



STATE OF MICHIGAN
DEPARTMENT OF EDUCATION
LANSING



July 24, 2002

MEMORANDUM

TO: State Board of Education

FROM: Thomas D. Watkins, Jr., Chairman

SUBJECT: Approval of Standards for the Preparation of Earth/Space Science Teachers

In pursuit of its goal to improve teacher quality, the State Board of Education receives proposals for the adoption and revision of program standards for teacher preparation. Proposed standards are developed to reflect and support Michigan's K-12 Curriculum Framework and Benchmarks, as well as standards adopted by national professional/specialty area organizations.

Over the last several years, a referent group reflecting the interests of public and independent teacher preparation institutions and K-12 teachers worked on the development of standards for the preparation of earth/space science teachers. The committee began its work by reviewing the Michigan Curriculum Framework for science and standards for the preparation of teachers as developed by the National Science Teachers Association to ensure alignment with both documents.

Ongoing feedback from K-12 schools and teacher preparation institutions from 2000 through 2002 was utilized in making significant revisions to an earlier proposal. A draft was forwarded to selected groups/organizations, all Michigan teacher preparation institutions, and a random sample of intermediate and local school districts for review and comment in September 2000. As presented in Attachment 1, the standards reflect the feedback received. Additional information regarding the standards development and review process is provided in Attachment 2.

The proposal was reviewed by the Board-appointed Professional Standards Commission for Teachers and is recommended for adoption by the State Board of Education.

It is recommended that the State Board of Education approve the standards for the preparation of earth/space science teachers, as discussed in the Superintendent's memorandum dated July 24, 2002.

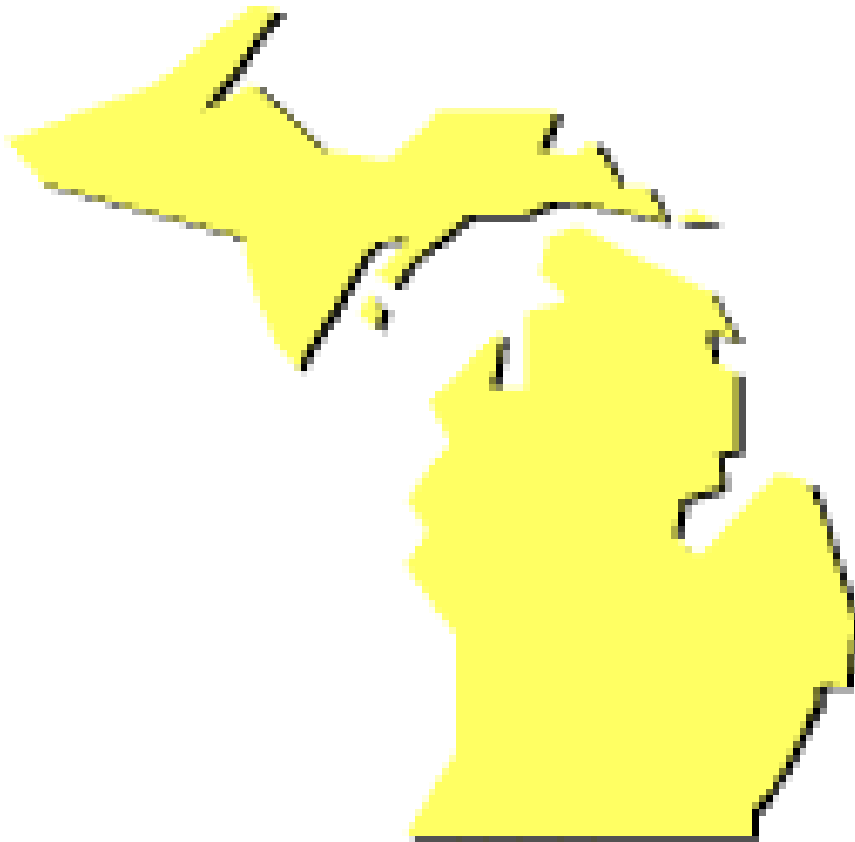
Proposal to the
Michigan State Board of Education
For the Preparation of Teachers

