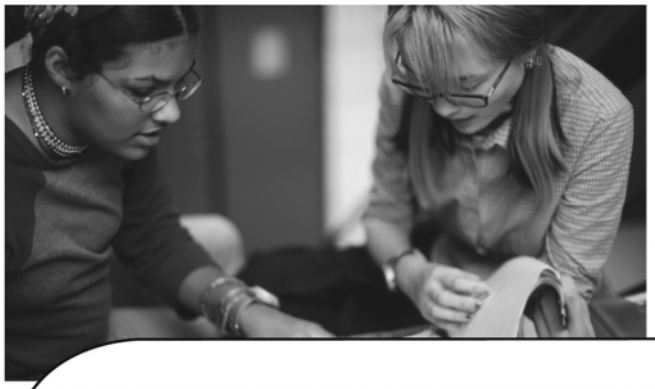
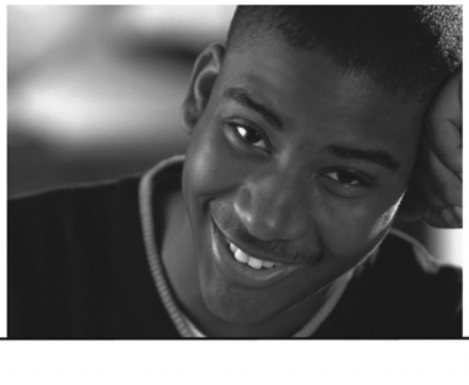
Oh, that explains it





Michigan Merit Curriculum
High School Graduation Requirements

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Updated September 2007

COURSE/CREDIT CONTENT EXPECTATIONS

Since the passage of the new state high school graduation requirements commonly referred to as the Michigan Merit Curriculum, the Michigan Department of Education has worked with hundreds of educators and representatives from professional organizations and higher education to develop documents and materials that outline what students should know and be able to do in required courses/credits during their high school experience.

Two main sets of documents called *High School Content Expectations (HSCE)* and specific *Course/Credit Content Expectations* and Guidelines provide educators with the tools needed to align their curriculum and instruction and provide parents with meaningful information to gauge student progress. These expectations also serve as the basis to determine student proficiency, grant high school credit, and develop various questions for the Michigan Merit Exam.

The Michigan Merit requirements are based on what research shows will provide students with the educational foundation to be successful as they move beyond high school into college and the workplace.

SCIENCE

What the Michigan Merit Curriculum Law Says

380.1278b(1)(b) The board of a school district or board of directors of a public school academy shall not award a high school diploma to a pupil unless the pupil has successfully completed at least 3 credits in science that are aligned with subject area content expectations developed by the Michigan Department of Education and approved by the Michigan State Board of Education, including completion of at least biology and either chemistry or physics. The law strongly encourages pupils to complete a 4th credit in science, such as Forensics, Astronomy, Earth Science, Agricultural Science, Environmental Science, Geology, Physics or Chemistry, Physiology, or Microbiology.

380.1278b(5)(f) The science credit requirements are not subject to modification as part of a personal curriculum.

Background Information

The Science High School Content Expectations (HSCE) were designed to include essential general science understandings as well as discipline-specific descriptions for Earth Science, Biology, Physics, and Chemistry. The HSCE are organized in four disciplines/strands, 19 standards, 92 content statements, and prerequisite, essential, core, and recommended content expectations. Students are expected to meet all essential expectations (those describing essential general science knowledge and skills and assessable on the Michigan Merit Exam) by the end of high school. The overarching goal for the Science HSCE is for students to engage in the four Practices of Science Literacy listed in the Successful Post-Secondary Engagement chart on page 3 of the HSCE document available on the Michigan Department of Education's high school web site at www.michigan.gov/highschool. These practices are developed throughout the four years of high school science instruction by building, refining, applying, and extending the useful and connected knowledge, skills, and strategies incorporated in the standards and expectations.

Course/Credit requirements have been developed for Earth Science, Biology, Physics, and Chemistry. They define the expectations that must be met for high school credit in Earth Science, Biology, Physics, or Chemistry. All students are required to earn three science credits aligned with the HSCE. These 3 credits must include Biology and either Chemistry or Physics.

The 3rd science credit may be met by taking another science course designed to meet other expectations included in the HSCE. The Michigan-developed science component of the high school Michigan Merit Exam (MME) will be based on the essential expectations from all four disciplines.

Districts are encouraged to offer opportunities for meeting both the graduation requirements and the essential science expectations identified as necessary for science literacy. The graduation requirement legislation recommends, but does not require, a fourth year of science credit.

