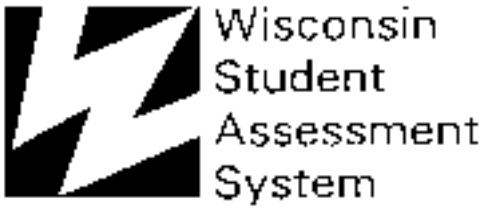
Wisconsin Knowledge and Concepts Examinations

An Alignment Study

at

Grade 10



Wisconsin Department of Public Instruction

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An Alignment Study
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Grade 10

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Executive Summary

Alignment of Level 20 *TerraNova,* Form A,
to Wisconsin Model Academic Standards

On April 20-21, 1998, CTB/McGraw-Hill staff conducted a workshop for the Department of Public Instruction (DPI) to match items on *TerraNova,* Form A, at Levels 14, 18, and 20 to the Model Academic Standards for Grades 4, 8, and 12 respectively. *TerraNova* is currently administered to Wisconsin students in Grades 4, 8, and 10. The purpose of conducting the match was to determine whether individual *TerraNova* items assess the Model Academic Standards and the extent to which the Model Academic Standards are addressed by *TerraNova* items—that is, breadth of coverage. Approximately ten Wisconsin educators participated in the alignment workshop for each of the four content areas assessed by *TerraNova:* reading/language arts, mathematics, science, and social studies. CTB facilitated content area groups by providing instructions on the specific tasks to be performed and on documentation procedures. Participants worked in pairs to review a draft match completed by CTB, then presented their findings to the whole group for discussion; groups reached consensus on each item. Test items could be matched to more than one performance standard, and an item was considered to match if it either assessed the content of the standard directly or assessed related content.

Major Findings

- Of all *TerraNova* items on Level 20, is administered to students in Grade 10, 98 percent match to one or more of the Model Academic Standards.
- In Reading/Language Arts, all 62 of the items match one or more performance standards. Four items were matched to a Grade 4 performance standard rather than a Grade 12 standard; four other items were matched to either a Grade 4 or a Grade 8 standard in addition to being matched to a Grade 12 standard.
- In both Mathematics and Science, 34 of 35 (97%) items match one or more performance standards.
- In Social Studies, 33 of 34 (97%) items match at least one performance standard.

At Grade 12 there are a total of 185 performance standards, of which 155 were judged to be appropriate for large-scale, paper-and-pencil kinds of tests for tenth-grade students. Some performance standards were considered to be inappropriate because either Grade 10 students have not been adequately exposed to the content or because the standard cannot be assessed with a paper-and-pencil test. Of the 155 assessable standards, 96 (62%) are measured by items on *TerraNova* Form A.

- The 10 Reading/Language Arts standards that are appropriate for large-scale assessment are addressed by one or more *TerraNova* items. In addition, an item matched an additional standard.
- Of the Mathematics assessable standards, 65 percent (15 of 23) are measured by *TerraNova* items.
- In Science, 58 percent of the assessable performance standards are tested by *TerraNova* items. Of the 60 Science performance standards, 45 were determined to be appropriate for large-scale assessments.
- In Social Studies, 44 of 76 (58%) assessable standards are measured by *TerraNova* items. There are 78 Grade 12 Social Studies performance standards.

Table of Contents

The purpose of this document is to present the findings of the alignment study completed by Wisconsin educators in April 1998. On the following pages are summary tables showing how many *TerraNova,* Form A, items match the Wisconsin Model Academic Standards. In addition, the breadth of coverage of the performance standards by *TerraNova* items is also presented. Sample items for each content area show the kinds of items found in *TerraNova* Level 20.

Grade 10
TerraNova Level 20

A standardized achievement test is designed to sample the skills and knowledge that students are usually expected to acquire as they progress through school. No standardized test can measure all of the academic standards that Wisconsin students are expected to learn. *TerraNova* Level 20 was matched to the Grade 10 Wisconsin Model Academic Standards to determine how well the test does measure the Wisconsin standards.

This table shows that nearly all of the items on the tenth-grade test measure at least one Wisconsin Model Academic Standard. Some items may measure more than one standard. For example, a math test item might measure both geometry and problem solving.

TerraNova, Form A, Items Measuring Wisconsin Model Academic Standards

	Number of Test Items on *TerraNova*, Form A	Number of Items Measuring Wisconsin Performance Standards	Percent of Items Measuring Wisconsin Performance Standards
Reading/Language Arts	62	62*	100%
Mathematics	35	34	97%
Science	35	34**	97%
Social Studies	34	33	97%
Total Battery	**166**	**163**	**98%**

* Four reading/language arts items were matched to a Grade 4 performance standard rather than a Grade 12 standard. Four other items were matched to either a Grade 4 or a Grade 8 standard *in addition* to being matched to a Grade 12 standard.

** One science item did not match, and one other item was matched to a Grade 8 performance standard rather than a Grade 12 performance standard.

Grade 10
TerraNova Level 20

On the following pages are tables that summarize the extent to which *TerraNova,* **Form A,** items measure the Grade 10 Wisconsin Model Academic Standards. It is important to keep in mind that some performance standards cannot be efficiently or effectively measured on an achievement test like *TerraNova*. This is because some performance standards require that students do an oral performance or participate in a discussion of a topic. Other standards might require students to create a product or to work on a project that may take several days or weeks to complete. Standards such as these are more appropriately assessed by regular classroom testing, observing students at work, or examining students' work products.

Following the tables are sample items illustrative of those on *TerraNova* Level 20. For each item, the Wisconsin Model Academic Standard to which the item is matched is highlighted in the shaded box beside the item. The descriptive information explains what the item measures and identifies other skills measured by similar items.

Grade 10
TerraNova Level 20

About half of the Wisconsin Model Academic Standards for English Language Arts cannot be assessed with a large-scale, paper-and-pencil test. The standards that cannot be assessed in this way include all of the Oral Language and Research and Inquiry standards and all but one of the Media and Technology standards. These standards require students to do oral presentations, use computers and other types of resources, and conduct research on a topic using a variety of information-collection methods. These are essential skills for Wisconsin students to acquire, but they are best measured using other assessment methods.

English Language Arts

Wisconsin Model Academic Standards			
Content Standards	**Number of Performance Standards**	**Performance Standards That Can Be Assessed by Large-Scale Tests**	**Number of Performance Standards Matched by *TerraNova*, Form A, Items**
A. Reading/Literature	4	4	4
B. Writing	3	3	3
C. Oral Language	3	0	0
D. Language	2	1	2
E. Media/Technology	5	1	1
F. Research/Inquiry	1	0	1*
Total	**18**	**10**	**11**

*One item matches a Research/Inquiry performance standard although the standards were judged to not be appropriate for paper-and-pencil tests.

Grade 10
TerraNova Level 20

Mathematics

Wisconsin Model Academic Standards			
Content Standards	**Number of Performance Standards**	**Performance Standards That Can Be Assessed by Large-Scale Tests**	**Number of Performance Standards Matched by *TerraNova*, Form A, Items**
A. Mathematical Process	6	3	1*
B. Number Operations & Relations	6	4	4
C. Geometry	5	5	3
D. Measurement	3	3	2
E. Statistics & Probability	5	4	2
F. Algebraic Relationships	4	4	3
Total	**29**	**23**	**15**

*Three performance standards are addressed by items; a fourth standard is addressed by the scoring rubrics for constructed response items.

Grade 10
TerraNova Level 20

Science

Wisconsin Model Academic Standards			
Content Standards	**Number of Performance Standards**	**Performance Standards That Can Be Assessed by Large-Scale Tests**	**Number of Performance Standards Matched by *TerraNova*, Form A, Items**
A. Science Connections	7	5	1
B. Nature of Science	5	5	2
C. Science Inquiry	7	4*	3
D. Physical Science	12	7**	7
E. Earth & Space Science	5	4	4
F. Life & Environmental Science	12	11	4
G. Science Applications	5	3	3
H. Science in Personal and Social Perspectives	7	6	2
Total	**60**	**45**	**26**

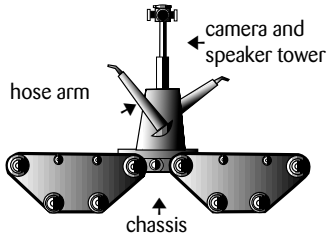
Grade 10
TerraNova Level 20

Social Studies

Wisconsin Model Academic Standards			
Content Standards	**Number of Performance Standards**	**Performance Standards That Can Be Assessed by Large-Scale Tests**	**Number of Performance Standards Matched by *TerraNova*, Form A, Items**
A. Geography	13	13	10
B. History	18	18	10
C. Political Science & Citizenship	16	16	12
D. Economics	14	13	7
E. The Behavioral Sciences	17	16	5
Total	**78**	**76**	**44**

Read this passage about a robotics technician/firefighter and her robot partner. Then do Numbers 1 through 4.

A Fearless Partner



"Nelson, stop!" Keisha looked carefully at her closed-circuit screen. The images on her screen were distorted by smoke and heat-rippled air, but Keisha could still make out the large metal door leading to the assembly room about twenty feet ahead of Nelson's current position.

The door itself was closed. Good. That meant the workers trapped inside the assembly room might still be okay, if they had managed to secure the door before too much smoke and toxic fumes had entered their area. Keisha would have to be very careful about opening the door.

"Nelson, go!"

