAST was to develop instruments that researchers could use to study the theory of action that underlies much professional development for science teachers. Briefly, the model asserts that changes in teacher knowledge lead to changes in classroom practice (mediated by instructional materials), and ultimately, changes in student learning. (See Figure 1.) Despite the prominent role this model plays in professional development design, it has not been studied systematically, in part because of a lack of instruments. Among other products, ATLAST developed pairs of assessments—one for teachers and one for students—focused on the same science content. These pairs of assessments enable the study of relationships between teacher knowledge and student learning in specific science contexts. ATLAST assessments exist for three content areas: flow of matter and energy in living systems (photosynthesis and cellular respiration), force and motion (Newton's first and second laws), and plate tectonics.

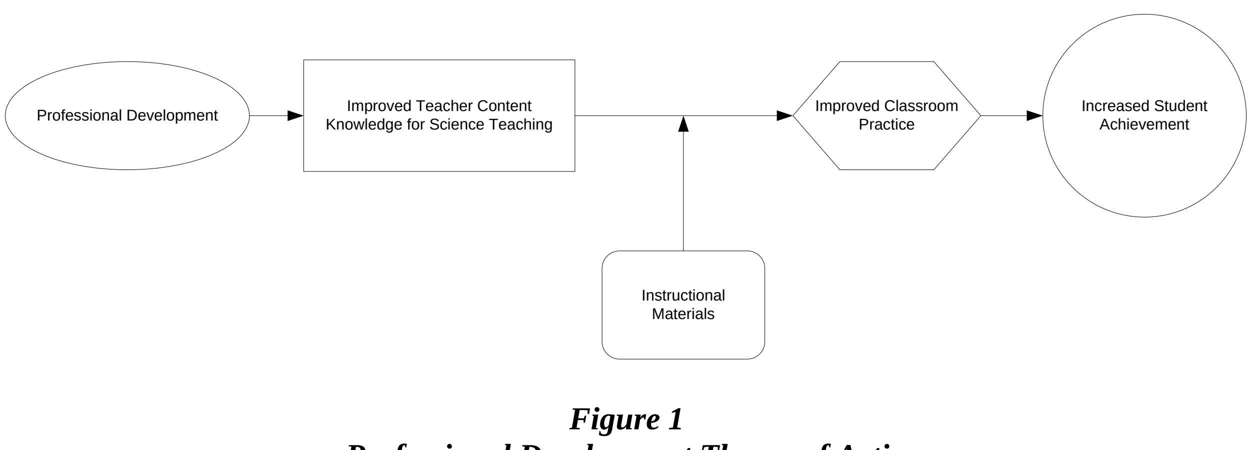


Figure 1
Professional Development Theory of Action

[1] Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

To enable large-scale research, HRI set out to create assessments that would be minimally burdensome, both for the test-taker and the researcher. Accordingly, HRI opted for a multiple-choice format, recognizing the limitations of such items. For instance, well-constructed open-ended items may probe more depth of understanding than multiple-choice items, but they are more burdensome for both the researcher (in terms of scoring costs) and the test-taker (in terms of time required to complete the assessment). In addition, scoring open-ended items requires the training of raters to establish inter-rater reliability.

3. Development of the Force and Motion Teacher Assessment

As described above, this development effort was part of a much larger and well-funded project, which afforded a thorough development process, depicted in Figure 2.

