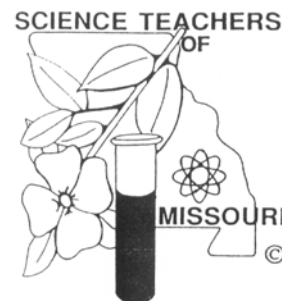


LEGISLATIVE ALERT



Attention: Missouri Teachers of Science

House Bill 1266 (subsequently identified as HB1266) has been filed in the Missouri House. HB1266 attempts to legislatively define "best practices" in the teaching of science, and mandates that alternative views of accepted science be presented to Missouri students in grades 6-12. The only specific scientific topic identified in HB1266 is biological origins.

Details of HB1266 can be found at: <http://www.house.mo.gov/bills061/biltxt/intro/HB1266I.htm> HB1266 is reproduced below in its entirety:

HB1266	Establishes the Missouri Science Education Act which requires instruction for science courses in sixth through twelfth grades to comply with its best practices
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SECOND REGULAR SESSION
HOUSE BILL NO. 1266
93RD GENERAL ASSEMBLY

INTRODUCED BY REPRESENTATIVE COOPER (155).

Read 1st time January 9, 2006 and copies ordered printed

STEPHEN S. DAVIS, Chief Clerk.

3830L.011

AN ACT

To amend chapter 170, RSMo, by adding thereto one new section relating to the Missouri science education act.

Be it enacted by the General Assembly of the state of Missouri, as follows:

Section A. Chapter 170, RSMo, is amended by adding thereto one new section, to be known as section 170.025, to read as follows:

170.025.1. This section shall be known and may be cited as the "Missouri Science Education Act".

2. As used in this section, the following terms mean:

- (1) "Substantive", equal to or greater than. Each public school district may modify or expand this definition as necessary within the meaning of substantive for local use;
- (2) "Verified empirical data", information representing physical reality based upon repeated independent human observation, measurement, and experimentation with consistent results. Verified empirical data is without significant inference and is not theory, hypothesis, conjecture, speculation, estimated data, extrapolated data, or consensus of scientific opinion.

3. Public elementary and secondary school science teacher instruction for sixth grade through twelfth grade courses in physics, chemistry, biology, physical science, earth science, and other natural science courses shall comply with the following best practices, subject to the availability of teaching material but no later than five years after the effective date of this section:

(1) Teacher classroom instruction shall use the following best practices to support the truthful identity of scientific information and minimize misrepresentation while promoting clarity, accuracy, and student understanding:

- (a) Information that appears to be verified empirical data, but is not, shall be identified to distinguish it as separate from verified empirical data. Verified empirical data needs no specific identification. Inability to determine if specific information is verified empirical data shall not invalidate such best practice;
- (b) Information representing scientific thought such as theory, hypothesis, conjecture, speculation, extrapolation, estimation, unverified data, consensus of scientific opinion, and philosophical belief shall be identified to distinguish it as separate from verified empirical data;

(2) Teacher classroom instruction shall use the following best practices to support the objective teaching of scientific information and minimize dogmatism while promoting student inquiry, healthy skepticism, and understanding:

- (a) When information other than verified empirical data is taught representing current scientific thought such as theory, hypothesis, conjecture, speculation, extrapolation, estimation, unverified data, consensus of scientific opinion, and philosophical belief, such information shall be within the purview of critical analysis and may be

critically analyzed. Critical analysis includes the teaching of anomalous verified empirical data, contrary verified empirical data, missing supporting data, inadequate mechanisms, insufficient resources, faulty logic, crucial assumptions, alternate logical explanations, lack of experimental results, conflicting experiments, or predictive failures where applicable;

(b) When information other than verified empirical data is taught representing current scientific thought such as theory or hypothesis regarding phenomena that occur in the future or that occurred previous to written history, a critical analysis of such information shall be taught in a substantive amount. If a theory or hypothesis of biological origins is taught, a critical analysis of such theory or hypothesis shall be taught in a substantive amount.

4. No public elementary or secondary school science teacher shall be refused employment, disciplined, denied advancement, transferred, or otherwise discriminated against for teaching in accordance with the best practices in subsection 3 of this section within the time allotted the affected subject matter by the course curriculum.

5. The state commissioner of education shall ensure that any assessment or competency testing of public elementary and secondary school pupils for academic performance used by the state and whose content may be modified by the state complies with the best practices in subsection 3 of this section by the proper identification of scientific information and critical analysis. If questions regarding information within the purview of paragraph (b) of subdivision (2) of subsection 3 of this section are included in a test, questions regarding critical analysis of such information shall be included in a substantive amount.