"Where?" the robot asked. His voice was mechanical and odd. Keisha would have laughed at his response, but she knew the situation was serious.

"Sorry," she said. Her apology was lost on the robot, of course, but she continued, "Nelson, go forward!" Nelson had been thoroughly programmed with Keisha's own voice frequencies, but she still pronounced each syllable with care.

The robot lurched ahead and quickly reached the door. He came to a halt. On Keisha's next order, he did a complete 360-degree scan of the corridor he had just traversed. His thermal imaging system quickly mapped out the hot spots, which showed up as bright shades of fluorescent green on Keisha's screen. As he made the next scan of the corridor, Keisha gave Nelson the order to spray fire retardant foam on the hot spots. That done, she moved the robot back a few paces and ordered it to spray cold water on the assembly room door. Clouds of steam billowed up, hiding everything for a few seconds.

By then the door had cooled enough for humans to touch.

Using Nelson's built-in loudspeaker, Keisha called out to the trapped workers. "HELLO! CAN YOU HEAR ME? IF YOU ARE ABLE TO REACH THE DOOR, TRY TO OPEN IT."

Without waiting for a response, Keisha began to raise Nelson's caterpillar treads to a vertical position. In this way, he would be able to go through the doorway and make the necessary 90-degree turn in the narrow hallway beyond. In the vertical mode, Nelson had a much shorter base, but he was also a full four feet taller. Keisha lowered Nelson's periscopic sight arm even as his wheel base was collapsing into a compact triangular shape.

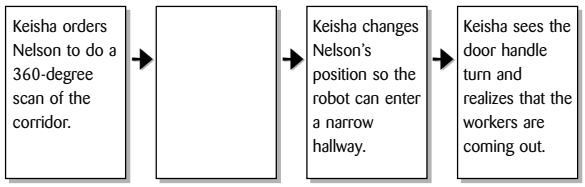
All she could do now was wait. In her anxiety, a thousand thoughts flashed through her mind. She remembered her training as a robotic technician. She thought about the day she first "met" Nelson. Keisha had read about the development of fire-fighting robots like Nelson, but she never dreamed that one day she would be working with one of the latest models. Together Keisha and Nelson had put out several fires, mostly small but intense and dangerous chemical blazes like this one. This, however, was the first time that other people's lives were at stake.

Only a few seconds had passed, but Keisha's anxiety was reaching the breaking point. She was about to order Nelson to break the door down, when she saw the door handle turning slowly. Then the grimy face of a worker appeared in the opening. "Nelson, old pal, we're sure glad to see you."

English/Language Arts Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

1 **Here is a time line of some events in the passage.**



Which of these events should go in the empty box?

- **A** Keisha's anxiety reaches the breaking point.
- **B** Keisha recalls the day she first met Nelson.
- ✔ **C** Keisha orders Nelson to spray the hot spots with foam.
- **D** Keisha looks at the distorted images on her closed-circuit screen.

A Reading/Literature

TerraNova Objective 02
Basic Understanding

In this item, the student is asked to recall the sequence of events in the passage and determine which event belongs in the blank box on the time line. Other items measuring basic reading skills address the student's understanding of on-grade-level vocabulary, understanding stated main ideas, and gathering stated information from graphics.

2 **Nelson is sent alone into the area that is on fire because**

- **A** there aren't enough human firefighters
- ✔ **B** the situation is physically dangerous for humans
- **C** Keisha thinks it's too late to save the trapped workers
- **D** Keisha wants to show off Nelson's abilities

A Reading/Literature

TerraNova Objective 03
Analyze Text

This item measures the student's ability to interpret the text by drawing a conclusion about Nelson's purpose. Other items measuring this content standard focus on determining an unstated main idea, gathering supporting evidence, inferring relationships such as cause/effect, identifying story elements such as plot and setting, analyzing characters and/or character actions, and recognizing the use of literary and persuasive techniques.

Wisconsin Model Academic Standards Measured

English/Language Arts Sample Items Grade 10, Level 20

A Reading/Literature

TerraNova Objective 04
Evaluate and Extend Meaning

At Level 20, items measure the student's ability to extend the meaning of text by applying information to new situations, distinguishing between fact and opinion, predicting future events or actions, and engaging in other types of critical assessment. In this item, the student must demonstrate an understanding of author craft.

3 **The way the author writes this story creates a feeling of**

- **A** sorrow
- ✔ **B** suspense
- **C** remorse
- **D** indifference

A Reading/Literature

TerraNova Objective 05
Identify Reading Strategies

This item measures the student's ability to formulate questions as a strategy for developing a deeper understanding of the text. Other items measure the student's ability to compare information across texts, connect graphics with texts, recognize underlying text structures, summarize what has been read, and use reading strategies to determine the meaning of above-grade-level words.

4 **The information in this passage could help you answer which of these questions?**

- **A** What causes fires to break out in modern factories?
- **B** Why should firefighters fight toxic fires with foam?
- ✔ **C** How has modern technology helped save lives in the workplace?
- **D** Where can one learn about robot technology?

English/Language Arts Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

5 **Here are two sentences related to the passage:**

Nelson was an average-sized robot.

The robot traveled on caterpillar treads that helped him go almost anywhere.

Select the answer choice that best combines the two sentences into one.

- **A** Nelson was an average-sized robot, and traveling anywhere on caterpillar treads.
- **B** Nelson was average-sized, which helped the robot travel on caterpillar treads almost anywhere.
- **C** Nelson traveled on caterpillar treads, and was an average-sized robot, and could go almost anywhere.
- ✔ **D** Nelson, an average-sized robot, traveled on caterpillar treads that helped him go almost anywhere.

B Writing

TerraNova Objective 07
Sentence Structure

In this item, the student must determine how to combine two sentences into a coherent and concise new sentence. Other items measuring writing and editing skills focus on distinguishing complete sentences from run-ons and fragments, and recognizing and correcting such problems in sentence construction as non-parallel structures and misplaced modifiers. These kinds of items are also embedded with other language items in informative passages, letters, and other types of stimuli.

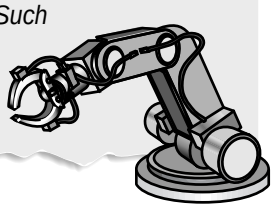
B Writing

TerraNova Objective 08
Writing Strategies

This item asks the student to choose an appropriate topic sentence for a paragraph. Other items measuring this content standard focus on identifying information sources and organizing information in preparation for writing, choosing supporting sentences that best develop a topic sentence, sequencing sentences in a paragraph, and identifying sentences irrelevant to the theme or flow of a paragraph.

6 **Choose the best topic sentence for this paragraph.**

_____. They are used to fight fires, spray-paint automobiles, assemble tiny electronic circuits, and do repetitive jobs on assembly lines. Scientists have also developed robots that "see" using television cameras and "feel" using electronic sensors. Such robots are often used for sea-floor and planetary exploration.



A In the Czech language, the word *robota* means drudgery.

B Robots are prominent in science fiction novels and films.

C On television and in movies, most robots look almost human.

✔**D** Robots perform many tasks that are boring, difficult, or dangerous for people.

B Writing

TerraNova Objective 09
Editing Skills

At Level 20, items focus on the student's ability to recognize incorrect usage, grammar, and mechanics. The items cover more sophisticated errors such as those in verb tense, objective pronoun forms, the use of quotation marks, and other commonly made mistakes.

7 **Choose the sentence that is written correctly.**

A Nelson lurches, spins, and turns when he moved around.

B Nelson responds only to Keisha, whom is a robotics technician.

✔**C** Robot firefighters will be more common in the future than they are now.

D If she hadn't seen that worker, Keisha would of made Nelson break down the door.

Wisconsin Model Academic Standards Measured

English/Language Arts Sample Items Grade 10, Level 20

B Writing

TerraNova Objective 04
Evaluate and Extend Meaning

Constructed-response items at Level 20 focus on writing in response to reading by making connections between texts or moving beyond the text. In this item, the student must fully explain and support any assertions and then proof and edit his or her response.

8 **The robot named Nelson helped Keisha save workers who were endangered by fire. Now think of a different kind of dangerous or difficult task, and on the lines below describe how a robot could help a human with that task. What would the robot do and how would it do its job?**

For this answer, make sure you use complete sentences and check your work for correct spelling, capitalization, and punctuation.

9 A student who read "A Fearless Partner" wrote the following paragraph. The paragraph has six mistakes in grammar, capitalization, and punctuation. Draw a line through each part that has a mistake, and write the correction above it.

Last year I participate in a vocational work-study program. Part of the program was helping to supervise a robot that assembled automobiles on an assembly line. The other part of the program were a series of classes in math and computer programming. I take the classes because I was working with the computers that controlled the robots on the assembly line.

I really enjoyed participating in the program, I learned a lot. When I graduate next year, I will be qualified to apply for a full-time job as an Industrial Robot production Technician. I'm looking forward to a career in this field, because one day I would like to design, build, and programming robots for the automobile industry.

B Writing

***TerraNova* Objective 09**
Editing Skills

This constructed-response editing item requires the student to proofread and correct errors in usage, punctuation, and capitalization, a process similar to what students would do when editing their own writing.

Mathematics Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

1 Which of these points on the number line represents 6×10^3 ?

A Point P
✔ **B** Point Q
C Point R
D Point S

B Number Operations and Relationships

TerraNova Objective 10
Number and Number Relations

At Level 20, items for this content standard measure the student's readiness to use numbers that have special applications in other content areas: exponents, scientific notation, irrational numbers, pi, and imaginary numbers. The sample item assesses the student's number sense and understanding of scientific notation.