What Research Says

Research shows students taking courses in Biology, Chemistry, and Physics and upper-level mathematics beyond Algebra II (such as Trigonometry) are more likely to be college ready. However, only 26% of ACT-tested high school graduates in Michigan met ACT's College Readiness Benchmark, demonstrating their readiness for their first credit-bearing college course in Biology.

Most modern technology came from physics. Any technology involving electricity, magnetism, mechanics, heat, light, sound, optics, etc. comes from physics. In addition, Physics is one of the few high school-level classes that requires both high level mathematical and verbal skills. All problems in physics are word problems that require students to think logically, use analogies, and deal with subtle shades of meaning as well as use mathematics. Physics courses teach students to think, a valuable skill apart from the knowledge content of physics.

In Michigan according to recent statistics, approximately 40 percent of students took Chemistry and 25 percent took physics prior to high school graduation.

Questions & Answers

1. **Q: What was the thinking behind the choice of science courses listed in the Michigan Merit Curriculum?**

   A: Students are required to take a minimum of 3 credits of science: Biology, Physics or Chemistry, and one additional science credit aligned with the HSCE, such as Earth Science. These courses are specified because they are most often the prerequisite courses for additional study in science, mathematics, or engineering. However, these recommendations do not specify a sequence, nor do they represent the only courses that could meet the requirement. The law strongly encourages students to take a 4th science credit such as Forensics, Astronomy, Earth Science, Agricultural or Environmental Science, Geology, Physiology, Microbiology, etc.

2. **Q: What subject can a student take to fulfill the 3rd science credit required in the Michigan Merit Curriculum? Can Advanced Placement (AP) Environmental Science or Psychology be counted as a "science" under the new state curriculum?**

   A: Under the Michigan Merit Curriculum, students are required to take 3 credits of science including Biology, Chemistry or Physics and 1 additional high school level credit. Students may select the 3rd credit from the menu of science credits offered and approved for credit by each district including advanced placement, dual enrollment, international baccalaureate or early college/middle college classes.

   In addition, the law strongly encourages pupils to complete a 4th credit in science, such as Forensics, Astronomy, Earth Science, Agricultural Science, Environmental Science, Geology, Physics or Chemistry, Physiology, or Microbiology.

   However, since the Michigan Merit Exam (MME) will assess student's knowledge in the essential expectations in all four science disciplines including; Biology, Chemistry, Physics and Earth Science, when helping students develop their schedule, districts should encourage students to select courses, which will assist them in preparing for the Michigan Merit Exam given in 11th grade. Updated 8/07

3. **Q: With respect to Physics and Chemistry classes, will a basic level of those classes be acceptable or will students have to take the more rigorous classes that require higher-level mathematics?**

   A: The Course/Credit Requirements for assigning credit for Physics and for Chemistry include meeting all essential and core expectations. Students earn the required credit for Chemistry or Physics when they have met the course/credit expectations. A "basic" class, implying coverage of less than the required content expectations, will not qualify for earning the Physics or Chemistry credit. The law also states that the assignment of credit must be based, at least in part, on assessments designed for the purpose of determining whether the expectations have been met. Since students are required to earn 4 credits in mathematics, they should be prepared for the mathematics infused in the science credits.

4. **Q: Can students earn science credit for conceptual Physics and Chemistry classes, or for other classes designed to address science concepts at a basic level?**

   A: The law does provide districts with the flexibility to determine which classes or credits contain enough science that is aligned with the HSCE to count as the 3rd science credit. Therefore, a district could decide to grant students their 3rd science credit for Basic Chemistry, Conceptual Physics, or for Physical Science, but students still would be required to demonstrate proficiency on the essential and core expectations in order to earn a full credit for the Physics or Chemistry that are required (one or the other) as part of the first two science credits.

   However, the Michigan Merit Exam (MME) will assess student's knowledge in the essential expectations in all four science disciplines including; Biology, Chemistry, Physics and Earth Science. When helping students develop their schedule, districts should encourage students to select courses, which meet the expectations and prepare for the MME. Updated 8/07

5. **Q: Can a student take a Physics class and count it for both a math / math-related and physics credit?**

   A: No. If a student takes Physics as one of the three required science credits, it could not be counted as a math-related credit. However, if a student takes Physics as an elective after fulfilling his/her science requirements, it could qualify as a math-related class as determined by the district.

6. **Q: Would an Earth Science class need to include the entire essential and core expectations for Earth Science. In other words, once a class is labeled Earth Science must it then meet ALL the expectations for that course?**

   A: If a course is designed to provide students with a high school Earth Science credit, it must meet all course/credit content expectations.

