Minnesota Test of Academic Skills (MTAS)

An Alternate Assessment for Students with the Most Significant Cognitive Disabilities

Test Specifications for Science MTAS

Based on the K-12 Minnesota Academic Standards in Science, 2009 version effective May 24, 2010

Minnesota Department of



Minnesota Department of Education

Minnesota Test of Academic Skills (MTAS)

Test Specifications
for Mathematics, Grades 3–8

Based on the K–12 Minnesota Academic Standards in Science, 2009 version effective May 24, 2010

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THE MINNESOTA TEST OF ACADEMIC SKILLS (MTAS)

Introduction

The Minnesota Test of Academic Skills (MTAS) is Minnesota's alternate assessment for students with the most significant cognitive disabilities. It is designed exclusively for use with students who receive special education services and whose participation has been determined on an individual basis by an Individualized Education Program (IEP) team. The Science MTAS is aligned to the Minnesota Academic Standards and the Minnesota Comprehensive Assessments—Series III (MCA—III) in science. A document titled Alternate Assessment Eligibility Requirements provides guidance to assist IEP teams in identifying students with the most significant cognitive disabilities who would be appropriately assessed with the MTAS. This document can be found in the Educator Excellence > Testing Resources section of the Minnesota Department of Education Website (http://education.state.mn.us). Participation information for the MTAS is included in Chapter 5 of the Procedures Manual for Minnesota Assessments, also available on the website.

As required by the Elementary and Secondary Education Act (ESEA), this assessment is aligned with grade-level content standards in science. ESEA requires that all students—including those with the most significant cognitive disabilities—be measured by an assessment aligned to grade-level academic standards, although the breadth, depth and complexity of the grade-level standards may be reduced for alternate assessments or modified to include prerequisite skills.

The Science MTAS is administered to eligible students in grades 5, 8 and one grade in high school. Students taking the MTAS must be administered the appropriate assessment for their enrolled grade. The Science assessments cover the academic standards as shown below.

Grade in which Science is assessed	Academic Standards assessed	
5	Grades 3–5	
8	Grades 6–8	
High School	Grades 9–12 standards related to life science	

Purpose of the MTAS

The MTAS serves a number of purposes:

- It meets the requirements of ESEA by providing Minnesota students who meet the
 eligibility guidelines for the MTAS with an alternate assessment based on alternate
 achievement standards that are aligned with grade-level academic standards.
- It promotes access to the general education curriculum for students with significant cognitive disabilities, as required by both ESEA and the Individuals with Disabilities Education Act (IDEA).
- It provides educators with a tool for measuring the progress students are making toward proficiency on academic standards in science.
- It provides results that can be used to inform instruction at the classroom level.

Test Specifications

All tests—from off-the-shelf, norm-referenced tests to customized, standards-based tests like those given in Minnesota—have test specifications. The primary purpose of a set of test specifications is to help test developers build a test that stays consistent over time. Test specifications clarify, define and/or limit how test tasks will be written to any given strand, substrand, standard or benchmark. Test specifications for the MTAS indicate which strands, standards and benchmarks have been selected as priorities for students with the most significant cognitive disabilities. For each benchmark, task specifications clarify, define and limit how performance tasks should address the extended benchmarks; they are intended to represent essential understandings and are not intended to describe all instruction.

Test specifications indicate only what is assessed, not what should be taught. Test specifications do not indicate how children should be taught; this remains the responsibility of the classroom teacher who best knows the child.

The MTAS test specifications help achieve the goal of a technically sound instrument that respects teachers' concern for the time students spend taking tests. They have taken into account the impact of the students' cognitive disabilities, their needs for extensive supports, their varying modes of communication, their age and their right to access grade-level curriculum.