2 Estimate.

$5\sqrt{3} + \sqrt{3} =$

A 20
B 7
C 15
✔ **D** 10
E None of these

B Number Operations and Relationships

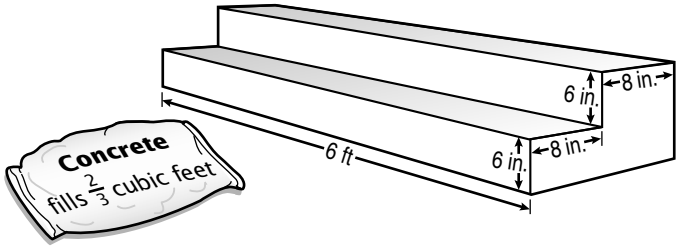
TerraNova Objective 11
Computation and NumbericalEstimation

Computation and estimation items measure the student's ability to apply operations to square roots (as in this sample), integers, and exponential and algebraic expressions. Some items are presented in a real-world context.

D Measurement

TerraNova Objective 13
Measurement

Measurement items at Level 20 relate to real-world situations which often require the student to use indirect measurement, rate, and scale, and to use algebraic and geometric principles to find the dimensions of solid figures. Many of the items for this content standard, such as this one, are set in contexts of other content areas, such as science, social studies, or manual arts.



3 How many bags of concrete mix will be needed to build this set of stairs?

✔**A** 9 bags
B 6 bags
C 4 bags
D 13 bags

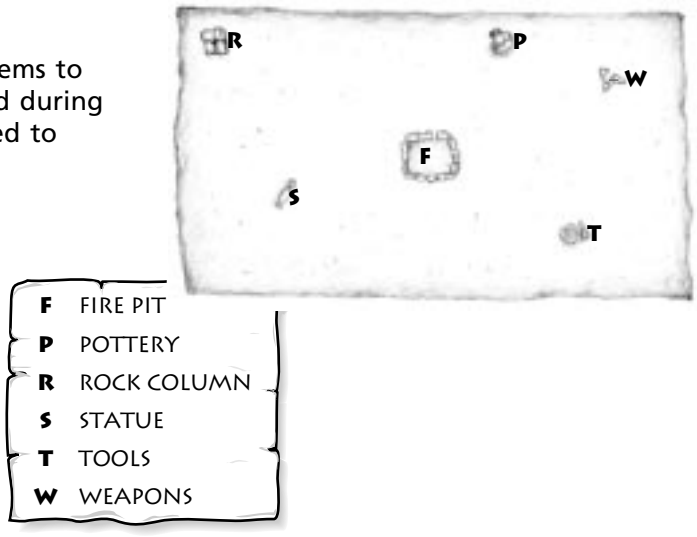
Mathematics Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

4 Archaeologists use coordinate systems to map the locations of objects found during a dig. These maps can later be used to learn about the culture of ancient civilizations.

The fire pit marks the origin. Pottery is located at coordinates (2, 3). Which item is located at (4, -2)?

A Rock Column
B Statue
✔**C** Tools
D Weapons



C Geometry

TerraNova Objective 14
Geometry and Spatial Sense

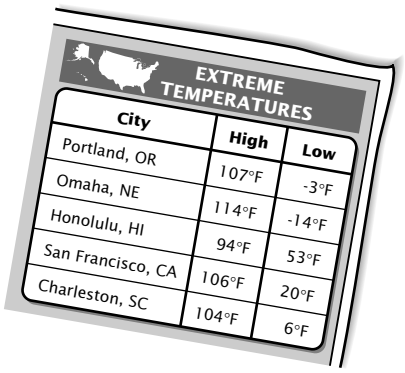
Items in this objective at the upper levels measure the student's understanding of the theoretical basis of geometric principles. The student is required to generalize from observations; propose, prove, and argue theories; and apply geometric principles such as congruence, similarity, transformations, and as here, coordinate graph modeling to solve problems.

E Statistics and Probability

TerraNova Objective 15
Data Analysis, Statistics and Probability

This item requires the student to present given data in a form that most clearly shows relationships. The student needs to notice and decipher subtle clues to identify the data and the purpose of its presentation. Other items for this content standard measure the student's ability to identify statistical bias and error and to demonstrate knowledge of the principles of statistics and probability.

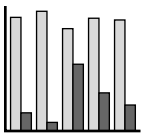
5 Which type of graph most clearly shows a comparison of the relative high and low temperatures among the cities?



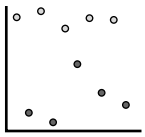
EXTREME TEMPERATURES

City	High	Low
Portland, OR	107°F	-3°F
Omaha, NE	114°F	-14°F
Honolulu, HI	94°F	53°F
San Francisco, CA	106°F	20°F
Charleston, SC	104°F	6°F

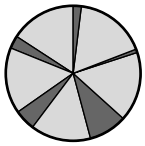
A



B ✔



C



D

Mathematics
Sample Items
Grade 10, Level 20

6 Joey invented an electric light device to put on his 26-inch diameter bicycle wheel. Every time the tire makes a full revolution, a wire touches a battery contact and a light flashes on the back of the bike seat. How many times will the light flash if he rides 50 yards?

$\pi = 3.14$

A 2 times
B 7 times
✔**C** 22 times
D 82 times

Wisconsin Model Academic Standards Measured

C Geometry

TerraNova Objective 17
Problem Solving and Reasoning

The sample item presents a problem in a real-world setting. The student is required to devise a strategy using principles from measurement, geometry, and algebra as part of the problem-solving process. A reference card supplying standard equations is provided with the test.

D Measurement

TerraNova Objective 13
Measurment
and
Terra Nova Objective 17
Problem Solving and Reasoning

The sample item requires the student to use procedures of measurement and algebra to devise and explain a strategy that will lead to the solution of the problem. Constructed-response items generally relate to real-world situations that have elements of several mathematical content areas.

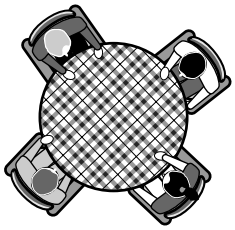


Table A

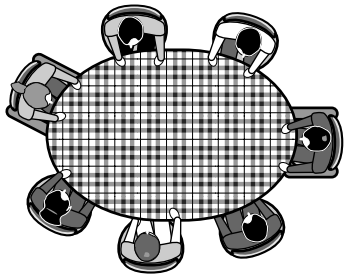
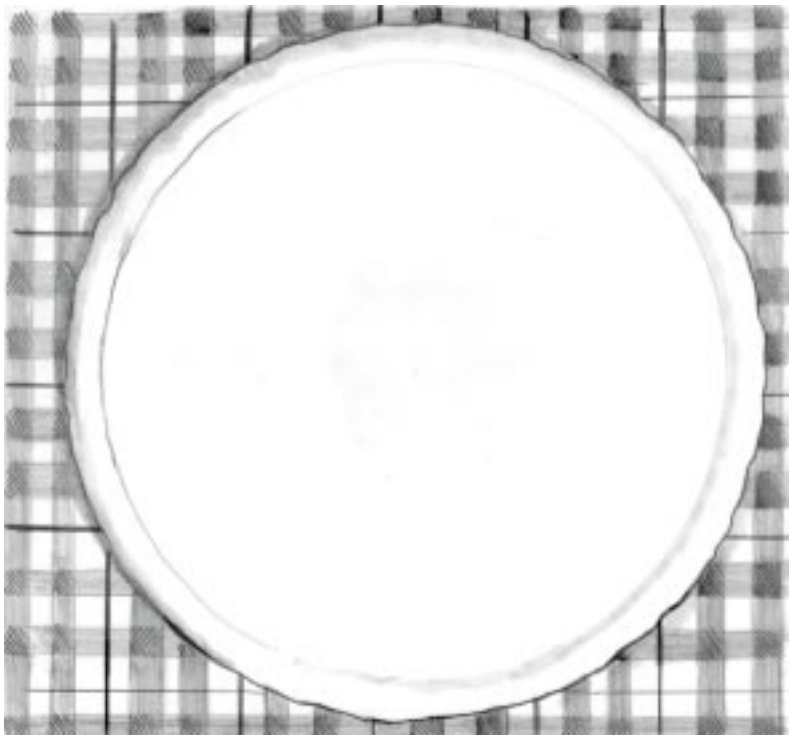


Table B

7 The people at Table A ordered a 12-inch pizza to share equally among them. The people at Table B ordered a 16-inch pizza also to share equally among everyone at their table. Who got more pizza, a person sitting at Table A or a person at Table B? Explain your answer in the space below with words, calculations, or diagrams.



Mathematics Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

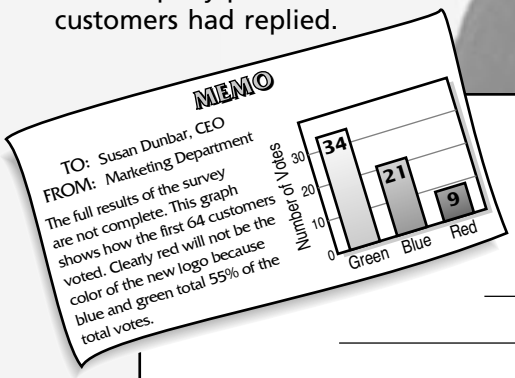
E Statistics and Probability

TerraNova Objective 15 Data Analysis, Statistics and Probability

The sample item measures the student's ability to apply data analysis, statistics, and probability and to evaluate and communicate mathematically. Once the statistical survey has been examined and evaluated, the student must propose and defend a legitimate conclusion based on the data.