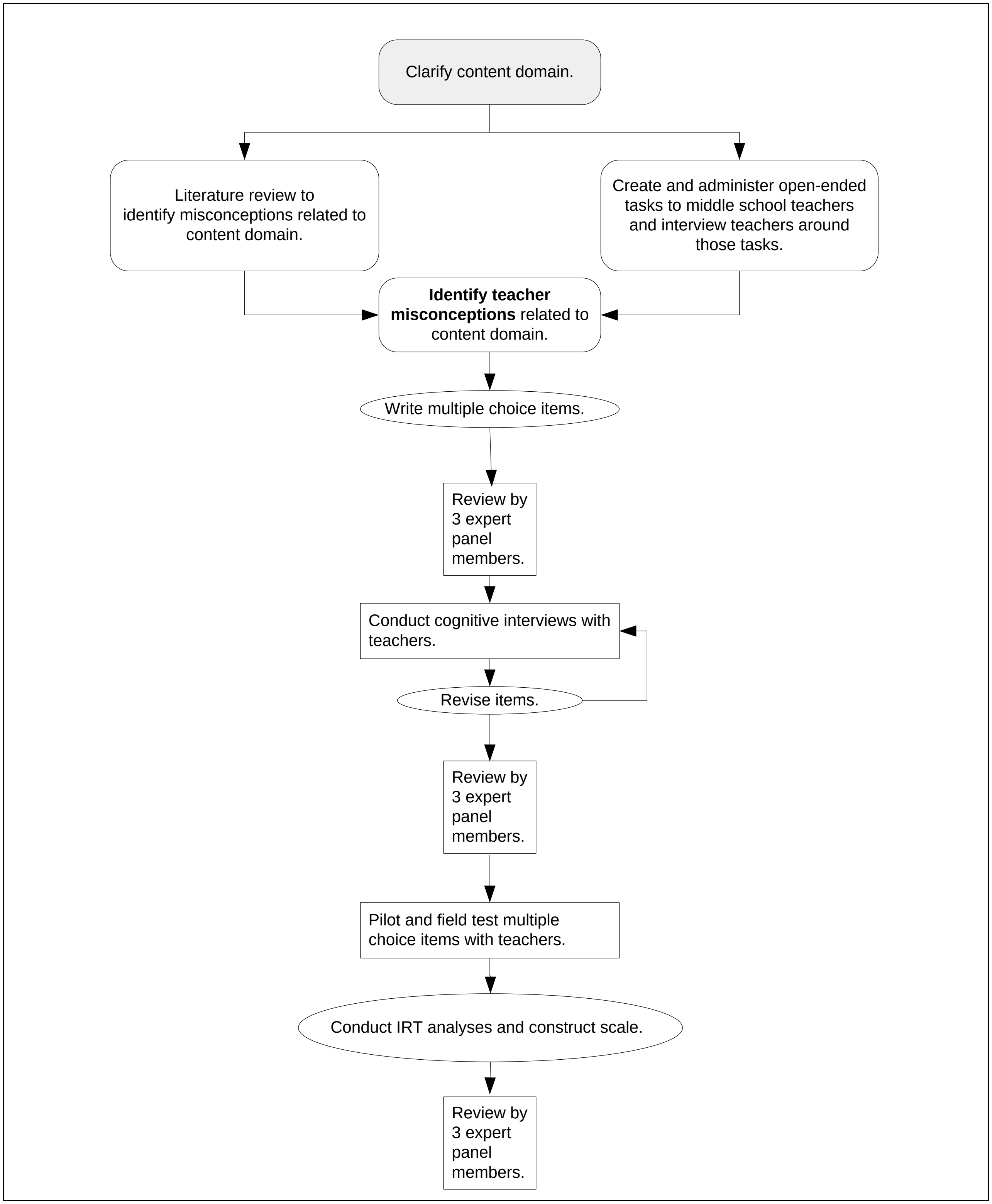


Figure 2
ATLAST Assessment Development Process

3.1. Clarifying the Content Domain

Development began with identifying the target content for the assessment, the idea that "an unbalanced force acting on an object changes its speed or direction of motion, or both" (American Association for the Advancement of Science/Project 2061, 1993). HRI specified the domain by "unpacking" this idea into 10 "sub-ideas," that were reviewed by four physicists/physics educators, resulting in minor edits. The final description of the content domain is shown in Table 1.

Table 1
Force and Motion Content Domain

Targeted Idea: An unbalanced force acting on an object changes its speed or direction of motion, or both.

Sub-ideas:

- A. A force is a push or pull interaction between two objects, and has both magnitude and direction.
- B. All of the forces acting on an object combine through vector addition into a net force; they either balance each other out (net force is zero), or act like an unbalanced force (net force is not zero).
    1. If the sum of forces exerted on an object in one direction is the same strength as the sum of forces exerted on the object in the opposite direction, then the forces on the object are balanced (i.e., the net force is zero).
    2. If the sum of forces exerted on an object in one direction is greater than the sum of forces exerted on the object in the opposite direction, then the forces on the object are unbalanced (i.e., the net force is not zero).
- C. A force diagram uses arrows to represent the forces acting on an object at a particular moment. The length of the arrow represents the relative magnitude of the force. The direction of the arrow represents the direction of the force acting on the object.
- D. If an object is moving faster and faster, then there is a net force acting on the object in the same direction as the motion.
- E. If an object is moving slower and slower, then there is a net force acting on the object in the direction opposite to the object's motion.
- F. If an unbalanced force acts on a moving object in a direction that is neither in the direction of the object's motion, nor directly opposed to it, then the object's direction (and possibly speed) will change.*
- G. If there is an unbalanced force acting on an object, the greater the strength of the unbalanced force, the greater the change in the object's velocity.
- H. If there is an unbalanced force acting on an object, the more massive an object is, the smaller the change in the object's velocity.
- I. If an object has constant speed in a straight line (or zero speed), then there is no net force acting on the object. This can occur either when:
    1. the forces on the object are balanced; or
    2. there are no forces exerted on the object
- J. The force of friction acts to oppose the relative motion of two objects in contact. Friction acts on both objects along the surfaces in contact with each other. The magnitude of friction depends upon the properties of the surfaces and how hard the objects are pushed together.

* This sub-idea is included for completeness of unpacking, but it is not included in the assessment. Only motion in one dimension is addressed.

In addition to specifying the science content domain, HRI specified the kinds of teacher knowledge the assessment would measure. Knowledge of science content was a given, but other kinds of knowledge were considered. For instance, one could argue that teachers should know what misconceptions or prior conceptions students are likely to bring to a study of the content. Teachers should also know effective strategies for engaging students with the science content and for helping students make sense of the content. Finally, teachers should know effective strategies for informally assessing student understanding during instruction. Each of these types of knowledge, which Shulman (1987) dubbed "pedagogical content knowledge," is content-specific.

After a review of existing literature on pedagogical content knowledge (e.g., Carlsen, 1999; Magnusson, Krajcik, & Borko, 1999; Shulman, 1987; Veal and MaKinster, 1999; Wilson & Berne, 1999), HRI compiled seven content-specific domains of teaching knowledge (see Table 2). The research base in force and motion seemed extensive enough to support item development in the first, fourth, and seventh domains; i.e., item writers could use the literature to generate plausible distractors as well as a single correct answer.

Table 2
Content-Specific Domains of Teacher Knowledge

1. **Knowledge of disciplinary content**
   This knowledge refers strictly to the science content, with no other elements of what a teacher would need to know in order to relate the content to students.

2. **Knowledge that alternative frameworks for thinking about the content exist**
   When teachers have deep knowledge of disciplinary content and recognize that different ways of organizing ideas exist, they can focus on helping students understand the important ideas, without necessarily requiring students to organize ideas in the exact same way. Such knowledge also enables teachers to recognize student understanding that is correct, but presented differently from how the teacher might organize it.

3. **Knowledge of the relationships between big ideas and the supporting ideas in a content area**
   Teachers need to help students not be so focused on the small details of the content that they never grasp the larger (and more powerful) concept.

4. **Knowledge/understanding of student thinking about the content**
   To help students understand content, teachers need to know what ideas students are *likely* to bring with them and where they are likely to struggle. Some content areas—e.g., force and motion—have a rich research base on student preconceptions and misconceptions, which includes research on how resistant these ideas may be to change. Most content areas do not have such a research base.

5. **Knowledge of activities/representations/hypothetical scenarios, etc. that can be used to *diagnose the thinking* of a particular group of students**
   Teachers need to know how to discern what ideas students have about a content area, both prior to and during a unit of instruction.

6. **Knowledge of how to sequence ideas for students to learn the content of interest**
   This type of knowledge highlights one of the differences in how a teacher and scientist think about content. A teacher needs to be able to think about content in terms of how students can most efficiently come to understand it. They need to know which ideas are pre-requisites for later ideas and how to progress from less complex to more complex ideas.

7. **Knowledge of content-specific strategies (activities/representations/hypothetical scenarios, etc.) that *move students' thinking forward***
   In addition to knowledge of student thinking, teachers need knowledge of ways to move that thinking forward. Included in this knowledge is an awareness that not all strategies will work equally well with all groups of students. The implications of some student differences are obvious—e.g., seeing or hearing impairments. Others are more subtle; e.g., representations that communicate well for students in inner city settings may not work well for students in rural schools, and vice-versa.

