What to Toss and What to Keep in Your Curriculum

by Lisa Martin-Hansen

At the beginning of each year, we have the daunting task of deciding which concepts and skills to teach our students. Many teachers feel the pressure to teach "the whole book". This pressure comes in multiple forms. There is ever-increasing pressure to perform well on state, national, and international exams. An added pressure is the mandate from the *National Science Education Standards* to include inquiry in the classroom (NRC 1996). While we may not be able to choose what standards get taught, teachers typically have the power to decide how to teach in their classrooms.

As we adopt curriculum to be taught, we often have the false notion that every page must be read in order to cover all standards required by the state. In a comparison study of industrialized nations throughout the world in the Third International Math and Science Study, the countries with students that fared the best (U.S. students ranked much lower) were found to cover fewer topics but at a more challenging level. Textbooks, by numbers of pages, were much thinner compared to the typical U.S. adopted textbook. The U.S. texts eclipsed other nations with its huge number of vocabulary terms making textbooks more like encyclopedias to be memorized rather than books containing meaningful concepts explained in depth. When, in reality, standards are better learned and better taught when addressing the core nature of the standard and leaving out the extraneous details that clutter and confuse our students. In a recent study by AAAS, every middle school textbook analyzed received failing marks (*www.project2061.org/about/press/pr990928.htm*). Attempting to cover this adopted curriculum results in the necessity of teaching numerous concepts in a superficial manner, usually through passive learning—solely reading the textbook, listening to lectures, watching an occasional demonstration, and answering textbook questions. Because our curriculum is so overloaded, there never seems to be enough time to teach any particular concept in depth using inquiry investigations, model creation, or other hands-on, minds-on instruction. As a result, students end up furiously memorizing in order to take a test, then quickly forgetting most memorized facts. We must ask ourselves, Is covering the text actually resulting in true learning? What happens to this information a week later? A month later? A year later?

If any particular state chooses to assign too many standards (concepts and skills) to a grade level, making it difficult to teach in a substantive manner—meaning more than reading the chapters and doing an activity here and there—we will fall into the same trap of teaching "a mile wide and an inch deep." In this case, it is even more important to see what you might be able to prune from your curriculum to free up time for meaningful, hands-on, engaging learning activities. (To see how your curriculum fares compared to the A+ countries, visit the North Central Regional Education Lab website at *currmap.ncrel.org/default.htm*.)

To free up time to provide meaningful, active learning experiences for our students that explicitly teach and reinforce mandated standards, we must throw out as much extraneous information as possible. Even though it is fall, it is time for spring cleaning. Review your usual assignments to pitch those that do not expressly address the core concepts you need to teach. Currently, workshops are offered across the United States by AAAS to help curriculum coordinators and teachers use the *Atlas for Scientific Literacy* (AAAS 2001) to streamline curriculum. The following recommendations were derived from a AAAS workshop hosted by the Heartland Area Education Agency in Ames, Iowa during the spring of 2004.

Lisa Martin-Hansen *is an assistant professor of Education at Georgia State University in Atlanta, Georgia.*

Streamlining the curriculum

Materials needed:

- *Science for All Americans*
- *Atlas for Scientific Literacy*
- *Benchmarks for Scientific Literacy*
- Your district curriculum and state/local standards
- Curriculum map or unit plan (not required but useful)

Procedure

Begin with your district standards. If they are not already organized into chunks to be taught as a unit, do so. Begin with one set of standards to be taught in one unit of instruction and the activities and lessons that you use to teach those standards.

Locate in the *Atlas* the concepts addressed in the standards that relate to your unit. (The concepts and skills in the *Atlas* directly correspond with the *Benchmarks*, and 90 percent of the *Benchmarks* are compatible with the *Standards*.) The following procedure streamlines instruction by focusing your unit on the core concepts, skills, vocabulary, and standards.

1. Read the science concept summary in *Science for All Americans* for a given unit in your curriculum. The summaries are the essence of the concepts and process skills needed to understand a particular concept. Compare the summary to the lessons and activities in your unit and then consider pruning any concepts or skills introduced that aren't found in the summary. Conversely, note any concepts mentioned in the summary that are not found in your unit so you can add them to your unit. Ideally, your department should go through this process together. However, if you find that your department is not interested, or perhaps you are in a small school without a science department, then you should consider sharing your work with special education teachers and other interested individuals.
2. In the *Atlas*, compare the core concepts, skills, vocabulary, and standards included in your unit with those listed in the *Atlas* for your grade level (grades 3–5 or middle school, for instance). Amend your curriculum where needed. A flowchart similar to Figure 1 can help you with this analysis. Review the lessons and activities in your unit to identify those that currently include a performance assessment and those that would benefit from such an assessment. Target concepts and skills that would be meaningfully taught through a learning cycle or inquiry investigation based on the items included in the performance assessment.
3. Use the concept and skill links in the *Atlas* from the K–5 grades to develop pre-assessment activities and to integrate these concepts into your curriculum. For example, if teaching Laws of Motion at the middle level, look at what is de-

FIGURE 1 **Analyzing your curriculum**

1. Begin with the *Atlas of Scientific Literacy*

Look up the particular benchmarks regarding the concept.