8 The Polar Wear Company is deciding whether its new logo should be red, blue, or green. To find the most popular color, the company sent a survey to 100 customers across the country asking them to vote for their choice. The company kept track of the results of the survey as they were returned.

Study the memo that was sent to the company president after 64 customers had replied.



Explain what might be wrong with the information in the memo.

Write a memo that accurately states what can be concluded from the data already collected. Include your prediction of the winning color and explain your reasoning.

TO: Susan Dunbar, CEO
FROM: Marketing Department

Wisconsin Model Academic Standards Measured

Science Sample Items Grade 10, Level 20

B Nature of Science

TerraNova Objective 25
History and Nature of Science

In this item, the student is asked to identify the basic criteria for accepting a scientific theory as a scientific law. Other items for this content standard assess the student's knowledge of how cultures and individuals have contributed to the development of major ideas in the sciences and the criteria that define scientific endeavor. Scientists and their discoveries, inventors and inventions, the history of advancements in science, and careers in science are also addressed.

1 Which of these is the most important requirement for accepting a theory as a scientific law?

A The theory must be more than 10 years old.

B The theory must appear in more than one scientific journal.

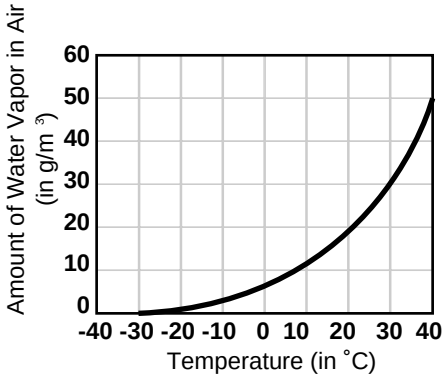
C The theory must be widely understood by both scientists and nonscientists.

✔ **D** The theory must be supported by repetitive and non-contradictory experimental results.

B Nature of Science

TerraNova Objective 19
Science Inquiry

This item measures the student's ability to interpret and draw a valid conclusion from a graph. Other Science Inquiry items assess the student's scientific thinking and planning skills, particularly those related to making hypotheses, laboratory procedure, data presentation and analysis, and the evaluation of experimental evidence and conclusions.



2 According to the information shown in the graph, which of these is a valid conclusion?

✔ **A** The amount of water vapor in the air increases as temperature increases.

B The amount of water vapor in the air is unaffected by temperature.

C The amount of water vapor is affected only by temperature.

D The amount of water vapor in the air decreases as temperature increases.

5 Which of these landforms was most likely created by a glacier?

A

C

B
✔

D

E Earth and Space Science

TerraNova Objective 22
Earth and Space Science

Items measuring this content standard require the student to connect concepts and processes of geology, meteorology, and the solar system to the world outside of the classroom. In this item, the student is expected to recognize a causal relationship between landforms and a glacier.

6 Which of these systems in the human body produces substances that control the rate of growth?

A skeletal system
B nervous system
✔ **C** endocrine system
D circulatory system

F Life and Environmental Science

TerraNova Objective 21
Life Science

Items measuring the Life and Environmental Science content standard assess the student's knowledge and understanding of biology, ecology, cellular structures and functions, and heredity. The sample item focuses on the student" understanding of human body systems.

G Science Applications

TerraNova Objective 23
Science and Technology

The sample item measures the student's ability to identify an application of scientific and technological advancements to a household object. Other items measuring this content standard assess the student's understanding of major scientific or technological developments and their impact on humans and the environment.

7 Which of these inventions involves combined technological advancements in the use of sound and light?

- **A** tape recorder
- ✔ **B** microwave oven
- **C** compact disc player
- **D** high-density television

H Science in Social and Personal Perspectives

TerraNova Objective 24
Personal and Social Perspectives in Science

Items measuring this content standard focus on situations of social concern that are either caused or affected by advances in science or technology, such as population changes, waste management, and pollution, as well as the effects of scientific developments on the individual and the workplace. In the sample item, the student must demonstrate an understanding of facts related to these issues.

8 Which of these has remained a major disadvantage of the wide-scale use of nuclear reactors as a source of electrical energy?

- ✔ **A** the disposal of radioactive waste
- **B** the short life span of nuclear power plants
- **C** the supply of fuel for nuclear reactors
- **D** the inferior quality of energy produced

Science
Sample Items
Grade 10, Level 20

Wisconsin Model Academic Standards Measured

3 The pictures show two levers being used to lift the same rock to the same height. What is the advantage of using the lever

in picture 2?

✔ **A** Less energy is lost due to friction.
B Less force is required to lift the rock.
C More work is done while lifting the rock.
D More energy is transferred to the rock.

D Physical Science

TerraNova Objective 20
Physical Science

At Level 20, items measuring the Physical Science content standard focus on the principles of physics and chemistry. The sample item measures the student's understanding of force and the efficiency of various models of a simple machine. Students are introduced to the concept of simple machines at earlier grade levels, but a deeper understanding is assessed at the high school levels.

4 When calcium hydroxide [$Ca(OH)_2$] is added to hydrochloric
acid (HCl) a reaction occurs resulting in the formation of calcium
chloride and water. Write a balanced equation for this reaction.

_____ + _____ → _____ + _____

Explain how you know that the equation is balanced.

_____

_____

_____

D Physical Science

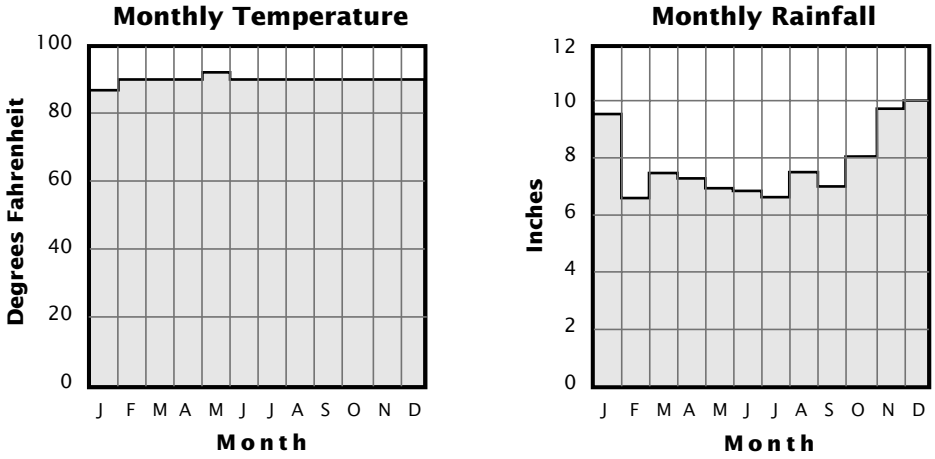
TerraNova Objective 19
Science Inquiry

Constructed-response items at Level 20 assess science knowledge by providing the student with the opportunity to explain processes or to evaluate laboratory procedures. Items often connect laboratory experiences to fundamental science concepts, as in this sample, by asking the student to give and explain the equation for a simple reaction.

Wisconsin Model Academic Standards Measured

Social Studies Sample Items Grade 10, Level 20

The graphs below show the monthly temperatures and rainfall of a particular region. Look at the graphs and then do Number 1.



1 The information on the graphs shows a rainfall and temperature pattern that is most like

- **A** the Arctic region of Europe
- **B** the desert regions of Africa
- ✔**C** the rain forest regions of Asia
- **D** the Great Plains region of North America

A Geography

TerraNova Objective 26
Geographic Perspectives

In this item, the student synthesizes geographic information from two graphs and integrates prior content knowledge to identify the characteristics of a region. Other items measuring this standard are based on maps, photographs, and graphic representations to analyze the physical characteristics of a place or the effects of change.

Social Studies Sample Items Grade 10, Level 20

Wisconsin Model Academic Standards Measured

Read the passage and then do Numbers 2 and 3.

Treat all men alike. Give them all the same laws. Give them all an even chance to live and grow.... Let me be a free man–free to travel, free to stop, free to work, free to trade where I choose, free to choose my own teachers, free to follow the religion of my fathers, free to think and talk and act for myself–and I will obey every law, or submit to the penalty.

—Chief Joseph, leader of the Nez Perce, 1879

2 **Which of these statements best summarizes Chief Joseph's speech?**

- **A** Native Americans should not be subject to any laws.
- **B** Native Americans should have their own Constitution.
- **C** Native Americans should receive special considerations from the United States government.
- ✔ **D** Native Americans should have the same rights as other people living in the United States.

B History

TerraNova Objective 28
Civics and Government Perspective

This item requires the student to analyze and then summarize a primary source, distilling from it the core American ideals of freedom and equality under the law.

3 **Which of these situations most directly caused the need for Chief Joseph's speech?**

- **A** the movement westward by settlers
- ✔ **B** the beginnings of the Industrial Revolution
- **C** trade disagreements between the United States and Europe
- **D** disagreements in the United States over the issue of slavery

B History

TerraNova Objective 27
Historical and Cultural Perspectives

Using historical content knowledge to recognize a causal relationship is the focus of this item. items addressing this standard relate to identifying the contribution of key historical documents and analyzing significant historical periods and the relationships among them.