Attempts to write items targeting teachers' knowledge of common patterns of student thinking were not successful. Items generally took the form of, "Which of the following misconceptions are students likely to exhibit in a study of force and motion?" Although the research base in force and motion has identified prevalent misconceptions, it is not strong enough to argue the *relative prominence* of two misconceptions. Further, it seemed unreasonable to expect teachers to be thoroughly familiar with the literature on student thinking in every content area they teach.

Multiple-choice items testing teachers' knowledge of instructional strategies were abandoned on different grounds. After many attempts to write such items, HRI recognized that even in force and motion, the literature is not strong enough to judge the relative effectiveness of two or more activities that reasonably address the same idea. Interviews with teachers revealed that such items were not measuring knowledge, but rather they were measuring teachers' beliefs or attitudes about teaching.

In summary, the ATLAST Force and Motion Teacher Assessment measures only knowledge of science content.

3.2. Types of Teacher Assessment Items

The sections that follow discuss the three types of teacher multiple-choice items included in the assessment:

1. knowledge of science content (Level 1 items);
2. using content knowledge to analyze/diagnose student thinking (Level 2 items); and
3. using content knowledge to make instructional decisions (Level 3 items).

Knowledge of science content

All of the ATLAST items for teachers assess knowledge of science content, but the most basic type of question attempts to isolate disciplinary content knowledge from a teachers' ability to apply that knowledge in making instructional decisions. An example of these "Level 1" items is shown in Figure 3 (correct answer is C).

A teacher takes a middle school science class to the bowling alley for a "hands-on" experience with force and motion. The teacher asks Jill to take a turn. After she releases the ball and it is rolling down the level alley, the teacher says to her,

> "Describe the ***horizontal*** force(s) that are acting on the ball ***after*** you release it and it is rolling down the alley."

Jill describes two forces: (1) the forward force on the ball making it move, and (2) the force of friction that makes the ball move slower and slower. Which one of the following is an accurate assessment of Jill's thinking about the forces acting on the ball ***after*** it has been released and is rolling down the alley?

A. Jill *correctly* identifies the only two horizontal forces acting on the ball.
B. Jill *correctly* identifies the force of friction, but should have called the force making the ball move "the force of momentum."
C. **Jill *correctly* identifies the force of friction, but *incorrectly* describes the ball as having a force on it that makes it move.**
D. Jill *correctly* identifies the force of friction, but should have called the force making the ball move "the force due to her hand."

Figure 3
Level 1 Item

This item illustrates some features common to all ATLAST teacher assessment items. As mentioned previously, all of the items are multiple-choice. In addition, all items include only four choices, and answer choices are never worded as "all of the above" or "none of the above." Multiple correct answers, such as "A and B but not C," are also not used. Perhaps most importantly, all of the items are set in an instructional context. The intent in using these contexts was two-fold: first, to make teachers feel like they were taking a test that was written for them, as opposed to, for example, a test constructed for undergraduates. The second goal was for teachers to recognize in the items the kind of work they do every day, making it more likely that they would intellectually engage with the items.

Using science content knowledge to analyze/diagnose student thinking
"Level 2" items require teachers to *apply* their content knowledge in analyzing or diagnosing a sample of student thinking. Figure 4 shows an illustrative item (correct answer is C).

A teacher gives her physical science class the following thought experiment:

> "Standing at the edge of an ice rink, you give a hockey puck a gentle push toward the middle of the rink. This is a special ice rink that has absolutely ***no friction***. About how far do you think the puck would go before it stops?"

Virtually all the students agree that the answer depends on how hard you push the puck with your foot. Which of the following best represents the students' understanding of forces and motion?