As with any test, the MTAS is a sampling of student knowledge and does not test every standard or benchmark. There are standards and benchmarks that cannot be assessed with a standardized test as well as standards and benchmarks that have not been identified as the top priorities for students with the most significant cognitive disabilities. This does not mean that these skills should not be taught or assessed. Students with the most significant cognitive disabilities should receive instruction on the full range of grade-level academic standards to the extent appropriate. The IEP team is responsible for developing an individualized program for each student that addresses identified needs, including, but not limited to, how students will access the general education curriculum as outlined by the Minnesota Academic Standards, which can be obtained from the Student Success > Standards, Curriculum and Instruction section of the MDE Website (http://education.state.mn.us).

Prioritizing the Grade-Level Academic Standards

When Minnesota educators helped design the original MTAS, the first step was to prioritize the grade-level academic standards for students with the most significant cognitive disabilities.

Panel members, including special educators and content specialists in science, identified

benchmarks that, in their view, represented the most critical learning outcomes for this population. The following criteria were established for prioritizing the benchmarks:

- The benchmark is assessed on the MCA.
- The benchmark reflects the pattern of emphasis on the test blueprint for the MCA.
- Proficiency on the benchmark will help the student in the next age-appropriate environment (i.e., the next grade in school or a post-school setting).
- Proficiency on the benchmark will aid future learning in the content area.
- The benchmark can be written as a performance task without creating bias against a particular student population.

In developing the Science MTAS based on the 2009 academic standards, the standards and benchmarks at each grade that are identical or close to those selected for inclusion under the previous academic standards and test specifications were carried forward. There are standards and benchmarks that did not appear in the previous academic standards, and MDE evaluated these benchmarks using the criteria described above.

Extended Standards and Extended Benchmarks

Extensions of standards and benchmarks represent a reduction in depth and complexity while maintaining a clear link to the grade-level content standard. For the Science MTAS based on the 2009 academic standards, both extended standards and extended benchmarks were written when appropriate. Counts of tasks per test form were determined at the standard level rather than at the benchmark level, as was done in the previous version of the MTAS.

Performance Tasks

The MTAS is designed to allow for appropriate flexibility within a standardized assessment environment. Each student will be given a number of tasks to complete in a one-on-one test administration. The test administrator, who will most likely be the child's classroom teacher, will present each task in a way that allows the student to understand what is being asked (i.e., an appropriate *presentation mode*). It is imperative that each student be given an opportunity

to access the content in a way that is appropriate for the individual. For example, students may need manipulatives or illustrations to aid their understanding of the science tasks. Tactile, visual and auditory presentation modes are allowable on the MTAS.

Student Responses

It is critical that students with the most significant cognitive disabilities have a way to show what they know and can do. Clearly, students who meet the guidelines for this alternate assessment would not be appropriately assessed with a multiple-choice test that is designed for general education students. Students with the most significant cognitive disabilities often have ways of communicating what they know and can do that are different from the general education population. Students may communicate through a variety of modes which include, but are not limited to, speaking, using gestures such as eye blinks or using assistive technology such as a language-based augmentative communication device. The critical feature of a meaningful response is that the student clearly communicates a message.

Evaluating Student Performance on Tasks

The teacher uses a scoring rubric to evaluate the student's performance. Test administrators are trained on the use of the scoring rubric in the spring of each year.

Minnesota Test of Academic Skills (MTAS) Scoring Rubric

3	2	1	0
Correct Response	Correct Response with Additional Support	Incorrect Response	Unrelated or No Response
The student responds correctly without assistance.	The student responds correctly to the task after the teacher provides additional support as indicated in the task script.	The student responds incorrectly to the task after the teacher provides additional support as indicated in the task script.	The student does not respond to the task, or the student's response is unrelated to the task.

Overall Considerations

Overall considerations are broad development issues that should be addressed during the development of performance tasks. Each of these issues is considered for all of the tasks developed for the Science MTAS.