D Economics

TerraNova Objective 29
Economic Perspective

Using an example of a real-world source, the student is asked to demonstrate knowledge of economic concepts related to production, distribution, and consumption. Other items for this standard measure the student's understanding of global economic interdependence and competition and the economic roles of various institutions.

Look at the advertisement and then do Number 4.

4 **On the lines below, write <u>three</u> reasons why Cathy's Computer Center lowered the price of the Brockton 5000 computer.**

- _____
- _____
- _____

Appendix A • Wisconsin Alignment Participants

WSAS Test Alignment Workshop Participants

Language Arts

Sandra Dickerson
Milwaukee Public Schools

Mark Hieke
Howard-Suamico Public Schools

Jacqueline Hill
Whitnall Public Schools

Janet Miller
Milwaukee Public Schools

Joe Papenfuss
Racine Public Schools

Sue Reader
Ashland Public Schools

Connie Russell
Eau Claire Public Schools

Roni Telfer
Whitewater Public Schools

Lisa Wiedmann
Rhinelander Public Schools

Brad Wiese
Appleton Public Schools

Mathematics

Janet Alekna
Wisconsin Rapids Public Schools

William Breisch
Monona Grove Public Schools

Jane Howell
Platteville Public Schools

J. Marshall Osborn
UW-Madison

Barbara Martinko
Milwaukee Public Schools

Steve Reinhart
Chippewa Falls Public Schools

Pat Reisdorf
Madison Metropolitan Schools

James Marty
Waukesha Public Schools

Science

Kathleen Damrow
Milwaukee Public Schools

Kris Dimock
Bloomer Public Schools

Alfred A., Jr. Hovey
Wauwatosa Public Schools

Mark Klawiter
Ladysmith Public Schools

Pat Marinac
Appleton Public Schools

Sharon Nelson
Waunakee Public Schools

Tom Reisenauer
Marshall Public Schools

Rhulene Swanigan
Milwaukee Public Schools

Paul Tweed
Augusta Public Schools

Social Studies

Susan Gogue
Baraboo Public Schools

Walt R. Herscher
Appleton Public Schools

James D. Kraft
Wausau Public Schools

Jeanne M. Kress
Franklin Public Schools

Margaret Laughlin
UW-Green Bay

MichaelMcKinnon
Janesville Public Schools

Iris Othrow
McFarland Public Schools

Michelle T. Trevino
Milwaukee Public Schools

Dave C. Wessel
Spencer Public School

Michael M. Yell
Hudson Public Schools

DPI Staff Participants

John Fortier, Division Administrator
Instructional Services

Sue Grady, Director
Content and Learning Team

Jodean Grunow, Education Consultant
Mathematics

Jacque Karbon, Education Consultant
Language Arts

Susan Ketchum, Measurement Specialist
Office of Educaton Accountability

Ellen Last, Education Consultant
Language Arts

Shelley Lee, Education Consultant
Social Studies

Jennifer Thayer, Education Consultant
Mathematics, Title I

Marsha Behnke, Program Assistant
Office of Education Accountability

Maggie Burke, Education Consultant
High School Graduate Test

Verlena Johnson, Special Assistant
High School Graduation Test

Guests and Observers

Luther Olson, State Representative
Chairman, State Assembly
Committee on Education

Sue Gehn, Mathematics Teacher
Monona Grove Public Schools

Lowell Gillette, Chair
Title I Committee of Practitioners

Appendix B • Description of Alignment Procedures

Alignment Procedures

On April 20-21, 1998, CTB/McGraw-Hill staff conducted a workshop for the Department of Public Instruction (DPI) to match items on *TerraNova*, Form A, at Levels 14, 18, and 20 to the Model Academic Standards for Grades 4, 8, and 12, respectively. *TerraNova* is currently administered to Wisconsin students in Grades 4, 8, and 10. A common criticism of nationally standardized, norm-referenced tests is that the items do not assess a particular state's or locality's curriculum. Therefore, one purpose of conducting the match was to determine whether individual *TerraNova,* Form A, items assess the Model Academic Standards and the extent to which the Model Academic Standards are addressed by *TerraNova,* Form A, items—that is, breadth of coverage.

The content assessed by *TerraNova* was defined by reviewing objectives and frameworks in state, district, and diocesan curriculum guides; standards in the most recent national standards publications; content of current, widely used basal texts and series; and practices in model educational programs. Based on this review, items were written to address the content that was common to these documents. Nonetheless, the Wisconsin Department of Public Instruction wanted to provide Wisconsin educators with information about the breadth of coverage of the Model Academic Standards and how many *TerraNova,* Form A, items match one or more standards.

At the time the workshop was conducted, only *TerraNova,* Form A, had been administered in Wisconsin; however, Form B will also be administered in future years. The *TerraNova* objective structure and the number of items measuring each objective remain constant across, Form A, and Form B. However, if the Wisconsin Model Academic Standards were to be matched to *TerraNova* Form B, it is likely that the number of items measuring the Wisconsin content standards may shift slightly.

The Department of Public Instruction invited Wisconsin educators to participate in the workshop. Many of the teachers selected for completing the match were also involved in the development of the Model Academic Standards. The participating educators represented elementary, middle, and high school grades. Approximately ten educators were selected for each of the four content areas assessed by TerraNova: reading/language arts, mathematics, science, and social studies. At least one Department of Public Instruction staff member observed each content area group and provided information or responded to questions only when requested by the participants.

Prior to the workshop, CTB content specialists reviewed the Model Academic Standards and completed a draft match of *TerraNova,* Form A, items to the standards. CTB also indicated which Model Academic Standards could or could not be reasonably assessed using large-scale, paper-and-pencil tests. These drafts served as a starting point for discussion.

CTB provided each participant with a copy of the draft match for each grade level and a *TerraNova,* Form A, test booklet for Levels 14, 18, and 20. Participants also had a *TerraNova* Teacher's Guide as a resource document.

During the morning of the first day of the workshop, participants received information about the nature and purpose of the alignment task. The national assessment consultant for CTB provided basic foundation information about the different purposes of norm-referenced and criterion-

referenced tests and the information derived from each. The presentation included information about different assessment formats (selected response, constructed response, essay, performance tasks, observation, and personal communication) and how different formats are better suited for certain types of achievement targets than other formats. The participants were also provided with information about the specific tasks each group would be completing and the record-keeping procedures that the groups would be using.

The alignment tasks were completed for each grade level, one grade at a time. Participants worked in dyads to complete the match for a portion of the Model Academic Standards for each grade level. Each dyad then presented their findings to the whole group; the whole group either accepted the findings or engaged in discussion until consensus was reached. CTB facilitators encouraged discussion and frequently checked to ensure that the participants had reached consensus.

CTB facilitators recorded changes to the draft match documents while participants discussed their findings. In addition, participants' comments or concerns about individual items or about other large-scale assessment issues were documented. When the participants could not reach consensus, CTB facilitators asked for a show of hands and made note of any discrepancies.

CTB staff kept a record of each *TerraNova* Form A item and the performance standards each item matched. If, at the end of the review, any item was not matched to a standard, the participants reviewed the item to determine whether it matched any standard. The results of the matches completed by the Wisconsin educators have been summarized and presented in this document.

Lynn Adams
Social Studies Development Editor

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Educational Consultant

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National Assessment Consultant

Jim Comerford, Ed.D.
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Jim Lee
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Steve Marsh
Evaluation Consultant

Robert Sanchez
Program Manager

Margie G. Tully, Ph.D.
Development Manager

Mary Waldorf
Development Manager

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
A. Reading/Literature			
A.12.1	Use effective reading strategies to achieve their purposes in reading	23, 24, 30, 38, 39, 42, 43, 45, 51, 52, 53, 55, 56	02, 03, 04, 05, 08
A.12.2	Read, interpret, and critically analyze literature	1–9, 22, 23, 25–27, 31	02, 03, 04, 05
A 12.3	Read and discuss literary nonliterary texts in order to understand human experience	26, 38, 39, 53, 62	02, 03, 04, 08, 09
A.12.4	Students will read to acquire information	10, 11, 30, 31, 34, 36–38, 54-58, 60, 61	02, 03, 04, 05
B. Writing			
B.12.1	Create or produce writing to communicate with different audiences for a variety of purposes	30, 31, 46, 48, 61, 62	04, 05, 08, 09
B.12.2	Plan, revise, edit, and publish clear and effective writing	17, 30, 31, 61, 62	02, 03, 04, 08, 09
B.12.3	Understand the function of various forms, structures, and punctuation marks of the standard American English and use them appropriately in oral and written communications	12–16, 18–20, 21, 28, 29, 31, 40–45, 47, 59, 62	02, 03, 04, 05, 07, 08, 09
C. Oral Language			
C.12.1	Prepare and deliver formal oral presentations appropriate to specific purposes and audiences		
C.12.2	Listen to, discuss, and comprehend oral communication		
C.12.3	Participate effectively in discussion		
D. Language			
D.12.1	Develop their vocabulary and ability to use words, phrases, idioms, and various grammatical structures as a means of improving communication	39, 45, 46, 48, 52	02, 07, 08
D.12.2	Recognize and interpret various uses and adaptations of language in social, cultural, regional, and professional situations, and learn to be flexible and responsive in their use of English	6, 7, 9, 23–26, 52	02, 03, 04, 05
E. Media and Technology			
E.12.1	Use computers to acquire, organize, analyze, and communicate information		
E.12.2	Make informed judgments about media and products	56, 58	05
E.12.3	Create media products appropriate to audience and purpose		
E.12.4	Demonstrate a working knowledge of media production and distribution		
E.12.5	Analyze and edit media work as appropriate to audience and purpose		
F. Research and Inquiry			
F.12.1	Conduct research and inquiry on self-selected or assigned topics, issues, or problems and use an appropriate form to communicate their findings	49	08