Earth/Space Science (DH)

Submitted by the
Office of Professional Preparation Services
July 24, 2002

Standards for the Preparation of Teachers

Earth/Space Science (DH)



Adopted by the Michigan State Board of Education
<date>

Standards for the Preparation of Teachers of Earth/Space Science (DH Endorsement)

Preface

Development of the Proposal

Over the last several years, a referent group of professional educators developed a proposal to adopt standards for the preparation of earth/space science teachers. These standards align with standards developed by the National Science Teachers Association and the Michigan Curriculum Framework for science education. Teachers who receive the endorsement in earth/space science would be prepared to teach any earth/space course at their certificate level.

To provide information and gather feedback on the proposal, a copy was also forwarded to selected groups/organizations, all Michigan teacher preparation institutions, and a random sample of intermediate and local school districts for review and comment. As presented in this document, the standards reflect the feedback received.

State Board adoption of these standards typically leads to the creation of a new certification test for teachers prepared to teach this content area. Test development for a new Michigan Test for Teacher Certification in earth/space science will be scheduled according to the recommendation of the Standing Technical Advisory Council.

Approval of Programs

Teacher preparation institutions that wish to continue to offer programs to prepare earth/space science teachers are required to submit an application for program approval that demonstrates how the new standards are met throughout the proposed curriculum. The programs must be re-approved to show compliance with the new standards. Following initial approval, the teacher preparation programs will be reviewed every five years through the Periodic Review/Program Evaluation process.

Content Guidelines/Standards Matrix

College/University	Code	
		DH
Source of Guidelines/Standards	Michigan State Board of Education, 2002	Program/Subject Area
		Earth/Space Science

Levels of proficiency are identified as follows:

A – Awareness

The earth/space science teacher recognizes/recalls the existence of different aspects of earth/space science and related teaching strategies.

B – Basic Understanding

The earth/space science teacher articulates knowledge about earth/space science and related instructional and assessment strategies. The earth/space science teacher demonstrates proficiency in using the knowledge at a fundamental level of competence acceptable for teaching.

C – Comprehensive Understanding

The earth/space science teacher is able to apply broad, in-depth knowledge of the different aspects of earth/space science in a variety of settings. (This level is not intended to reflect mastery; all teachers are expected to be lifelong learners.)

DIRECTIONS: List required courses on matrix and provide additional narrative to explain how standards are met. If electives are included, they should be clearly indicated. Adjust size of cells as needed.