- 1. Each task is written to primarily measure one benchmark; however, other benchmarks may also be reflected in the content of the performance task.
- 2. Tasks are appropriate for students in terms of grade-level content, age and typical life experiences for the majority of this population.
- 3. Tasks are developed to allow students with varying modes of communication to demonstrate proficiency, given sufficient instruction and opportunity to learn.
- 4. Tasks do not disadvantage or offend any segment of the population in regard to age, gender, race, ethnicity, language, religion, socioeconomic status, disability or geographic region.
- 5. Each task is written to clearly and unambiguously elicit the desired response.
- 6. A calculator, or any tool functioning as a calculator, may be used on any of the tasks.
- 7. Tasks are reviewed for content characteristics, potential bias and any issues that may be of concern. Minnesota educators with experience and expertise in special education instruction, science instruction and serving the needs of students with the most significant cognitive disabilities review the performance tasks for each passage in terms of content, bias (gender, racial/ethnic, linguistic, religious, geographic, socioeconomic and issues related to individuals with disabilities) and psychometric data collected from field testing.
- 8. Students may use all necessary supports during testing as identified in the IEP. Supports include, but are not limited to, manipulatives, visual aids, number lines, multiplication charts and assistive technology.

Test Design by Grade Level

Each operational administration of the MTAS consists of nine tasks distributed across the strands of the academic standards as shown below. Additional tasks are field tested during each administration in order to construct assessments in future years.

Grade	Strand	Number of Tasks by Strand	Number of Extended Standards/ Benchmarks by Strand
5	1: The Nature of Science & Engineering	1–2	1
	2: Physical Science	1–2	1
	3: Earth & Space Science	2–4	2
	4: Life Science	2–4	2
8	1: The Nature of Science & Engineering	1–2	1
	2: Physical Science	2–4	2
	3: Earth & Space Science	1–2	1
	4: Life Science	2–4	2
High	1: The Nature of Science & Engineering	1–2	1
School	4: Life Science	5–8	5

Guide to Reading the Test Specifications

Strand

The general category of content organization

Substrand

The second level of strand organization

Task Total by Strand

The number of tasks that test the strand

Grades 9-12

(1-2 tasks)

(1-2 tasks)

Task Total by

Standard

The number of

tasks that test

this standard

Standard

The first level of organization within the substrand

Extended Benchmark(s)

The specific knowledge or skills that students should acquire by the end of the grade level

Task Specifications

The clarification, definition or restriction of tasks assessing the benchmark(s)

Strand 1—The Nature of Science and Engineering

Substrand: The practice of science

Standard 9.1.1.2

Scientific inquiry uses multiple interrelated processes to investigate and explain the natural world.

Extended Benchmark

9.1.1.2.1 Recognize a scientific experiment by making a hypothesis, analyzing data and/or making a conclusion on this data.

Task Specifications

- Context of items should demonstrate all appropriate safety consideration
- Items may address part or all of the benchmark.
- Hypothesis is defined as a testable statement about the natural world that
 can be used to build more complex inferences and explanations. (National
 Academy of Sciences, Teaching About Evolution and the Nature of Science,
 [National Academy Press, 1998], 5)
- Items will NOT require students to define hypothesis.
- Items that analyze data are limited to three data points.

Strand 4—Life Science

(5-8 tasks)

Key to Code Sequence

- 1. Grade (9-12)
- 2. Strand (4)
- 3. Substrand (1)
- 4. Standard (1)
- 5. Extended Benchmark (2)

Substrand: Structure and function in living systems

Standard 9.4.1.1

(1-2 tasks)

Organisms use the interaction of cellular processes as well as tissues and organ systems to maintain homeostasis. (9.4.1.1)

Extended Benchmark

9.4.1.1.2 Recognize that plants and animals have different structures and methods to obtain energy.

Task Specifications

- Tasks may be placed in contexts that refer to body temperature, breathing and pulse rate as homeostatic disruptions of the human body, or any context that addresses symptoms or disruptions of homeostasis.
- Organ systems are limited to digestive, respiratory, circulatory and nervous systems in animals and nutrient uptake, gas exchange and material transport in plants.

Explanation of Terms Related to the Grade-Level Tables

Strand: This is the most general categorization of content in the Minnesota Academic Standards. There are four strands in science:

- 1. The Nature of Science & Engineering
- 2. Physical Science
- 3. Earth & Space Science
- 4. Life Science

Substrand: This is the second level of strand organization. Each strand has three or four substrands.