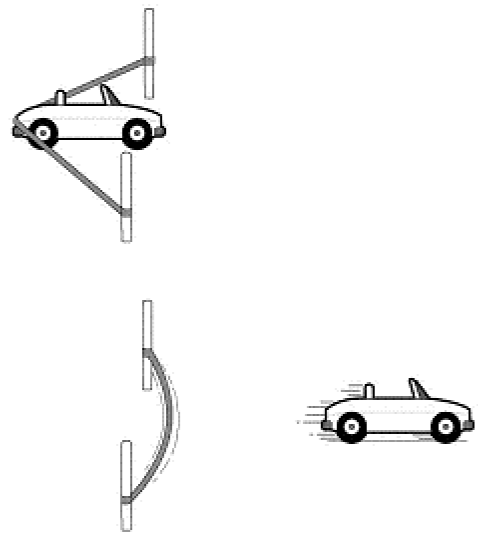
A. They do not understand the idea that forces combine to create a single net force on an object.
B. They do not understand the idea that force is directly proportional to an object's acceleration.
C. **They do not understand the idea that an object's motion will not change unless an unbalanced force acts on it.**
D. They correctly understand the motion of the puck.

Figure 4
Level 2 Item

Certainly a teacher must understand the science content in order to answer Level 2 items correctly. However, additional analysis of the question is required because more than one of the choices includes a correct physics statement, unlike the Level 1 item in Figure 3. In Figure 4, the statements in choices A, B, and C are correct in terms of the physics, but only C *also* applies to what the students said. This feature is present in all Level 2 items and makes the cognitive load of these items higher than that of Level 1; teachers must evaluate the students' thinking in relation to the physical scenario in order to choose the correct answer.

Using content knowledge to make instructional decisions
"Level 3" items ask teachers to apply their content knowledge in choosing among instructional moves. A sample Level 3 item is shown in Figure 5 (correct answer is B).

During a lesson in a unit on force and motion, students observe what happens when a car is launched across a level floor with a rubber band, as shown in the diagram below.



The teacher asks the students to explain the forces acting on the car from the time that the rubber band is released until the car comes to a stop. A student provides the following response:

> "The force of the launcher makes the car go faster and faster. Once the force of the launcher has run out, the force of friction takes over and will make the car move slower and slower and eventually stop."

What question should the teacher ask this student to determine what he understands and/or misunderstands about forces and motion?

A. "What causes 'the force of friction'?"
B. **"What do you mean by 'the force of the launcher has run out'?"**
C. "What happens when the car reaches its maximum speed?"
D. "What would happen if we used a stronger rubber band?"

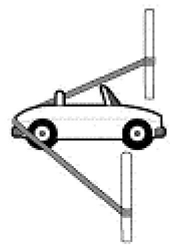
Figure 5
Level 3 Item

Level 3 items have the highest cognitive load; teachers must evaluate the physical scenario, the student's thinking in relation to the physical scenario, and then evaluate each instructional choice. As with Level 2 items, more than one answer choice has a correct physics statement, but only one has a correct physics statement *and* is relevant to the instructional context. Although the cognitive load of Level 3 items is demanding, it is a small fraction of the demand placed on a teacher managing the learning of a classroom of students.

3.3. Item Development

Development of the multiple-choice items began with asking approximately 100 teachers to respond to open-ended items about the teaching of force and motion concepts. A sample item is shown in Figure 6. These items accomplished two things. First, responses provided a window into teachers' thinking about the content, in many cases revealing the kinds of misconceptions teachers have about force and motion. In most instances, their misconceptions were the same as those identified in the literature as held by middle grades students. Second, teachers' incorrect responses could be used to generate distractors for the multiple-choice items.

At the beginning of a unit on forces and motion, you set up a demonstration for your students, in which a rubber band, stretched between two posts, is used to launch a toy car across the classroom floor.



Following the demonstration, you ask the students to explain the forces acting on the car just after the car is released from the rubber band. Students are likely to offer a number of different answers, some correct and some incorrect.

What are some incorrect answers your students are likely to give? For each incorrect idea, please explain why you think a student might have that idea.

What would be a completely correct student answer?

Figure 6
Open-Ended Item Used in Development

Once teachers' responses to open-ended items were collected, a months-long iterative process followed in which multiple-choice items were written and refined based on conducting cognitive interviews with middle grades science teachers. The interview protocol is shown in Figure 7.

Prologue:

We are developing a test for middle school teachers who teach physical science, and we need your help to get the questions on the test just right. I don't expect you to answer all of the answers correctly. If you get a few wrong, it will help me know whether we have written the items well. Remember, the point is to help us write a good test, not to test what you do or don't know. Do you have any questions before we get started? Remember that all of your answers are confidential.