   Earth Science is not a required science credit, but it could be used as a 3rd year science credit. A course should only be named Earth Science if it is designed to meet all of the Earth Science course/credit content expectations. If a student takes a general science or other course designed to meet some of the Earth Science expectations, that course could count as a 3rd science credit if it is aligned with the HSCE, as determined by the district. In this case, the credit earned would bear the name of the course in which the Earth Science essential expectations were covered and could not be labeled Earth Science.

7. **Q: While Earth Science is not a required credit under the Michigan Merit Curriculum, will it be tested on the new Michigan Merit Exam (MME)?**

   A: While Earth Science is not a high school graduation requirement, the essential skills listed for Earth Science are expectations for high school and will be tested on the MME, along with the essentials for the other 3 science credit areas.

SCIENCE ADDITIONS 9/07

Questions & Answers

8. Q: Whether it's Earth Science, or Biology, or Chemistry, or Physics, what is the difference between "essential" and "core" expectations?

A: In general, essential expectations are those all high school students should achieve, whether or not they take a particular course in Earth Science, Biology, Chemistry, or Physics. Essential knowledge is considered useful and connected knowledge for all high school graduates, regardless of what courses they take in high school. Essential expectation codes include an upper case letter as the last letter in the code (e.g. the final capital "A" in **E2.1A**). Essential content knowledge and performance expectations are required and assessed on the Michigan Merit Exam (MME) and on future secondary assessments.

Core expectations, on the other hand, are skills that are more rigorous or knowledge that a student needs to build a sound foundation for post secondary education or training and end in a lower case letter (e.g., B2.3d).

For students to receive credit in a discipline, they must be proficient in both essential and core expectations.

9. Q: If a class requires a prerequisite that freshmen would need to have, can one assume that that skill/content will be in the Middle School Grade Level Content Expectations?

A: The prerequisites listed in the original high school document were those skills and content the high school writers felt important to their discipline and possible to address in the middle school curriculum. Those skills and content that directly lead to high school expectations and are tied to the National Assessment of Educational Progress (NAEP) will be part of the middle school grade level content expectations.

10. Q: What is the status of Earth Science in the new graduation requirements?

A: Earth science is part of a complete curriculum all students need to know and be able to do. While a credit in Earth Science is not required for high school graduation, the essential Earth Science expectations, along with Biology, Chemistry, and Physics will be tested on the Michigan Merit Exam. It is important, therefore, that districts and schools, in their science curriculum, ensure that students have had an opportunity to acquire the knowledge that will be tested on the Michigan Merit Exam.

11. Q: How do we know what Earth Science knowledge or skills will be tested on the MME?

A: The high school science expectations are coded to distinguish skills or knowledge that is "essential" or "core." The MME will test the skills or knowledge that are coded as "essential." One can distinguish "essential" skills by the fact that the last letter of the code, on the far right, is a capital letter For example, the first skill to be listed in the expectations for Earth Science is:

E1.1A – Generate new questions that can be investigated in the laboratory or field. The capital "A" at the end signifies this as an essential skill.

12. Q: If a teacher does not have a major or minor in Earth Science, college level coursework or prior teaching experience in Earth Science, can they become HQ by simply taking and passing the General Sciences (DX) or the Earth Science Certification Tests?

A: If a teacher has a major or minor and has taken the state certification test for that endorsement and passed, then he or she would be considered highly qualified. However, a teacher cannot simply take the DX test and be endorsed. They must go through an established university with a program approved by MDE.

13. Q: If a school offers a course, which combines the essentials of both Physics and Chemistry, can a student receive either a full Physics or Chemistry credit or must they meet either all the Physics or all the Chemistry expectations?

A: No. A student must be proficient in all the Physics or all the Chemistry essential and core expectations in order to receive a full credit in either.

14. Q: Can 8th grade be used for the 3rd science credit for graduation? For example, can we have a Forensics, Astronomy, Geology, Physiology, Geophysical, etc., class count?

A: Yes. Each district has the flexibility to determine what students can take to receive the third science high school credit. However, the class must be a high school level course and students must meet the same expectations and proficiency level as high school students.

15. Q: Can a general science (or Earth Science essential + some core expectations) class in 8th grade count for the third graduation credit if it aligns with the high school content expectations?

A: Yes, if all the following criteria are meet: the 8th grade class is a high school level class aligned to the science HSCE; the class has the same rigor as other local board approved third high school science credits, it can count toward graduation. A district is reminded that any student, including any current high school aged student, has the opportunity to "test out" and show proficiency for this 3rd credit.

16. Q: Can a "physical science" class composed of the essential expectations of Chemistry and Physics, count as the 3rd science credit for graduation?

A: Yes. What courses count as the 3rd science credit is a local district decision. However, a district may only count this combination course as 1 credit.