Standard: Within each strand, standards describe the expectations in science that students must satisfy to meet state requirements.

Extended Benchmark: Each standard is divided into several benchmarks. The purpose of benchmarks is to provide details about "the academic knowledge and skills that schools must offer and students must achieve to satisfactorily complete the standards" (Minn. Stat. § 120B.023 (2006)). Benchmarks are intended to "inform and guide parents, teachers, school districts and other interested persons and for use in developing tests consistent with the benchmarks" (Minn. Stat. § 120B.023 (2006)). Extended benchmarks represent reductions in the depth, breadth and complexity of the benchmarks of the academic standards.

Code: Test developers use this code to identify the grade, strand, substrand, standard and benchmark to which a performance task is aligned.

Task Specifications: These statements provide more specific clarifications, definitions or restrictions for the benchmark as it is assessed on the MTAS.

Task Total by Strand: This number is the possible number of tasks from a specific strand that could be on the operational test form.

Task Total by Standard: This number is the total number of tasks measuring the indicated standard that could be on the operational test. For example, in the Grade 5 Science assessment, five to eight tasks are from Strand 4. Of those five to eight Strand 4 tasks, one to two tasks are from Standard 9.4.1.1.

Grade Level Tables

Grades 3-5

Strand 1—The Nature of Science and Engineering

(1-2 tasks)

Substrand: Interactions among science, technology, engineering and society

Standards 3.1.3.4 and 5.1.3.4

(1–2 tasks)

Tools and mathematics help scientists and engineers see more, measure more accurately, and do things that they could not otherwise accomplish

Extended Benchmark

3.1.3.4.1 Identify tools appropriate for a given scientific investigation.

Task Specifications

- Appropriate tools are limited to: rulers, thermometers, magnifiers, simple balances, rain gauges, timers and common items that may indicate wind speed or direction such as a flag or weather vane.
- Measurement tools are limited to metric.
- Tasks may require students to choose a tool that is most appropriate to a particular task in a simple scientific investigation. This includes selecting a tool that has the appropriate units of measure.
- Tasks may require students to identify how a tool may be used in a simple scientific experiment.

Strand 2—Physical Science

(1–2 tasks)

Substrand: Matter

Standard 4.2.1.2 (1–2 tasks)

Solids, liquids and gases are states of matter that have unique properties

Extended Benchmark

4.2.1.2.2 Identify and describe how states of matter change as a result of heating and cooling.

Task Specifications

- Changes in state include changes between solid, liquid and gas.
- Tasks may include no change in states of matter such as when temperature differences are insufficient to cause a phase change in that material.
- Examples of materials used to illustrate concepts include water, crayons and oils, or other common materials.
- Changes are limited to one change in state per task.

Strand 3—Earth and Space Science

(2-4 tasks)

Substrand: Interdependence within the Earth system

Standard 4.3.2.3 (1–2 tasks)

Water circulates through the Earth's crust, oceans and atmosphere in what is known as the water cycle.

Extended Benchmark

4.3.2.3.1 Identify where water collects on Earth, including atmosphere and surface water, and identify how water moves through the Earth system.

Task Specifications

- Examples of places where water exists on Earth are limited to rivers, lakes, streams, clouds, the atmosphere and oceans.
- Tasks may include identifying precipitation and collection in a simple water cycle diagram.
- Concepts are limited to evaporation, precipitation and collection.
- Vocabulary used in tasks may include terms such as water vapor, water, ice, rain, snow, pond, puddle, evaporation and collection.

Substrand: Human interactions with Earth systems

Standard 5.3.4.1 (1–2 tasks)

In order to maintain and improve their existence, humans interact with and influence Earth systems.

Extended Benchmark

5.3.4.1.3 Identify, evaluate and compare how individual decisions impact the environment.

Task Specifications

- Individuals evaluate an action with regard to recycling and reusing resources and reducing their consumption of resources.
- Tasks are limited to one decision and one impact.