Procedure:

- Ask teacher to read aloud and "think aloud" as they read the questions and answer choices, if they are comfortable doing so.

- For each multiple-choice item, ask:
  1. Why did you choose that answer? (probe for words or diagrams they keyed in on, as well as their thinking behind the response)
  2. Were there other answer choices that you almost chose? (why?)
  3. Were there any answer choices that you did not even consider? (why?)
  4. Was there an answer choice you were expecting to see, but did not? What was it?
  5. Were there any words or diagrams you did not really understand, or situations that made the question confusing?
  6. Do you have any other comments on the item?

Figure 7
Cognitive Interview Protocol

The cognitive interviews revealed distinct patterns of errors in teacher responses to the Level 2 items (using content knowledge to analyze/diagnose student thinking). Some teachers chose an answer that included student thinking they were familiar with, whether or not it represented the thinking of the student in the item. Others chose a statement that was correct in terms of the physics, but not in relation to the student's thinking.

Interviews also suggest some common errors teachers make with Level 3 items (using content knowledge to make instructional decisions). First, they often saw more than one of the instructional choices (including the correct one) as equally good, particularly when the item requires teachers to evaluate which question should be asked next, as in the example in Figure 5. When the choices are about actual activities, teachers sometimes get bogged down in the details of the choices. For instance, they may rule out a choice that includes low-friction carts because they do not have access to such equipment, regardless of whether the activity would help move the student's thinking forward. Finally, teacher beliefs about effective instruction may get in the way, even when they seem to understand the content targeted by the item. For example, teachers often choose a hands-on activity, even if it does not address the student's thinking.

3.4. Field Tests

A pool of 60 force and motion teacher items was distributed over three forms for the initial field test, with 15 items common to each form. Just over 500 science teachers across the nation responded to each form. Each group included roughly one-fifth high school physics/physical science teachers to ensure an adequate distribution of levels of teacher knowledge in the sample. The remaining respondents were middle grades science teachers.

Using results from the first field test, 33 items were selected for the second field test with approximately 750 teachers nationally, again with one-fifth of the sample being high school science teachers. Table 3 describes the sample in terms of various demographic variables. Both field tests were administered entirely on-line.

Table 3
Characteristics of the Second Field Test Sample (N = 747)

	Percent
Grade Level Taught	
Middle grades (6-8)	79
High school (9-12)	21
Experience Teaching Newton's Laws of Motion	
Middle school physical science	76
High school physical science	22
High school physics	14
High school advanced/AP physics	8
Other	12
Taken a college-level introductory physics course	78
Gender	
Female	60
Male	40
Race/Ethnicity	
American Indian or Alaskan Native	2
Asian	1
Black or African American	2
Hispanic or Latino	1
Native Hawaiian or Other Pacific Islander	0
White	96

4. Measurement Properties of the Assessment

Following is a description of the content coverage of the assessment, information about the validity and reliability of the assessment, and the results of the item response theory (IRT) analysis.

4.1. Content Coverage

Using results from the second field test, 29 items were selected for the final form. The distribution of items by sub-idea is shown in Table 4. The number of items totals to more than 29 because one item may address more than one sub-idea.

Table 4
Number of Items Addressing Each Sub-Idea

Sub-Ideas:	Number of Items
A. A force is a push or pull interaction between two objects, and has both magnitude and direction.	7
B. All of the forces acting on an object combine through vector addition into a net force; they either balance each other out (net force is zero), or act like an unbalanced force (net force is not zero).	7
C. A force diagram uses arrows to represent the forces acting on an object at a particular moment. The length of the arrow represents the relative magnitude of the force. The direction of the arrow represents the direction of the force acting on the object.	10
D. If an object is moving faster and faster, then there is a net force acting on the object in the same direction as the motion.	6
E. If an object is moving slower and slower, then there is a net force acting on the object in the direction opposite to the object's motion.	4
G. If there is an unbalanced force acting on an object, the greater the strength of the unbalanced force, the greater the change in the object's velocity.	2
H. If there is an unbalanced force acting on an object, the more massive an object is, the smaller the change in the object's velocity.	1
I. If an object has constant speed in a straight line (or zero speed), then there is no net force acting on the object. This can occur either when the forces on the object are balanced or there are no forces exerted on the object	5
J. The force of friction acts to oppose the relative motion of two objects in contact. Friction acts on both objects along the surfaces in contact with each other. The magnitude of friction depends upon the properties of the surfaces and how hard the objects are pushed together.	6

Table 5 shows the answer key and content association for each item on the assessment. The letter "P" denotes a primary association with the sub-idea being targeted by the item. An "s" denotes a secondary association with a sub-idea that is also necessary in order to answer the item correctly but is not the primary idea being assessed.