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
A. Mathematical Processes			
A.12.1	Use reason and logic to • evaluate information • perceive patterns • identify relationships • formulate questions, pose problems, and make and test conjectures • pursue ideas that lead to further understanding and deeper insight	5, 8, 15, 16, 17, 23	13, 14, 15, 17
A.12.2	Communicate logical arguments and clearly show • why a result does or does not make sense • why the reasoning is or is not valid • an understanding of the difference between examples that support a conjecture and a proof of the conjecture		
A.12.3	Analyze non-routine problems and arrive at solutions by various means, including models and simulations, often starting with provisional conjectures and progressing, directly or indirectly, to a solution, justification, or counter-example		
A.12.4	Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data		
A.12.5	Organize work and present mathematical procedures and results clearly, systematically, succinctly, and correctly		
A.12.6	Read and understand • mathematical texts and other instructional materials • writing about mathematics (e.g., articles in journals) • mathematical ideas as they are used in other contexts		
B. Number Operations and Relationships			
B.1.1	Use complex counting procedures such as union and intersection of sets and arrangements (permutations and combinations) to solve problems	26	15, 17
B.12.2	Compare real numbers using • order relations (>, <) and transitivity • ordinal scales including logarithmic (e.g., Richter, pH rating) • arithmetic differences • ratios, proportions, percents, rates of change	4, 10, 17, 24, 29, 35	10, 11, 13, 17
B.12.3	Perform and explain operations on real numbers (add, subtract, multiply, divide, raise to a power, extract a root, take opposites and reciprocals, determine absolute value)	1, 2, 3, 13	10, 11
B.12.4	In problem-solving situations involving the application of different number systems (natural, integers, rational, real) select and use appropriate • computational procedures • properties (e.g., commutativity, associativity, inverses) • modes of representation (e.g., rationals as repeating decimals, indicated roots as fractional exponents)	14, 19, 27, 29, 33	11, 13, 15, 17
B.12.5	Create and critically evaluate numerical arguments presented in a variety of classroom and real-world situations (e.g., political, economic, scientific, social)		
B.12.6	Routinely assess the acceptable limits of error when • evaluating strategies • testing the reasonableness of results • using technology to carry out computations		

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
C. Geometry			
C.12.1	Identify, describe, and analyze properties of figures, relationships among figures, and relationships among their parts by • constructing physical models • drawing precisely with paper-and-pencil, hand calculators, and computer software • using appropriate transformations (e.g., translations, rotations, reflections, enlargements) • using reason and logic	6, 21, 17, 22, 24, 32	13, 14, 17, 18
C.12.2	Use geometric models to solve mathematical and real-world problems		
C.12.3	Present convincing arguments by means of demonstration, informal proof, counter-examples, or any other logical means to show the truth of • statements (e.g., these two triangles are not congruent) • generalizations (e.g., the Pythagorean theorem holds for all right triangles)	5, 28, 32	14, 18
C.12.4	Use the two-dimensional rectangular coordinate system and algebraic procedures to describe and characterize geometric properties and relationships such as slope, intercepts, parallelism, and perpendicularity	31	16
C.12.5	Identify and demonstrate an understanding of the three ratios used in right-triangle trigonometry (sine, cosine, tangent)		
D. Measurement			
D.12.1	Identify, describe, and use derived attributes (e.g., density, speed, acceleration, pressure) to represent and solve problem situations		
D.12.2	Select and use tools with appropriate degree of precision to determine measurements directly within specified degrees of accuracy and error (tolerance)	34	
D.12.3	Determine measurements indirectly, using • estimation • proportional reasoning, including those involving squaring and cubing (e.g., reasoning that areas of circles are proportional to the squares of their radii) • techniques of algebra, geometry, and right triangle trigonometry • formulas in applications (e.g., for compound interest, distance formula) • geometric formulas to derive lengths, areas, or volumes of shapes and objects (e.g., cones, parallelograms, cylinders, pyramids) • geometric relationships and properties of circles and polygons (e.g., size of central angles, area of a sector of a circle) • conversion constants to relate measures in one system to another (e.g., meters to feet, dollars to Deutschmarks)	5, 7, 8, 17, 19, 21, 24, 27, 29, 34	11, 13, 14, 15, 17, 18
E. Statistics and Probability			
E.12.1	Work with data in the context of real-world situations by • formulating hypotheses that lead to collection and analysis of one-and two-variable data • designing a data collection plan that considers random sampling, control groups, the role of assumptions, etc. • conducting an investigation based on that plan • using technology to generate displays, summary statistics, and presentations		
E.12.2	Organize and display data from statistical investigations using • frequency distributions • percentiles, quartiles, deciles • line of best fit (estimated regression line) • matrices		

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
E.12.3	Interpret and analyze information from organized and displayed data when given • measures of dispersion, including standard deviation and variance • measures of reliability • measures of correlation	16, 23, 28, 30	14, 15, 18
E.12.4	Analyze, evaluate, and critique the methods and conclusions of statistical experiments reported in journals, magazines, news media, advertising, etc.		
E.12.5	Determine the likelihood of occurrence of complex events by using a variety of strategies (e.g., combinations) to identify possible outcomes • conducting an experiment • designing and conducting simulations • applying theoretical probability	9, 26	15, 17
F. Algebraic Relationships			
F.12.1	Analyze and generalize patterns of change (e.g., direct and inverse variation) and numerical sequences, and then represent them with algebraic expressions and equations	11	16
F.12.2	Use mathematical functions (e.g., linear, exponential, quadratic, power) in a variety of ways, including • recognizing that a variety of mathematical and real-world phenomena can be modeled by the same type of function • translating different forms of representing them (e.g., tables, graphs, functional notation, formulas) • describing the relationships among variable quantities in a problem • using appropriate technology to interpret properties of their graphical representations (e.g., intercepts, slopes, rates of change, changes in rates of change, maximum, minimum)	11, 18, 25, 31	16
F.12.3	Solve linear and quadratic equations, linear inequalities, and systems of linear equations and inequalities	20	16
F.12.4	Model and solve a variety of mathematical and real-world problems by using algebraic expressions, equations, and inequalities		

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
A. Science Connections			
A.12.1 the future	Apply the underlying themes of science to develop defensible visions of		
A.12.2	Show how conflicting assumptions about science themes lead to different opinions and decisions about evolution, health, population, longevity, education, and use of resources, and show how these opinions and decisions have diverse effects on an individual, a community, and a country, both now and in the future		
A.12.3	Give examples that show how partial systems, models, and explanations are used to give quick and reasonable solutions that are accurate enough for basic needs	11	22
A.12.4	Construct arguments that show how conflicting models and explanations of events can start with similar evidence		
A.12.5	Show how the ideas and themes of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources		
A.12.6	Identify and, using evidence learned or discovered, replace inaccurate personal models and explanations of science-related events		
A.12.7	Re-examine the evidence and reasoning that led to conclusions drawn from investigations, using the science themes		
B. Nature of Science			
B.12.1	Show how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences	23	22
B.12.2	Identify the cultural conditions that are usually present during great periods of discovery, scientific development, and invention		
B.12.3	Relate the major themes of science to human progress in understanding science and the world		
B.12.4	Show how basic research and applied research contribute to new discoveries, inventions, and applications	32	23
B.12.5	Explain how science is based on assumptions about the natural world and themes that describe the natural world		
C. Science Inquiry			
C.12.1	When studying science content, ask questions suggested by current social issues, scientific literature, and observations of phenomena, build hypotheses that might answer some of these questions, design possible investigations, and describe results that might emerge from such investigations	7, 13	19, 23
C.12.2	Identify issues from an area of science study, write questions that could be investigated, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions	16, 25, 34	19
C.12.3	Evaluate the data collected during an investigation, critique the data-collection procedures and results, and suggest ways to make any needed improvements	5, 34	19
C.12.4	During investigations, choose the best data-collection procedures and materials available, use them competently, and calculate the degree of precision of the resulting data		

