

Legislative Analysis



REVISE SCIENCE CONTENT STANDARDS

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House Bill 5251 (Substitute H-1)
Sponsor: Rep. John Moolenaar
Committee: Education

Revised First Analysis (9-15-06)

BRIEF SUMMARY: The bill would require the State Board of Education to revise the model core academic curriculum content standards for science before August 1, 2006, to ensure that students are able to use scientific methods to critically evaluate scientific theories and use scientific data to assess the validity of those theories.

FISCAL IMPACT: The bill, as amended, would not create additional administrative costs for the Department of Education, or local school districts.

THE APPARENT PROBLEM:

The Michigan State Board of Education, working together with leaders in the scientific learning disciplines known as the Science Work Group (including a science review group of academicians chaired by nationally known scholars), is charged with adopting high school content expectations in science and periodically updating those standards. The content expectations outline what students should know and be able to do in a learning discipline. Teachers and school improvement leaders design their classroom curriculum and assessments, using the standards as a guide.

Michigan's standards or content expectations are established for four knowledge disciplines within science: earth and space; physics; chemistry; and biology. Each of these disciplines addresses the main ideas within that particular learning domain. For example, the biology content expectations cover four main ideas: organization and development of living systems; interdependence of living systems and the environment; genetics; and evolution and biodiversity.

The Science Content Expectations also include an overarching section concerning scientific inquiry, noting that scientifically literate graduates make observations about the natural world, identify patterns in data, and propose explanations to account for the patterns. Further, scientific inquiry involves the collection of relevant data, the use of logical reasoning, and the application of imagination in devising hypotheses to explain patterns in data. Scientific inquiry is a complex and time-intensive process that is iterative rather than linear. Habits of mind—curiosity, openness to new ideas, informed skepticism—are part of scientific inquiry. This includes, say the Science Content Expectations, the ability to read or listen critically to assertions in the media, deciding what evidence to pay attention to and what to dismiss, and distinguishing careful arguments from shoddy ones.

The content expectations say that scientific inquiry comprises nine types of performance expectations: generating questions; designing, critiquing, and conducting scientific investigations, using several controlled variables, and one manipulated variable; relating data patterns to theoretical models; describing conclusions using evidence from an investigation; explaining how scientific evidence supports or refutes claims or explanations; predicting what happens when variables change; using empirical evidence to validate or criticize conclusions; and organizing data results in graphs, tables, and charts.

The Science Content Expectations note that scientific inquiry is more complex than simply making, summarizing, and explaining observations, and it is more flexible than the rigid set of steps often referred to as the "scientific method." Instead, inquiry goes beyond "science as a process" to include an understanding of the nature of science.

Legislation was recently introduced to change the Science Content Expectations, in order to further emphasize the need for students to be able to do both of the following: use the scientific method to critically evaluate scientific theories including, but not limited to, the theories of global warming and evolution; and use relevant scientific data to assess the validity of those theories and to formulate arguments for or against those theories. Although the sponsor of the bill argued otherwise, some feared the legislation would invite costly lawsuits, if school districts were sued for not teaching scientific evidence critical of evolution. Consequently, the legislation was amended in the House Education Committee, as described below.

THE CONTENT OF THE BILL:

House Bill 5251 (H-1) would amend the Revised School Code to require the State Board of Education to revise the model core academic curriculum content standards for science.

Under the bill, not later than August 1, 2006, the state board would be required to revise the recommended model core academic curriculum content standards in science to ensure that students will be able to use scientific methods to critically evaluate scientific theories and use scientific data to assess the validity of those theories.

MCL 380.1278

ARGUMENTS:

For:

In order to retain its competitive edge in the global economy, the United States must train more scientists. Consequently, high school science curricula should be rigorous, and students must work harder to demonstrate their proficiency in the sciences, including mathematics—customarily thought of as the “language” of the sciences. To ensure high levels of competence, students need classroom experiences that enable them to learn and to use the knowledge and information contained in several science disciplines, including earth science, physics, chemistry, and biology. They must be challenged to learn and to apply the methods of scientific inquiry and investigation, and to recognize the kinds of empirical evidence that count for results within each learning discipline.

Although the Michigan Science Content Expectations are developed within an overarching framework that promotes scientific inquiry, that framework is not explicit enough to provide guidance to classroom teachers. This legislation clarifies that framework, requiring that science students study a curriculum that allows them to use scientific methods to critically evaluate scientific theories and use scientific data to assess the validity of those theories.

Response:

As originally introduced, this bill would have required the State Board of Education to revise the Michigan Science Content Standards to ensure that students would be able to "use the scientific method to critically evaluate scientific theories including, but not limited to, the theories of global warming and evolution." Further, under the original bill, students were to be able to "use relevant scientific data to assess the validity of those theories, and to formulate arguments for or against those theories." In short, the original bill would have called upon biology teachers to teach *all* of the scientific evidence concerning theories now advanced within the scientific community, including evidence that supports or disputes theories of evolution and global warming. In this way, students would be exposed to scientific evidence that extends our knowledge by challenging our current understanding, assuming that is not now the case.

Supporters of the original bill note that the current Biology Content Expectations teach the theory of evolution that has emerged since Charles Darwin published *Origin of the Species* in 1859—at which time he observed the changing characteristics of animal species, noting in particular the differences among finches in their respective habitats within the Galapagos Islands, variations he suggested were the result of natural selection within their differing environments. While this theory of change is commonly held by scientists world-wide who study biology and its sub-disciplines, there are over six hundred scientists who have recently signed a document that challenges Darwin's theory. That document, called "A Scientific Dissent from Darwinism" expressed public skepticism about the adequacy of evolutionary theory to explain the astonishing diversity and complexity of life. Three books have been published that advance their critique: Michael Denton's *Evolution: A Theory in Crisis*; Phillip Johnson's *Darwin on Trial*; and Michael Behe's *Darwin's Black Box*. These scientists note that at the microscopic level inside a cell, organisms appears to have levels of irreducible complexity that could not have evolved—molecular "motors" that exquisitely control collections of enzymes that make the products needed by the cell.