Table 5
Answer Key and Sub-Idea Associations

Item #	Key	*A*	*B*	*C*	*D*	*E*	*G*	*H*	*I*	*J*
1	A						P			
2	C					P				
3	D	P								
4	C		P	s						
5	B	s								P
6	A								P	
7	D				P					
8	C								P	
9	A		P	s	P					
10	D		s	s					P	
11	D	P								
12	A				P					
13	A					P				
14	A			P						
15	B					P				
16	C									P
17	B				P					
18	A		s	s					P	
19	A	P								
20	C		P	s						
21	A	P		s						P
22	B					P	s			s
23	B									P
24	B	P								
25	D							P		
26	D		s	s	P					
27	C	P		s						P
28	D								P	
29	D		s	s	P					
Primary:		6	3	1	6	4	1	1	5	5
Secondary:		1	4	9	0	0	1	0	0	1
Total:		7	7	10	6	4	2	1	5	6

4.2. Validity

Four lines of evidence support the argument that the assessment is a valid measure of teachers' knowledge of force and motion ideas. First, cognitive interviews with teachers established that teachers interpret the items as intended and that teachers must use their knowledge of content to answer the items correctly. Second, a panel of three content experts (individuals with a Ph.D. in physics) reviewed the assessment items at three stages (see Figure 2) to ensure content accuracy. They also reviewed the final assessment and judged it to be an adequate measure of the content domain. Third, dimensionality analyses (including both factor analysis and cluster analysis) indicate that all items on the assessment measure a single dominant trait. HRI termed this trait "content knowledge for teaching about force and motion."

A fourth line of evidence for the validity of the assessment is derived from a study that compared teachers' performance on the assessment with their knowledge level as indicated in an interview. HRI administered the assessment to approximately 100 middle grades teachers. The five highest- and lowest-scoring teachers were selected for interviews. Interviews were conducted approximately two months after the assessment by a content expert (a Ph.D. professor with expertise in physics). The interviewer was not aware of the teachers' assessment scores. Interview questions addressed the same content used to formulate the assessment and were developed through the collaboration of HRI researchers with the content expert. The interview provided a second measure of content knowledge, independent of the assessment with regard to format and time of administration.

Based on the interview responses, the content expert categorized each interviewee as displaying "extensive knowledge of the content" or "limited knowledge of the content." Analysis of the interviewer ratings and assessment scores showed that the five highest-scoring teachers were categorized as having "extensive knowledge of the content," while the five lowest-scoring teachers were categorized as having "limited knowledge of the content." The agreement between assessment score and interviewer rating provides further evidence that the assessment is a valid measure of teachers' knowledge of force and motion ideas.

4.3 Reliability

The assessment has an internal reliability of 0.85. HRI conducted a study of test-reliability with approximately 100 middle grades science teachers who took the test twice, two weeks apart with no intervening instruction. The test-reliability was 0.88.

4.4. Speededness

Neither the pilot, field test, nor test-retest study were timed administrations. As such, there is no information about speededness.

5. Using the Assessment

The ATLAST Force and Motion Teacher Assessment is available at no cost to individuals who agree to certain terms of use. To request a review copy of the assessment, or to access the terms of use, visit http://www.horizon-research.com/atlast.

5.1. Appropriate Use

The ATLAST Force and Motion Teacher Assessment will yield a score for each individual. However, the assessment is not valid for making *judgments* about individuals based on those scores. For instance, assigning grades based on scores is not a valid use of the assessment. The assessment was not validated for such purposes.

HRI developed the assessment for use in research contexts involving groups of teachers. Appropriate uses with sufficiently large groups of teachers (20 or more) include:

- Measuring the change in group mean from pre-workshop to post-workshop;
- Comparing the gains of treatment and control groups; and
- Investigating the relationship between teacher knowledge and student learning.