Forces and Motion

The first benchmark listed for grades 6–8

"The motion of an object is always judged with respect to some other object or point. 10A/1…"

2. Compare. Is it currently taught?

Yes
- How could the concept be assessed?
- Would a performance assessment be appropriate?
- What activities are currently used in instruction?

No
Should it be added to the curriculum?

Yes, it should be added to the curriculum
How would the concept be assessed? What classroom activities will be developed?

No

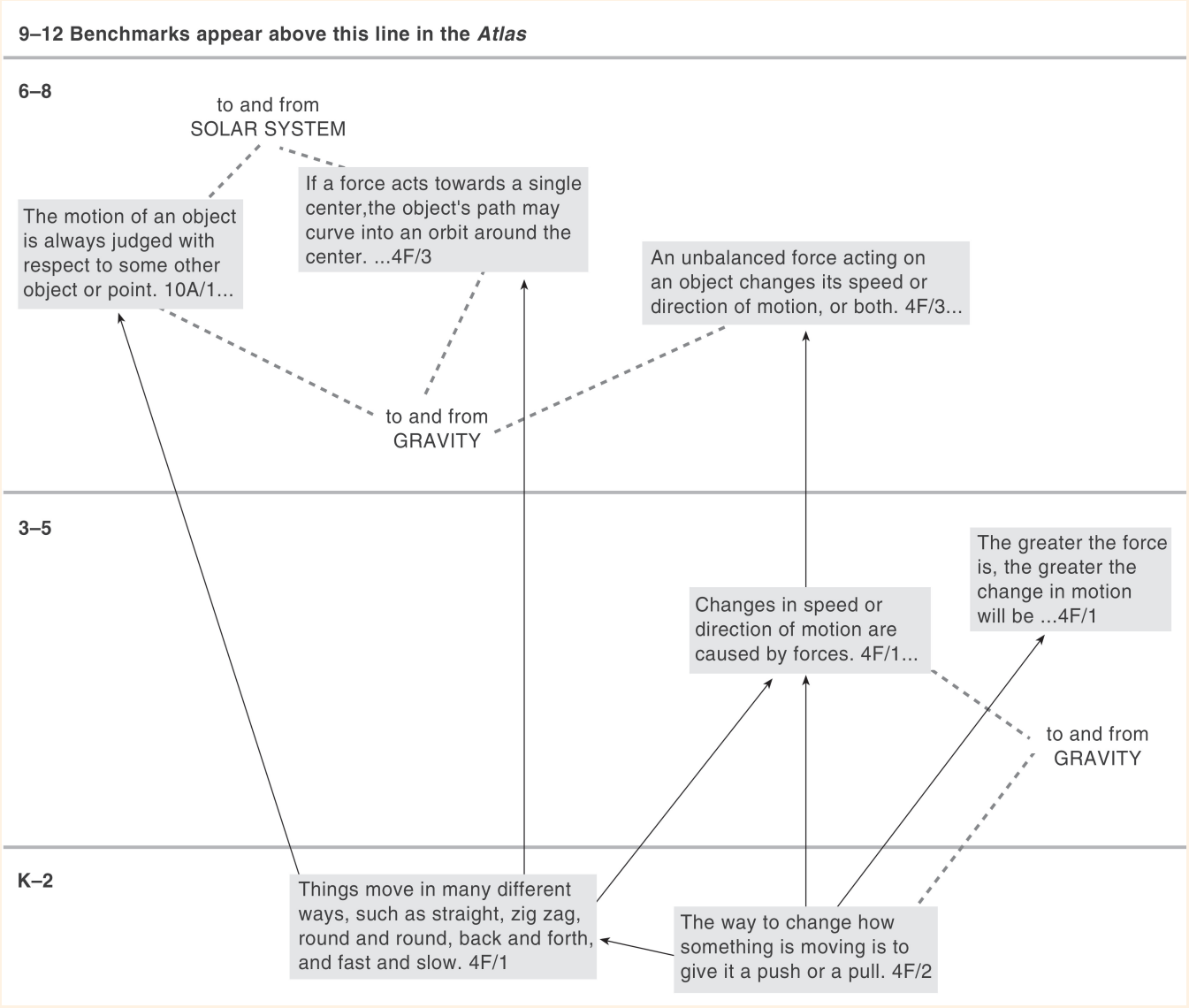
3. Additional concepts listed in curriculum but not in the *Atlas of Scientific Literacy*

Is that particular concept required by your standards/benchmarks?

Yes
- How could the concept be assessed?
- Would a performance assessment be appropriate?
- What activities are currently used in instruction?

No
Consider pruning the topic if removing the concept or idea would not hinder learning.

FIGURE 2 **An example of the grade level distribution and concepts/skills from the *Atlas for Scientific Literacy***



DETAILS FROM LAWS OF MOTION MAP FROM *ATLAS OF SCIENCE LITERACY*, PG 63. AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. (2001). WASHINGTON, D.C.

scribed in grades 3–5 and K–2 to determine what your students should already know (see Figure 2): 1) Changes in speed or direction of motion are caused by forces, and 2) The greater the force is, the greater the change in motion will be. If preassessment activities reveal a lack of understanding of these concepts, they will need to be included in your unit.

By using the *Atlas for Scientific Literacy*, we can create the additional time needed for hands-on, minds-on science. With this additional time, we can specifically target student misconceptions and work toward changing student thinking. ■

References

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Internet resource

AAAS website for Project 2061—*www.project2061.org*