Strand 4—Life Science

(2-4 tasks)

Substrand: Structure and function in living systems

Standards 3.4.1.1 and 5.4.1.1

(1-2 tasks)

Living things are diverse with many different characteristics that enable them to grow, reproduce and survive.

Extended Benchmark

3.4.1.1.2 Group plants and/or animals based on their physical characteristics.

Task Specifications

- Characteristics of animals may include sex, color, size, shape, coverings (skin, fur, hair, scales, feathers), appendages (wings, arms, legs, number of each), eyes, ears and mouths.
- Characteristics of plants are limited to roots, stems, leaves, needles, flowers, fruits and seeds.

Substrand: Human interactions with living systems

Standard 4.4.4.2 (1–2 tasks)

Microorganisms can get inside one's body and they may keep it from working properly.

Extended Benchmark

4.4.4.2.1 Identify methods of personal hygiene that help prevent germs from entering the body.

Task Specifications

• Tasks may include how germs enter the body and ways that lifestyle choices such as personal hygiene prevent germs from entering the body.

Grades 6–8

Strand 1—The Nature of Science and Engineering

(1-2 tasks)

Substrand: The practice of engineering

Standard 6.1.2.1 (1–2 tasks)

Engineers create, develop and manufacture machines, structures, processes and systems that impact society and may make humans more productive.

Extended Benchmark

6.1.2.1.1 Identify common engineered systems and evaluate their impact on the daily life of humans.

Task Specifications

- Tasks are limited to engineered machines, structures, processes, and systems that are equally accessible to middle school students in all socio-economic groups.
- Tasks are limited to engineered machines, structures, processes, and systems that are highly familiar in the daily life of students eligible for the MTAS.

Strand 2—Physical Science

(2-4 tasks)

Substrand: Matter

Standards 6.2.1.2 and 8.2.1.2

(1-2 tasks)

Substances can undergo physical changes which do not change the composition or the total mass of the substance in a closed system (6.2.1.2);

Substances can undergo physical and/or chemical changes which may change the properties of the substance but do not change the total mass in a closed system (8.2.1.2).

Extended Benchmark

8.2.1.2.2 Identify chemical or physical changes in matter.

Task Specifications

- Evidence for chemical reactions will be limited to changes commonly seen in daily life: a gas produced, heat released, a color change and formation of a solid.
- Evidence for physical changes will be limited to changes in state (phase), shape, and dissolving (e.g., salt and water).
- Tasks will NOT include chemical formulas or equations.
- Tasks may not use the term chemical changes.

Substrand: Motion

Standard 6.2.2.2 (1–2 tasks)

Forces have magnitude and direction and govern the motion of objects.

Extended Benchmark

6.2.2.2.1 Recognize the effects of balanced or unbalanced forces on an object.

Task Specifications

- Forces are described as pushes or pulls.
- Tasks are limited to unbalanced forces acting on an object, such as a bat hitting a ball or pushing a swing.
- Tasks will address the concepts qualitatively. Tasks will NOT include the calculation of acceleration or net forces.
- Examples are limited to common situations/objects (For example: games and objects with wheels).

Strand 3—Earth and Space Science

(1-2 tasks)

Substrand: Earth structure and processes

Standard 8.3.1.2 (1–2 tasks)

Landforms are the result of the combination of constructive and destructive processes

Extended Benchmark

8.3.1.2.1 Identify the effects of weathering, erosion and deposition of sediment on landforms.

Task Specifications

- Tasks may address physical weathering.
- Tasks will address only one process at a time.
- Landforms may include mountains, hills, beaches, streambanks, river floodplains and dunes.
- Landforms may be described as being made of rock, gravel, sand, mud or dirt.

Strand 4—Life Science

(2-4 tasks)

Substrand: Structure and function in living systems

Standard 7.4.1.1 (1–2 tasks)

Tissues, organs and organ systems are composed of cells and function to serve the needs of all cells for food, air and waste removal.