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
C.12.5	Use the explanations and models found in the earth and space, life and environmental, and physical sciences to develop likely explanations for the results of their investigations		
C.12.6	Present the results of investigations to groups concerned with the issues, explaining the meaning and implications of the results, and answering questions in terms the audience can understand		
C.12.7	Evaluate articles and reports in the popular press, in scientific journals, on television, and on the Internet, using criteria related to accuracy, degree of error, sampling, treatment of data, and other standards of experimental design		
D. Physical Science			
STRUCTURE OF ATOMS AND MATTER			
D.12.1 D12.2	Describe atomic structure and the properties of atoms, molecules, and matter during physical and chemical interactions Explain the forces that hold the atom together and illustrate how nuclear interactions change the atom	11, 20, 33	20, 22
D.12.3	Explain exchanges of energy in chemical interactions and exchange of mass and energy in atomic/nuclear reactions	20	20
CHEMICAL REACTIONS			
D.12.4	Explain how substances, both simple and complex, interact with one another to produce new substances		
D.12.5	Identify patterns in chemical and physical properties and use them to predict likely chemical and physical changes and interactions	3, 15, 29	20
D.12.6	Through investigations, identify the types of chemical interactions, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions		
MOTIONS AND FORCES			
D.12.7	Qualitatively and quantitatively analyze changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically	9	23
D.12.8	Understand the forces of gravitation, the electromagnetic force, intermolecular force, and explain their impact on the universal system		
D.12.9	Describe models of light, heat, and sound and through investigations describe similarities and differences in the way these energy forms behave		
CONSERVATION OF ENERGY AND THE INCREASE IN DISORDER			
D.12.10	Using the science themes, illustrate the law of conservation of energy during chemical and nuclear reactions	19	20
INTERACTIONS OF MATTER AND ENERGY			
D.12.11	Using the science themes, explain common occurrences in the physical world	19, 29	20
D.12.12	Using the science themes and knowledge of chemical, physical, atomic, and nuclear interactions, explain changes in materials, living things, earth's features, and stars		

Appendix C • Summary of TerraNova Items and Objectives Matching Wisconsin Model Academic Standards

Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
E. Earth and Space Science			
ENERGY IN THE EARTH SYSTEM			
E. 12.1	Using the science themes, distinguish between internal energies (decay of radioactive isotopes, gravity) and external energies (sun) in the earth's systems and show how these sources of energy have an impact on those systems		
GEOCHEMICAL CYCLES			
E.12.2	Analyze the geochemical and physical cycles of the earth and use them to describe movements of matter	10, 11, 12, 24, 27	22
THE ORIGIN AND EVOLUTION OF THE EARTH SYSTEM			
E.12.3	Using the science themes, describe theories of the origins and evolution of the universe and solar system, including the earth system as a part of the solar system, and relate these theories and their implications to geologic time on earth	23	22
E.12.4	Analyze the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain the consequences to the environment	4	22
THE ORIGIN AND EVOLUTION OF THE UNIVERSE			
E.12.5	Using the science themes, understand that the origin of the universe is not completely understood, but that there are current ideas in science that attempt to explain its origin		
F. Life and Environmental Science			
THE CELL			
F.12.1	Evaluate the normal structures and the general and special functions of cells in single-celled and multiple-celled organisms	18, 30	21
F.12.2	Understand how cells differentiate and how cells are regulated		
THE MOLECULAR BASIS OF HEREDITY			
F.12.3	Explain current scientific ideas and information about the molecular and genetic basis of heredity		
F.12.4	State the relationships between functions of the cell and functions of the organism as related to genetics and heredity	17	21
BIOLOGICAL EVOLUTION			
F.12.5	Understand the theory of evolution, natural selection, and biological classification		
F.12.6	Using concepts of evolution and heredity, account for changes in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals	14	21
THE INTERDEPENDENCE OF ORGANISMS			
F.12.7	Investigate how organisms both cooperate and compete in ecosystems		
F.12.8	Using the science themes, infer changes in ecosystems prompted by the introduction of new species, environmental conditions, chemicals, and air, water, or earth pollution		

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MATTER, ENERGY AND ORGANIZATION IN LIVING SYSTEMS			
F.12.9	Using the science themes, investigate energy systems (related to food chains) to show how energy is stored in food (plants and animals) and how energy is released by digestion and metabolism		
F.12.10	Understand the impact of energy on organisms in living systems		
F.12.11	Investigate how the complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain an organism		
THE BEHAVIOR OF ORGANISMS			
F.12.12	Trace how the sensory and nervous systems of various organisms react to the internal and external environment and transmit survival or learning stimuli to cause changes in behavior or responses	6	21
G. Science Applications			
G.12.1	Identify personal interests in science and technology, implications that these interests might have for future education, and decisions to be considered		
G.12.2	Design, build, evaluate, and revise models and explanations related to the earth and space, life and environmental, and physical sciences	28	24
G.12.3	Analyze the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community	21, 22	24
G.12.4	Show how a major scientific or technological change has had an impact on work, leisure, or the home	8	24
G.12.5	Choose a specific problem in our society, identify alternative scientific or technological solutions to that problem and argue it merits		
H. Science in Personal and Social Perspectives			
H.12.1	Using the science themes and knowledge of the earth and space, life and environmental, and physical sciences, analyze the costs, risks, benefits, and consequences of a proposal concerning resource management in the community and determine the potential impact of the proposal on life in the community and the region		
H.12.2	Evaluate proposed policy recommendations (local, state, and/or national) in science and technology for validity, evidence, reasoning, and implications, both short and long-term		
H.12.3	Show how policy decisions in science depend on social values, ethics, beliefs, and time-frames as well as considerations of science and technology	35	24
H.12.4	Advocate a solution or combination of solutions to a problem in science or technology		
H.12.5	Investigate how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region	26, 31	24
H.12.6	Evaluate data and sources of information when using scientific information to make decisions		
H.12.7	When making decisions, construct a plan that includes the use of current scientific knowledge and scientific reasoning		

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A. GEOGRAPHY: People, Places, and Environments			
A.12.1	Use various types of atlases and appropriate vocabulary to describe the physical attributes of a place or region, employing such concepts as climate, plate tectonics, volcanism, and landforms, and to describe the human attributes, employing such concepts as demographics, birth and death rates, doubling time, emigration, and immigration	4, 5, 12, 13 , 17	26
A.12.2	Analyze information generated from a computer about a place, including statistical sources, aerial and satellite images, and three-dimensional models	12, 13	26
A.12.3	Construct mental maps of the world and the world's regions an d draw maps from memory showing major physical and human features	20, 32	26, 27
A.12.4	Analyze the short-term and long-term effects that major changes in population in various parts of the world have had or might have on the environment	12, 13	26
A.12.5	Use a variety of geographic information and resources to analyze and illustrate the ways in which the unequal global distribution of natural resources influences trade and shapes economic patterns	17, 19	26, 28
A.12.6	Collect and analyze geographic information to examine the effects that a geographic or environmental change in one part of the world, such as volcanic activity, river diversion, ozone depletion, air pollution, deforestation, or desertification, may have on other parts of the world	18	26
A.12.7	Collect relevant data to analyze the distribution of products among global markets and the movement of people among regions of the world		
A.12.8	Identify the world's major ecosystems and analyze how different economic, social, political, religious, and cultural systems have adapted to them	17	26
A.12.9	Identify and analyze cultural factors, such as human needs, values, ideals, and public policies, that influence the design of places, such as an urban center, an industrial park, a public project, or a planned neighborhood	14	29
A.12.10	Analyze the effect of cultural ethics and values in various parts of the world on scientific and technological development		
A.12.11	Describe scientific and technological development in various regions of the world and analyze the ways in which development affects environment and culture	5, 6, 17	26
A.12.12	Assess the advantages and disadvantages of selected land use policies in the local community, Wisconsin, the United States, and the world		
A.12.13	Give examples and analyze conflict and cooperation in the establishment of cultural regions and political boundaries	19	28
B. HISTORY: Time, Continuity, and Change			
Fourth-Twelfth Grade Historical Eras and Themes			
While studying Wisconsin history, students in grades 4-12 will learn about:			
	The prehistory and the early history of Wisconsin's native people		
	Early explorers, traders, and settlers to 1812		
	The transition from territory to statehood, 1787-1848		
	Immigration and settlement		
	Wisconsin's role in the Civil War, 1860-1865		
	Mining, lumber, and agriculture		

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	La Follette and the Progressive Era, 1874-1914		
	The world wars and conflicts		
	Prosperity, depression, industrialization, and urbanization		
	Wisconsin's response to 20th century change		
Fifth-Twelfth Grade Historical Eras and Themes			
While studying United States history, students in grades 5-12 will learn about:			
	The prehistory and early history of the Americas to 1607		
	Colonial history and settlement, 1607-1763		
	The American Revolution and the early national period, 1763-1815		
	The paradox of nationalism and sectionalism in an expanding nation, 1815-1860		
	The Civil War and Reconstruction, 1861-1877		
	The growth of industrialization and urbanization, 1865-1914		
	World War I and America's emergence as a world power, 1890-1920		
	Prosperity, depression, and the New Deal, 1920-1941		
	World War II, the Cold War, the Korean War, and the Vietnamese conflict, 1941-1975		
	The search for prosperity and equal rights in Cold War and post-Cold War America, 1945-present		
Fifth-Twelfth Grade Historical Eras and Themes			
While studying world history, students in grades 5-12 will learn about:			
	Prehistory to 2000 BC		
	Early pastoral civilizations, nonwestern empires, and tropical civilizations		
	Classical civilizations, including China, India, Egypt, Greece, and Rome, 1000 BC to 500 AD		
	Multiple religions (Judaism, Christianity, Islam, Buddhism, Hinduism) and civilizations to 1100 AD		
	Expansion and centralization of power, including the decline of feudalism, 1000-1500 AD		
	The early modern world, 1450-1800 AD		
	Global unrest, change, and revolution, 1750-1850 AD		
	Global encounters, industrialization, urbanization, and imperialism, 1850-1914 AD		
	Wars, revolutions, and ideologies, 1900-1945 AD		
	Post-industrialism, global interdependence, and fragmentation in the contemporary world, 1945-present		
B.12.1	Explain different points of view on the same historical event, using data gathered from various sources, such as letters, journals, diaries, newspapers, government documents, and speeches	30, 31	28