It is important that HB1266 be read carefully and its actual implications be considered. At first glance, the bill appears somewhat benign and, in fact, appealing to the general public. Who would not want educational practices that “support the truthful identity of scientific information and minimize representation while promoting clarity, accuracy and student understanding”? However, after careful analysis of all points, ***it is the position of the STOM Board (taken at its January 21, 2006 meeting) that HB1266 fails to promote quality science education*** – the stated intent of the proposed legislation. Opposition to the bill is based on a three-part rationale:

1. The proposed legislation misuses terminology of a critical nature to science education.
2. The proposed legislation specifically mentions the teaching of biological origins; in mandating that a “critical analysis” be taught, including alternate logical explanations, the bill lays the foundation for the teaching of intelligent design.
3. The proposed legislation violates local control of curriculum and the traditional role of the Department of Elementary and Secondary Education in determining the standards for Missouri’s public schools.

Misuse of Scientific Terminology

HB1266 consistently misuses the word *theory*. By grouping *theory* with words such as hypothesis, conjecture, and speculation, HB1266 seems to be making the point that these terms are all equivalent. In their common, non-science usage, the terms are often interchangeable. However, that is most definitely *not* how scientists and science educators use these terms. While a hypothesis is a tentative explanation put forth to account for observed phenomena, a theory is defined as a well-tested explanation that unifies a broad range of observations.

The term *verified empirical data* as used in the proposed legislation is not defined in Bignum, Browne, and Porter’s *Dictionary of the History of Science*. One is left to assume that it refers to empirical data, which is an essential part of science investigations and is collected by students/scientists in their attempt to solve a problem or explain natural phenomenon. Section 2(2) would seem to indicate that repeatability is the defining factor. NSTA’s position paper on the teaching of evolution (2003) provides elaboration about the role of empirical data and the methodology of science. Explanations that are not consistent with empirical evidence or cannot be tested empirically are not a part of science. As a result, explanations of natural phenomena that are not based on evidence but on myths, personal beliefs, religious values, and superstitions are not scientific.

The proposed legislation misrepresents the very nature of scientific study by disassociating scientific theory from the empirical data upon which it is based. It dismisses almost all scientific theory, and not just those related to biological origins, as equivalent to conjecture. One would be hard-pressed to name a single science area that does not involve the very theories, hypotheses, extrapolations, etc., which are denigrated by this legislation. The purpose of science is to explain observations, and development of scientific theory is an important component in this process. By its nature, science is not static. New technologies often lead to new observations that may conflict with accepted scientific thought. However, the raw data collected during these observations is almost meaningless without an interpretation.

Moreover, a number of inconsistencies are noted. In Section 3(1)(a), HB1266 states that the “inability to determine if specific information is verified empirical data shall not invalidate such best practices.” Up to this

point, the arguments given imply that “verified empirical data” is the gold standard for best practices. Illogically, there is a sudden shift in that position that would appear to open the door to teaching almost anything as long as the teacher acknowledged that the information being used could not be verified. This would open the door to teaching intelligent design or creationism, as well as other pseudo-sciences.

Section 4 indicates that a school district would not have any recourse for dealing with a teacher who teaches non-scientific ideas in their science classroom.

Attempt to Lay Foundation for Teaching Intelligent Design

“Alternate logical explanations” are referred to in Section 3(2)(a). In the context of the proposed legislation, this is an obvious reference to such ideas as Intelligent Design. Section 3(2)(b) then brings back the equal time argument by stating that “if a theory or hypothesis of biological origins is taught, a critical analysis of such theory or hypothesis shall be taught in a substantive amount.” In Section 2(1), substantive is defined as equal or greater (note that this is not the traditional definition). In other words, this proposed legislation could be interpreted as requiring that equal or greater time be spent on teaching alternative ideas about the origins of life than those accepted by the scientific community.

The teaching of intelligent design in science classrooms has been the subject of a number of court rulings. In each case, courts have ruled against the inclusion of this concept. In the landmark U.S. Supreme Court case of *McLean v. Arkansas Board of Education* (1982), the court identified five characteristics of science:

1. guided by natural laws (biological or physical)
2. explanatory by referring to natural law
3. testable in an empirical world
4. conclusions are tentative (can be revised with new data)
5. prediction can be tested (called falsifiable by the court)

In so doing, the court supported the teaching of biological evolution. The other “alternate logical explanations” referenced in HB1266 do not meet these criteria.

In January 13, 2005, a federal court decision in Cobb County Georgia declared the use of disclaimers in biology textbooks questioning theory and facts about evolution unconstitutional because it violated the Establishment Clause of the First Amendment. The sticker read,

"This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered."

U.S. District Judge Clarence Cooper noted that,

"In this case, the Court believes that an informed, reasonable observer would interpret the Sticker to convey a message of endorsement of religion."

In an opinion issued December 20, 2005, U.S. District Judge John Jones ruled that a Pennsylvania school district could not teach the concept of intelligent design in science classes as an alternative to evolutionary theory. Specifically he noted that teaching "intelligent design" would violate the Constitutional separation of church and state.

"We have concluded that it is not [science], and moreover that ID cannot uncouple itself from its creationist, and thus religious, antecedents," Jones writes in his 139-page opinion posted on the court's Web site".... "To be sure, Darwin's theory of evolution is imperfect. However, the fact that a scientific theory cannot yet render an explanation on every point should not be used as a pretext to thrust an untestable alternative hypothesis grounded in religion into the science classroom or to misrepresent well-established scientific propositions."