Extended Benchmark

7.4.1.1.2 Identify how organs in the respiratory, circulatory and digestive systems function in the human body.

Task Specifications

• Tasks will NOT require students to identify the structure and function of systems.

Substrand: Human interactions with living systems

Standard 7.4.4.2 (1–2 tasks)

Human beings are constantly interacting with other organisms that cause disease.

Extended Benchmark

7.4.4.2.1 Recognize that disease of the human body can be caused by other organisms.

Task Specifications

- Tasks that refer to a biological agent will provide relevant background information.
- Tasks will not address uncommon or specific diseases by name.
- Examples may include exposure to organisms through unsanitary object.

Grades 9–12

Strand 1—The Nature of Science and Engineering

(1–2 tasks)

Substrand: The practice of science

Standard 9.1.1.2 (1–2 tasks)

Scientific inquiry uses multiple interrelated processes to investigate and explain the natural world.

Extended Benchmark

9.1.1.2.1 Recognize a scientific experiment by making a hypothesis, analyzing data and/or making a conclusion on this data.

Task Specifications

- Context of tasks should demonstrate all appropriate safety considerations.
- Tasks may address part or all of the benchmark.
- Hypothesis is defined as a testable statement about the natural world that can be used to build more complex inferences and explanations. (National Academy of Sciences, *Teaching About Evolution and the Nature of Science*, [National Academy Press, 1998], 5)
- Tasks will NOT require students to define hypothesis.

Strand 4—Life Science

(5–8 tasks)

Substrand: Structure and function in living systems

Standard 9.4.1.1 (1–2 tasks)

Organisms use the interaction of cellular processes as well as tissues and organ systems to maintain homeostasis. (9.4.1.1)

Extended Benchmark

9.4.1.1.2 Recognize that plants and animals have different structures and methods to obtain energy and maintain homeostasis.

Task Specifications

- Tasks may be placed in contexts that refer to body temperature, breathing and pulse rate as homeostatic disruptions of the human body, or any context that addresses symptoms or disruptions of homeostasis.
- Organ systems are limited to digestive, respiratory, circulatory and nervous systems in animals, and roots and leaves in plants.

Strand 4—Life Science (continued)

Substrand: Interdependence among living systems

Standard 9.4.2.1 (1–2 tasks)

The interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.

Extended Benchmark

9.4.2.1.2 Recognize that an ecosystem can change when a new species is introduced to it.

Task Specifications

- Contexts for tasks will use examples of Minnesota ecosystems when appropriate.
- Tasks may include invasive species.

Substrand: Evolution in living systems

Standard 9.4.3.2 (1–2 tasks)

Variation within a species is the natural result of new inheritable characteristics occurring from new combinations of existing genes or from mutations of genes in reproductive cells.

Extended Benchmark

9.4.3.2.1 Recognize that traits are transmitted from parents to offspring.

Task Specifications

- Tasks will NOT reference specific human genetic disorders.
- Tasks will NOT make reference to fertilization, meiosis and egg/sperm.
- Examples may include general traits such as type of foot, type of mouth and presence of fur/feathers.
- Tasks will not make reference to traits such as eye color and hair color that require knowledge of specific patterns of inheritance.

Strand 4—Life Science (continued)

Standard 9.4.3.3 (1–2 tasks)

Evolution by natural selection is a scientific explanation for the history and diversity of life on Earth.

Extended Benchmark

9.4.3.3.5 Recognize that the principles of natural selection affect the survival rate of groups of organisms.

Task Specifications

- Contexts for tasks will use examples of Minnesota ecosystems when appropriate.
- Survival rate is shown by the number of successful offspring.
- Students are not required to use the term natural selection.

Substrand: Human interactions with living systems

Standard 9.4.4.1 (1–2 tasks)

Human activity has consequences on living organisms and ecosystems.

Extended Benchmark

9.4.4.1.2 Recognize the risks and benefits of changing a natural ecosystem as a result of human activity.

Task Specifications

• Contexts for tasks will use examples of Minnesota ecosystems when appropriate.