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Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
B.12.2	Analyze primary and secondary sources related to a historical question to evaluate their relevance, make comparisons, integrate new information with prior knowledge, and come to a reasoned conclusion	33, 34	27
B.12.3	Recall, select, and analyze significant historical periods and the relationshipsvamong them	33, 34	27
B.12.4	Assess the validity of different interpretations of significant historical events	15	27
B.12.5	Gather various types of historical evidence, including visual and quantitative data, to analyze issues of freedom and equality, liberty and order, region and nation, individual and community, law and conscience, diversity and civic duty; form a reasoned conclusion in the light of other possible conclusions; and develop a coherent argument in the light of other possible arguments	30, 31	28
B.12.6	Select and analyze various documents that have influenced the legal, political, and constitutional heritage of the United States	2, 10, 12	26, 28
B.12.7	Identify major works of art and literature produced in the United States and elsewhere in the world and explain how they reflect the era in which they were created		
B.12.8	Recall, select, and explain the significance of important people, their work, and their ideas in the areas of political and intellectual leadership, inventions, discoveries, and the arts, within each major era of Wisconsin, United States, and world history	33, 34	27
B.12.9	Select significant changes caused by technology, industrialization, urbanization, and population growth, and analyze the effects of these changes in the United States and the world	12 , 13, 14, 28, 29	26, 29
B.12.10	Select instances of scientific, intellectual, and religious change in various regions of the world at different times in history and discuss the impact those changes had on beliefs and values		
B.12.11	Compare examples and analyze why governments of various countries have sometimes sought peaceful resolution to conflicts and sometimes gone to war		
B.12.12	Analyze the history, culture, tribal sovereignty, and current status of the American Indian tribes and bands in Wisconsin		
B.12.13	Analyze examples of ongoing change within and across cultures, such as the development of ancient civilizations; the rise of nation-states; and social, economic, and political revolutions	6, 7, 8, 9	26, 17
B.12.14	Explain the origins, central ideas, and global influence of religions, such as Buddhism, Islam, Hinduism, Judaism, and Christianity		
B.12.15	Identify a historical or contemporary event in which a person was forced to take an ethical position, such as a decision to go to war, the impeachment of a president, or a presidential pardon, and explain the issues involved		
B.12.16	Describe the purpose and effects of treaties, alliances, and international organizations that characterize today's interconnected world		
B.12.17	Identify historical and current instances when national interests and global interests have seemed to be opposed and analyze the issues involved		
B.12.18	Explain the history of slavery, racial and ethnic discrimination, and efforts to eliminate discrimination in the United States and elsewhere in the world	10, 33, 34	27, 28

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C. POLITICAL SCIENCE AND CITIZENSHIP: Power, Authority, Governance, and Responsibility			
C.12.1	Identify the sources, evaluate the justification, and analyze the implications of certain rights and responsibilities of citizens	1, 10	28
C.12.2	Describe how different political systems define and protect individual human rights		
C.12.3	Trace how legal interpretations of liberty, equality, justice, and power, as identified in the Constitution, the Bill of Rights, and other Constitutional Amendments, have changed and evolved over time	10, 30, 31, 33	27, 28
C.12.4	Explain the multiple purposes of democratic government, analyze historical and contemporary examples of the tensions between those purposes, and illustrate how governmental powers can be acquired, used, abused, or legitimized	33, 34	27
C.12.5	Analyze different theories of how governmental powers might be used to help promote or hinder liberty, equality, and justice, and develop a reasoned conclusion		
C.12.6	Identify and analyze significant political benefits, problems, and solutions to problems related to federalism and the separation of powers		
C.12.7	Describe how past and present American political parties and interest groups have gained or lost influence on political decision-making and voting behavior	33, 34	27
C.12.8	Locate, organize, analyze, and use information from various sources to understand an issue of public concern, take a position, and communicate the position	1, 2, 11, 30, 31, 34	27, 28
C.12.9	Identify and evaluate the means through which advocates influence public policy	33, 34	27
C.12.10	Identify ways people may participate effectively in community affairs and the political process	3, 11	28
C.12.11	Evaluate the ways in which public opinion can be used to influence and shape public policy	33, 34	27
C.12.12	Explain the United States' relationship to other nations and its role in international organizations, such as the United Nations, North Atlantic Treaty Organization, World Bank, International Monetary Fund, and North American Free Trade Agreement		
C.12.13	Describe and evaluate ideas of how society should be organized and political power should be exercised, including the ideas of monarchism, anarchism, socialism, fascism, and communism; compare these ideas to those of representative democracy; and assess how such ideas have worked in practice		
C.12.14	Explain and analyze how different political and social movements have sought to mobilize public opinion and obtain governmental support in order to achieve their goals	33, 34	27
C.12.15	Describe and analyze the origins and consequences of slavery, genocide, and other forms of persecution, including the Holocaust	33, 34	27
C.12.16	Describe the evolution of movements to assert rights by people with disabilities, ethnic and racial groups, minorities, and women	10, 33, 34	27, 28
D. ECONOMICS: Production, Distribution, Exchange, Consumption			
D.12.1	Explain how decisions about spending and production made by households, businesses, and governments determine the nation's levels of income, employment, and prices	24	29

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Wisconsin Model Academic Standards		*TerraNova,* Form A, Multiple Assessments Level 20 Items Matched	*TerraNova* Objectives
D.12.2	Use basic economic concepts (such as supply and demand; production, distribution, and consumption; labor, wages, and capital; inflation and deflation; market economy and command economy) to compare and contrast local, regional, and national economies across time and at the present time	13, 21	26, 28
D.12.3	Analyze and evaluate the role of Wisconsin and the United States in the world economy		
D.12.4	Explain and evaluate the effects of new technology, global economic interdependence, and competition on the development of national policies and on the lives of individuals and families in the United States and the world	18, 28, 29	26, 29
D.12.5	Explain how federal budgetary policy and the Federal Reserve System's monetary policies influence overall levels of employment, interest rates, production, and prices		
D.12.6	Use economic concepts to analyze historical and contemporary questions about economic development in the United States and the world	17	26
D.12.7	Compare, contrast, and evaluate different types of economies (traditional, command, market, and mixed) and analyze how they have been affected in the past by specific social and political systems and important historical events		
D.12.8	Explain the basic characteristics of international trade, including absolute and comparative advantage, barriers to trade, exchange rates, and balance of trade		
D.12.9	Explain the operations of common financial instruments (such as stocks and bonds) and financial institutions (such as credit companies, banks, and insurance companies)		
D.12.10	Analyze the ways in which supply and demand, competition, prices, incentives, and profits influence what is produced and distributed in a competitive market system	23, 27	29
D.12.11	Explain how interest rates are determined by market forces that influence the amount of borrowing and saving done by investors, consumers, and government officials		
D.12.12	Compare and contrast how values and beliefs, such as economic freedom, economic efficiency, equity, full employment, price stability, security, and growth, influence decisions in different economic systems		
D.12.13	Describe and explain global economic interdependence and competition, using examples to illustrate their influence on national and international policies	18, 19	26, 28
D.12.14	Analyze the economic roles of institutions, such as corporations and businesses, banks, labor unions, and the Federal Reserve System	25, 26	29
E. THE BEHAVIORAL SCIENCES: Individuals, Institutions, and Society			
E.12.1	Summarize research that helps explain how the brain's structure and function influence learning and behavior		
E.12.2	Explain how such factors as physical endowment and capabilities, family, gender, ethnicity, religion, socioeconomic status, attitudes, beliefs, work, and motivation contribute to individual identity and development		
E.12.3	Compare and describe similarities and differences in the ways various cultures define individual rights and responsibilities, including the use of rules, folkways, mores, and taboos		

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E.12.4	Analyze the role of economic, political, educational, familial, and religious institutions as agents of both continuity and change, citing current and past examples		
E.12.5	Describe the ways cultural and social groups are defined and how they have changed over time	14	29
E.12.6	Analyze the means by which and extent to which groups and institutions can influence people, events, and cultures in both historical and contemporary settings	33 , 34	27
E.12.7	Use scientific methods to assess the influence of media on people's behavior and decisions		
E.12.8	Analyze issues of cultural assimilation and cultural preservation among ethnic and racial groups in Wisconsin, the United States, and the world		
E.12.9	Defend a point of view related to an ethical issue such as genetic engineering, declaring conscientious objector status, or restricting immigration		
E.12.10	Describe a particular culture as an integrated whole and use that understanding to explain its language, literature, arts, traditions, beliefs, values, and behaviors	20	27
E.12.11	Illustrate and evaluate ways in which cultures resolve conflicting beliefs and practices		
E.12.12	Explain current and past efforts of groups and institutions to eliminate prejudice and discrimination against racial, ethnic, religious, and social groups such as women, children, the elderly, and individuals who are disabled	33, 34	27
E.12.13	Compare the ways in which a universal theme is expressed artistically in three different world cultures		
E.12.14	Use the research procedures and skills of the behavioral sciences (such as gathering, organizing, and interpreting data from several sources) to develop an informed position on an issue	8, 9, 22	27, 29
E.12.15	Identify the skills needed to work effectively alone, in groups, and in institutions		
E.12.16	Identify and analyze factors that influence a person's mental Health		
E.12.17	Examine and describe various belief systems that exist in the world, such as democracy, socialism, and capitalism		