Guideline/Standard		Courses and/or Experiences that Fulfill the Guideline	
		Secondary Minor	Secondary Major
Submit a narrative that explains how this program:			
A.	uses the Michigan Curriculum Framework K-12 Science Content Standards and Benchmarks as the critical foundation for teacher preparation, ensuring that earth/space science teachers have the content knowledge and the ability to teach this curriculum; and		
B.	develops an understanding of the interconnectedness of all science, including biology, chemistry, and physics, and relates this understanding to the teaching of the earth/space sciences.		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
	The preparation of earth/space science teachers will enable them to:			
1.0	understand earth/space science as the study of the earth and its processes and of the interaction between the lithosphere, atmosphere, hydrosphere, and biosphere and the relationship of the earth to the rest of the universe, which shall include such topics as the following:			
1.1	Physical Geology			
1.1.1	earth and solar system	B		
1.1.2	minerals and rocks	C		
1.1.3	volcanic rocks and processes	C		
1.1.4	weathering and sedimentary rocks	C		
1.1.5	metamorphic rocks	C		
1.1.6	soil formation	B		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.1.7	mass wasting	C		
1.1.8	geological time, relative and absolute dating	C		
1.1.9	hydrologic cycle	C		
1.1.10	groundwater	C		
1.1.11	glaciers/glaciation	C		
1.1.12	deserts/desertification	B		
1.1.13	crusted deformation	C		
1.1.14	earthquakes/mountain building	C		
1.1.15	folding	C		
1.1.16	plate tectonics/ocean floor	C		
1.1.17	mineral resources	C		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.1.18	earth's interior	C		
1.1.19	planetary geology	B		
1.2	Historical Geology			
1.2.1	history of geology	B		
1.2.2	depositional processes and sedimentary rocks	C		
1.2.3	fossils and fossil records through time	C		
1.2.4	global tectonics through time	C		
1.2.5	origin of the earth and Precambrian era	C		
1.2.6	Paleozoic era	C		
1.2.7	Mesozoic era	C		
1.2.8	Cenozoic era	C		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.3	Oceanography			
1.3.1	origins of the continents, oceans, basins, and plate tectonics	C		
1.3.2	ocean basin physiography	C		
1.3.2.1	sea floor	C		
1.3.2.2	sediments	C		
1.3.2.3	explorations	B		
1.3.3	ocean chemistry	C		
1.3.4	ocean physics	B		
1.3.5	circulation	B		
1.3.6	climate change	C		
1.3.7	ocean waves and beaches	C		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.3.8	biological oceanography	C		
1.3.8.1	plankton and plants	C		
1.3.8.2	marine life	C		
1.3.8.3	resources	C		
1.4	Meteorology			
1.4.1	weather	C		
1.4.2	climate	C		
1.4.3	atmospheric circulation	C		
1.5	Astronomy			
1.5.1	celestial spheres and constellations	C		
1.5.2	seasons, solstices, equinoxes	C		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.5.3	natural laws	C		
1.5.3.1	Copernicus	C		
1.5.3.2	Kepler	C		
1.5.3.3	Newton	C		
1.5.4	solar structure and energy	C		
1.5.4.1	fusion	C		
1.5.5	stars	C		
1.5.5.1	magnitudes and spectra	C		
1.5.5.2	binary stars and masses	C		
1.5.5.3	birth and death of stars	C		
1.5.5.4	white dwarfs and neutron stars	C		

No.	Guideline/Standard	Level of Proficiency	Courses and/or Experiences that Fulfill the Guideline	
			Secondary Minor	Secondary Major
1.5.5.5	novae and supernovae	C		
1.5.5.6	protostars and extra solar planets	C		
1.5.6	galaxy	C		
1.5.6.1	types and classification	C		
1.5.6.2	milky way	C		
1.5.6.3	active galaxies	C		
1.5.6.4	clusters and groups	C		
1.5.6.5	black holes	C		
1.5.6.6	dark matter/nature of	C		
1.5.6.7	big bang and fate of universe	C		
1.5.7	the solar system	C		

No.	Guideline/Standard	Courses and/or Experiences that Fulfill the Guideline	
		Secondary Minor	Secondary Major
	The preparation of earth/space science teachers will enable them to:		
2.0	apply mathematics, including statistics and precalculus, to investigations in the earth/space sciences and the analysis of data;		
3.0	relate the concepts of the earth/space sciences to contemporary, historical, technological, and societal issues; in particular, relate concepts of earth/space science to current controversies, such as those around the use of energy, exploitation of resources, and global change, as well as other issues;		
4.0	locate resources, design and conduct inquiry-based open-ended investigations in the earth/space sciences, interpret findings, communicate results, and make judgments based on evidence;		
5.0	construct new knowledge for themselves through research, reading and discussion, and reflect in an informed way on the role of science in human affairs;		
6.0	understand and promote the maintenance of a safe science classroom as identified by the Council of State Science Supervisors, including the ethical and appropriate use of scientific equipment, and the safe storage, use, and disposal of materials;		
7.0	demonstrate competence in the practice of teaching as defined within the Entry-Level Standards for Michigan Teachers;		

No.	Guideline/Standard	Courses and/or Experiences that Fulfill the Guideline	
		Secondary Minor	Secondary Major
8.0	create and maintain an educational environment in which conceptual understanding will occur for all science students;		
9.0	demonstrate competence in the practice of teaching through investigative experiences and by demonstrating the application of the scientific processes and in assessing student learning through multiple processes; and		
10.0	develop an understanding and appreciation for the nature of scientific inquiry.		