5.2. Amount of Time Required to Complete the Assessment

As described above, both the pilot and field test were administered on-line and were not timed. Although there is no evidence of speededness, it is recommended that at least 30 minutes be allowed for completing the assessment.

5.3. Computing Scores

Scores may be computed either as number correct or percent correct. Results of an item-response theory (IRT) analysis are shown in Table 6. This table can be used to convert a raw score in terms of number correct to the corresponding scaled score. Raw and scaled scores representing mean values are presented in bold text.

Table 6
Assessment Score Conversions

Force and Motion Teacher Assessment				
Raw Score	Scaled Score		Raw Scores	
0	5		Mean	SD
1	7		15.2	5.38
2	9			
3	11			
4	13			
5	19			
6	22			
7	26			
8	28			
9	30			
10	34			
11	38			
12	42			
13	46			
14	50			
15	**52**			
16	54			
17	58			
18	62			
19	65			
20	69			
21	73			
22	76			
23	80			
24	83			
25	86			
26	90			
27	94			
28	96			
29	100			

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Terms of Use Agreement
Force and Motion Teacher Assessment

By using the ATLAST Force and Motion Teacher developed by Horizon Research, Inc. (HRI), you agree to abide by the stipulations below concerning use, test security, test administration, and citations.

Use of the Assessment

The Force and Motion Teacher assessment may be used to gauge growth in knowledge about a specific content area as a result of an intervention such as professional development, curriculum use, or mentoring. It may also be used to learn about the contribution of teacher knowledge to student knowledge and classroom instruction.

We ask that you abide generally by the standards put forward in the *Standards for Educational and Psychological Testing* (AERA/APA 1999).

You may not use the assessment to evaluate individuals. Assessment results may not be associated with any high-stakes consequence such as tenure, pay, hiring, or grades. The assessments were not developed for making decisions/judgments about individuals.

You should also refrain from using these measures to publicly demonstrate teachers' ability or lack of ability in science, which may adversely affect willingness to participate in future studies.

IRB and/or District/School Study Approval

It is your responsibility to obtain proper IRB and/or the appropriate district/school approval for your study and to follow the necessary requirements for obtaining principal, teacher, parent, and/or student permission/approval to administer to the assessment(s).

Responsibilities to Teachers and Students

Your responsibilities to study participants will largely depend on the details of the IRB and/or district/school approval of your study. In most cases, completion of the assessment will be strictly voluntary. As such, participants should be informed of the voluntary nature of the study. Teachers should be assured that if their data are not anonymous, individual identities will be kept strictly confidential; i.e., an individual's score or responses will never be reported in association with his or her name or any other identifying information. To encourage a high response rate among teachers, it may be helpful to:

- Clearly explain what the data will be used for and why the data are important for your study;
- Explain that there are no high-stakes consequences associated with completing the assessment;

- Offer teachers compensation for time spent outside of the regular school day completing the assessment.

Test Security

The ATLAST Force and Motion Teacher Assessment may NOT be shared without prior authorization from HRI. Anyone who administers the assessment must agree to:

- Refrain from using any non-released item in any presentation, paper, article, or other public forum. Items are expensive to develop and pilot, and we are attempting to keep our item pool secure.
- Refrain from distributing copies of any non-released item to individuals other than participants in your research project.
- Refrain from using the assessment, in original or in copied form, to provide test-taking practice or to enhance test-taking skills.
- Refrain from using test items, actual or similar, for discussion or review.

(HRI acknowledges that, in some cases, school administrators and IRBs may require that the test materials be reviewed prior to granting permission for study participants to take the test. Such a review is not considered a violation of this Test Security Policy as long as the other provisions of this policy are not violated.)

Citing ATLAST Assessments

In any writing in which data from HRI's ATLAST assessments are included, the following citation must be used:

The assessment was developed by the Assessing Teacher Learning About Science Teaching (ATLAST) project at Horizon Research, Inc. ATLAST is funded by the National Science Foundation under grant number DUE-0335328.

By signing below, I acknowledge that I have read the user manual, and I agree to abide by terms of use described above.

____

Printed Name   Signature   Date

Address: ____

Street   City   State   Zip code

Phone number (including area code): ___________________________________

Your email address: ____