This bill should be amended, so that science teachers in public high schools teach the theorists' controversy in biology, thereby exposing students both to the Darwinian theory of evolution and to those scientists who challenge it. More specifically, it should be amended to require that biology teachers include scientific evidence about evolution and global warming, with a critical regard for evidence that pushes our understanding beyond prevailing knowledge. Without direct references to those two contested areas of controversy, the bill is confusing, and fails to give the State Board of Education the guidance it needs to change the science curriculum in the manner that those who supported the original bill intended.

Against:

Opponents of the original bill, including the Michigan Science Teachers Association, point out that "evolution is a major unifying concept of science, and should be included

as part of [Kindergarten]-College science frameworks and curricula." Further, the association notes that "a legislative mandate that includes only evolution and global warming in such an evaluation may suggest to students and the public that these theories are somehow less robust or less scientific than are other scientific theories that were not selected for mandatory evaluation, such as plate tectonics, atomic theory, cell theory, relativity. They say that such an inference would be in clear contrast to the preponderance of scientific evidence supporting both of these theories, and would represent a dishonest and unprofessional approach to the sciences and science education in Michigan."

In addition, Michigan Citizens for Science claims that the wording of House Bill 5251, as originally introduced, "falls directly in line with the current legal strategy of the Intelligent Design Movement." They continue: "Even before the federal court ruling in Dover, Pennsylvania, that ruled it was unconstitutional to teach intelligent design in public school science classrooms, the movement had begun to move on to a new legal strategy. Rather than advocating that intelligent design be taught explicitly along with evolution, they now are encouraging school boards and legislatures to 'teach the controversy', or to just teach 'the arguments for and against evolution.'" According to Michigan Citizens for Science, this poses numerous difficulties. First, they say, it ignores the fact that intelligent design theory is, in reality, nothing more than a set of arguments against evolution. There is no positive ID theory that could be confirmed with scientific research, but rather a set of arguments attempting to debunk evolution...all of the major ID arguments are purely negative in nature, relying upon the alleged failure of evolution as an explanation in order to make the case for design. So, by requesting that the 'arguments for and against' evolution be taught, they are really requesting the same thing they always have, under a different name."

A second difficulty, according to Michigan Citizens for Science, is that "the language will essentially give permission to local school boards and teachers to use those ID arguments in science classrooms to try to poke holes in evolution under the guise of 'formulating arguments for and against' the theory of evolution. The primary effect of this will be that Michigan students will be taught unscientific creationist material—material that has been explicitly rejected in statements from over 70 professional scientific organizations. The secondary, but perhaps more important, effect will be to invite lawsuits against districts that introduce this material in science classrooms."

An attorney and spokesperson with the Thrun Law Firm, PC, which represents over 450 Michigan school districts and intermediate school districts, testified against the bill as originally introduced, noting that the Thomas More Law Center has threatened at least one school district with a lawsuit, if intelligent design is not included in the curriculum. In the spokesperson's judgment, the original wording of the bill would create a mandate about competing theories of evolution, and invite lawsuits from the center and others. If that occurs, school districts will incur high legal expenses to defend against the charge.

Reply:

The sponsor and supporters of the original bill have testified that House Bill 5251 is *not about intelligent design*. Further, the sponsor has pointed-out the recommended model curriculum standards for science *are not a mandate* to change high school curricula. Consequently, the original bill *does not require the teaching of intelligent design*, but that such a decision would be up to local school boards.

Against:

This legislation is unnecessary. The State Board of Education, working together with scientists and science educators, has already adopted science content expectations that contain a sharp focus on the nature of scientific inquiry, and the role of evidence to advance scientific understanding. Following those norms of inquiry, the Darwinian theory of evolution has emerged as the prevailing and most robust theory of change that helps to explain differences among and within species, in ways that extend scientific understanding. What is more, the extant framework of scientific inquiry is open to modification, even elimination, of a particular theory, *if and when* scientific evidence is advanced that explains more of the difference among and within species. Generally, K-12 science educators are not working scientists, so they seldom gather empirical data to challenge robust theories. Instead, they teach the theories that research scientists find useful to help explain the natural world. Today, the Darwinian theory of evolution, while being challenged by some working scientists who seek to advance our understanding of evolutionary change, is the prevailing theory among biologists. As yet, no rival theories replace it. For this reason, there is no need to change the Michigan Science Content Expectations.

POSITIONS:

Citizens for Traditional Values supports the bill. (6-28-06)

The Michigan Department of Education opposes the bill. (6-28-06)

The Michigan Science Teachers Association opposes the bill. (6-28-06)

The Michigan Federation of Teachers opposes the bill. (6-28-06)

The Michigan Association of School Boards opposes the bill. (6-28-06)

The Macomb Intermediate School District opposes the bill. (6-28-06)

Thrun Law Firm, PC, representing over 450 school districts and ISDs, opposes the bill. (6-28-06)

The American Civil Liberties Union opposes the bill. (6-28-06)

Michigan Citizens for Science opposes the bill. (6-28-06)

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■ This analysis was prepared by nonpartisan House staff for use by House members in their deliberations, and does not constitute an official statement of legislative intent.