List for Distribution of Draft Standards

Earth/Space Science (DH)

**Teacher Preparation Standards Development Committee
for
Biology, Chemistry, Physics, Physical Science, Earth/Space Science,
Integrated Science – Elementary, and Integrated Science – Secondary**

Maurice Barnes	Grand Rapids Central High School
Frank Ciloski	Michigan Department of Education
Claudia Douglass	Central Michigan University
Ray Francis	Central Michigan University
David Frank	Ferris State University
Dan Genter	Dansville High School
Jim Hewitt	Saginaw Valley State University
Stanley Hirachi	Central Michigan University
Joseph Krajcik	University of Michigan
David Klingbiel	Dansville High School
Mozell Lang	Michigan Department of Education
Peggy Liggett	Eastern Michigan University
Catherine Smith	Michigan Department of Education
Deborah Smith	Michigan State University
Steven Stegink	Grand Rapids Public Schools
Jane Teska	Southfield Public Schools
Denny Travis	Oakland University
Sue Wittick	Michigan Department of Education

List for Distribution of Draft Standards Earth/Space Science (DH)

Educational Organizations

Association of Independent Colleges & Universities of Michigan

Directors and Representatives of Teacher Education Programs

* Michigan Association of Colleges for Teacher Education

Michigan Association of Nonpublic Schools

Michigan Association of School Administrators

Michigan Association of School Boards

Michigan Association of School Personnel Administrators

Michigan Association of Secondary School Principals

Michigan Association of Supervision & Curriculum Development

Michigan Association of Teacher Educators

Michigan Congress of Parents, Teachers, and Students

Michigan Deans' Council

* Michigan Earth Science Teachers Association

Michigan Education Association

Michigan Elementary & Middle School Principals Association

Michigan Federation of Teachers & School Related Personnel

Michigan Science Teachers Association

Middle Cities Education Association

Professional Standards Commission for Teachers

* Indicates submission of a response

Teacher Preparation Institutions

Earth/Space Science (DH)

- | | |
|---------------------------------|-------------------------------------|
| * Adrian College | * Madonna University |
| Albion College | * Marygrove College |
| Alma College | * Michigan State University |
| * Andrews University | Michigan Technological University |
| Aquinas College | Northern Michigan University |
| Calvin College | * Oakland University |
| Central Michigan University | Olivet College |
| Concordia University | Saginaw Valley State University |
| Cornerstone University | Siena Heights University |
| * Eastern Michigan University | * Spring Arbor University |
| Ferris State University | * University of Michigan – Dearborn |
| * Grand Valley State University | University of Michigan – Flint |
| Hillsdale College | University of Detroit Mercy |
| Hope College | * University of Michigan |
| * Kalamazoo College | * Wayne State University |
| Lake Superior State University | * Western Michigan University |

* Indicates submission of a response

Local School Districts
Earth/Space Science (DH)

Armada Area Schools	Kalkaska Public Schools
Bangor Public Schools	Lansing School District
Van Buren Public Schools	Lakeview Community Schools
Boyne Falls Public Schools	Mackinac Island Public Schools
Atherton Community Schools	Marshall-Mar Lee School District
* Carsonville-Port Sanilac Schools	Middleton-Fulton Schools
Clare Public Schools	Mt. Morris Consolidated Schools
Constantine Schools	New Haven Community Schools
Decatur Public Schools	Okemos Public Schools
East China School District	Paradise-Whitefish Township Schools
* Engadine Consolidated Schools	Pinconning Area Schools
Flat Rock Community Schools	Reading Community Schools
Fruitport Community Schools	Rogers City Area Schools
Grand Marais-Burt Township Schools	Scottville-Mason County Central Schools
Hamilton Community Schools	
Hastings School District	
* Hanover-Horton Schools	
Iron Mountain-North Dickinson County Schools	

*Indicates submission of a response

Intermediate School Districts (ISD)
Earth/Space Science (DH)

Allegan County
Charlevoix-Emmet
Dickinson-Iron
Huron
Ionia County
Lapeer
Mason-Lake
Newaygo
St. Joseph
Washtenaw

*Indicates submission of a response

NOTE: Additional responses were received anonymously.