HB1266 specifically mandates that critical analysis be taught in studies of biological origins, to include “missing supporting data” and “lack of experimental results.”

State vs. Local Control of Curriculum

In addition to the previously mentioned flaws in HB1266, there is a larger issue inherent in the proposed legislation that could potentially affect all content areas. HB1266 aims to establish, through an act of legislation, educational best practices. As a strong local control state, Missouri does not have a tradition of allowing the establishment of educational best practices through acts of legislation. We do have a tradition of allowing professional educators in local school districts to research and determine what qualifies as a best practice.

HB1266 also removes control of the content of state assessments from the Department of Elementary and Secondary Education and the State Board of Education and puts it in the hands of the legislature. At a great expense of time, effort, and money, DESE developed the Grade Level Expectations that were approved by the State Board. Test items have been written, reviewed and will be field-tested this year. Extensive work has been done to ensure that the expectations are grade-appropriate and follow a logical scope and sequence. The materials dealing with biological origins would have to be revisited, revised and/or discarded.

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Conclusion

For the above reasons, the STOM Board of Directors opposes HB1266 and encourages STOM members, their colleagues, families, and friends to contact their legislators to voice their concerns about this bill. A sample letter has been attached to this alert. Please personalize your letters, as a form letter receives less attention than one that has a personal touch. Contact information for legislative representatives may be found at the following websites:

<http://www.house.mo.gov/bills041/member/memmail.htm> (Representatives)

http://www.senate.state.mo.us/zipcode/leg_lookup.htm (Senators)

HB1266 updates will be posted to the STOM website (www.stom.org) and on the bill tracking section of the Missouri House of Representatives website (www.house.mo.gov). **The bill has been assigned to the House Elementary and Secondary Education Committee.**

References and Suggested Readings

- Alters, B. (1997). Whose nature of science. *Journal of Research in Science Teaching*, 34, 39-55.
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- Kinraide, T. and Danison, R. (2003). Strong inference: The way of science. *American Biology Teacher*, 65, 419-424.
- Kitzmiller et al v. Dover School District. Case 4:04-cv-02688-JEJ Document 342 Filed 12/20/2005 in the United States District Court for the Middle District of Pennsylvania.
- Lederman, N. (1992). Student's and Teacher's conception of the nature of science: A review of the research. *Journal of Research in Science Teaching*, 29, 331-359.
- McLean v. Arkansas Board of Education*. 529F. Supplement 1255 (ED Ark.1982)
- National Science Teachers Association Handbook (2004/04). An NSTA position statement...The Teaching of Evolution. pp 185-188.

STOM Board Members Opposing HB1266

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Dr. Pat Lucido
STOM President, 1999-2000

Dr. Kristie Parfet
Executive Secretary

Dr. Becky Litherland
NSTA Dist.t XI Director, 2004-07
STOM President, 2001-02

Sample letter to legislator concerning HB1266

Provided only as a sample and not as a form letter!

Linda M. Dudley

*1204 Fowler Rd.
Lebanon, MO 65536
January 30, 2006*

*Representative Darrell Pollock
201 West Capitol Avenue
Room 201F
Jefferson City, MO 65101*

Representative Pollock;

Thank you for your recent help in locating a copy of HB1266 when it wasn't yet available on the House of Representatives website. Your office's prompt reply was greatly appreciated.

I would like to voice my opposition to HB1266. As a science educator, I have several issues with this proposed legislation. I am always concerned when scientific terminology is misused, and I feel that this was definitely done in HB1266. The term "theory" has a much different meaning in science than it has in ordinary conversation. [Follow this with an explanation]

The intent of HB1266 seems to be an attempt to require that Intelligent Design, etc., be taught in public school classrooms. There have been repeated legal findings that show that this is a violation of the separation of church and state and is therefore unconstitutional. Nonscientific explanations have no place in the science classroom.

As a public citizen, I am also concerned about establishing a precedent of having legislators determine what qualifies as best practices for education. We have a strong tradition of local control in Missouri. While I will agree that this isn't always a good thing, I worry about where we will be headed if this proposed legislation is passed. In the extreme, I could envision legislation that would require social studies teachers whose curriculum includes World War II having to spend an equal or greater amount of time explaining why some people don't believe the Holocaust ever happened!

I am also a member of the Science Teachers of Missouri. STOM is the state chapter of the National Science Teachers Association. The STOM Board of Directors has taken a stand in opposition to HB1266 and has created a Legislative Alert that explains the reasons for their opposition. I would be glad to provide a copy of the Legislative Alert to your office. You may also find it posted on the STOM website (www.stom.org).

Should HB1266 ever come to the floor of the House of Representatives, I hope that you will carefully consider how it could affect not just the future of science education in our state, but also the future of all education. If you would like to discuss this issue further, I may be reached at [provide contact information here].

[Sign]