

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

A. SCIENCE CONNECTIONS	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	
Sci:F12-8, Sci:F12-12		
A.12.1 Apply the underlying themes of science to develop defensible visions of the future	B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.3 Explain the impact of climate change on existing agricultural systems E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities E.12.2 Analyze benefits, costs, and consequences of land use E.12.3 Explain the impact of climate change on existing agricultural systems E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world B.12.1 Apply knowledge of technology to identify and solve problems	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products	
A.12.4 Construct arguments that show how conflicting models and explanations of events can start with similar evidence	E.12.3 Explain the impact of climate change on existing agricultural systems E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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.12.1 Identify how political policies and issues shape and influence food and fiber systems A.12.2 Understand the variety, complexity, and size of the agriculture industry in the world A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber. B.12.5 Explore various career opportunities in the food, fiber, and natural resources industries using available forms of technology D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact. E.12.2 Analyze benefits, costs, and consequences of land use E.12.3 Explain the impact of climate change on existing agricultural systems F.12.4 Research a career in agricultural business marketing and management	Lesson B2-8 Identifying Career Opportunities in Agricultural Biotechnology Identify careers in plant or environmental biotechnology. Examine the companies or public institutes that conduct research or develop products through plant or environmental biotechnology. Identify careers in animal biotechnology. Recognize the education and skills necessary to obtain a career in agricultural biotechnology. BT118 Biotech: The Environmental Benefits Identify and discuss the positive role biotechnology plays in protecting the environment and in cleaning up environmental pollution. Analyse the implications of biotechnology for local environmental concerns BT119 Biotech: The Environmental Risks Understand and discuss the environmental risks associated with the release of altered organisms into nature Define “genetic pollution Explain how altered genes can spread,

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

A.12.6 Identify and replace inaccurate personal models and explanations of science-related phenomena using evidence learned or discovered	D.12.5 Describe how biotechnology can enhance food and fiber production E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
A.12.7 Re-examine the evidence and reasoning that led to conclusions drawn from investigations, using the science themes	E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity	
B. NATURE OF SCIENCE Performance Standards	Agricultural Education Standards Performance Standards	Crosswalk of Local School Curriculum
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	
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	B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia C.12.1 Demonstrate a working knowledge of leadership and leadership styles D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.5 Describe how biotechnology can enhance food and fiber production E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity	Lesson A1-1 Exploring Research Methods in Agriculture Explain how the science of agriculture helped develop civilization. Identify and define various areas of science and agriscience. Discuss advancements made through agriscience. Lesson A1-2 Designing and Conducting Agricultural Research Understand the importance of the scientific method. Explain the steps in conducting research in agriculture. Explain the importance of controlled research. Lesson A1-4 Reporting Agricultural Research Identify the major parts of a research project. Explain the general guidelines for preparing a research report. Explain how to properly include tables and figures in a research report.

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

<p>B.12.2 Identify the cultural conditions that are usually present during great periods of discovery, scientific development, and invention</p>	<p>D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.5 Describe how biotechnology can enhance food and fiber production</p>	
<p>B.12.3 Relate the major themes of science to human progress in understanding science and the world</p>	<p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p>	
<p>B.12.4 Show how basic research and applied research contribute to new discoveries, inventions, and applications</p>	<p>B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p>	<p>Lesson A1-1 Exploring Research Methods in Agriculture Explain how the science of agriculture helped develop civilization. Identify and define various areas of science and agriscience. Discuss advancements made through agriscience.</p> <p>Lesson A1-2 Designing and Conducting Agricultural Research Understand the importance of the scientific method. Explain the steps in conducting research in agriculture. Explain the importance of controlled research.</p> <p>Lesson A1-4 Reporting Agricultural Research Identify the major parts of a research project. Explain the general guidelines for preparing a research report. Explain how to properly include tables and figures in a research report.</p>
<p>B.12.5 Explain how science is based on assumptions about the natural world and themes that describe the natural world</p>	<p>D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries E.12.3 Explain the impact of climate change on existing agricultural systems D.12.6 Understand the impact emerging technologies</p>	

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources	
C. SCIENCE INQUIRY	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	
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	B.12.1 Apply knowledge of technology to identify and solve problems C.12.2 Practice skills relating to communication, problem-solving, and decision-making through individual, group, and team processes	
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	B.12.1 Apply knowledge of technology to identify and solve problems B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia C.12.2 Practice skills relating to communication, problem-solving, and decision-making through individual, group, and team processes D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	Lesson A1-4 Developing AgriScience Fair Projects Identify and describe the steps involved in developing a quality AgriScience Fair project. Review the rules and guidelines associated with AgriScience Fair projects. Demonstrate the ability to produce an AgriScience Fair project report. Demonstrate the ability to develop an AgriScience Fair project display. Demonstrate the ability to successfully answer questions about the project in an interview setting.
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	B.12.1 Apply knowledge of technology to identify and solve problems B.12.3 Use technology to acquire, organize, and communicate information by entering, modifying,	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	retrieving, and storing data C.12.2 Practice skills relating to communication, problem-solving, and decision-making	
C.12.4 During investigations, choose the best data-collection procedures and materials, use them competently, and calculate the degree of precision of the resulting data	B.12.1 Apply knowledge of technology to identify and solve problems B.12.3 Use technology to acquire, organize, and communicate information by entering, modifying, retrieving, and storing data C.12.2 Practice skills relating to communication, problem-solving, and decision-making	
C.12.5 Use the explanations and models found in earth and space, life and environmental, and physical sciences to develop likely explanations for the results of their investigations	B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia C.12.2 Practice skills relating to communication, problem-solving, and decision-making	
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	B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology C.12.2 Practice skills relating to communication, problem-solving, and decision-making	
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	B.12.1 Apply knowledge of technology to identify and solve problems B.12.2 Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia C.12.2 Practice skills relating to communication, problem-solving, and decision-making	
D. PHYSICAL SCIENCE	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	
Structures of Atoms and Matter		
D.12.1 Describe atomic structure and the properties of atoms, molecules, and matter during physical and chemical	D.12.5 Describe how biotechnology can enhance food and fiber production	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

interactions	<p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources</p> <p>E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity</p> <p>E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p> <p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	
D.12.2 Explain the forces that hold the atom together and illustrate how nuclear interactions change the atom	No significant match found	
D.12.3 Explain exchanges of energy in chemical interactions and exchange of mass and energy in atomic/nuclear reactions	<p>E.12.3 Explain the impact of climate change on existing agricultural systems</p> <p>E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p> <p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

Chemical Reactions		
<p>D.12.4 Explain how substances, both simple and complex, interact with one another to produce new substances</p>	<p>A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Lesson C2-10 Effect of Antibiotics on Bacteria Understand the function and purpose of antibiotics. Explain the way that bacteria can cause infections. Understand how bacteria can be spread from host to host. Lesson C1-3 Controlling Molds with Food Preservatives Describe how different microbes cause food spoilage. Describe methods used in controlling food contamination. Explain the methods used in preventing the growth of microbes in food. Explain methods for decreasing food contamination.</p> <p>Lesson C2-5 Pasteurized Milk as an Ecological System for Bacteria Describe the composition of milk. Explain the processing of raw milk and the pasteurization process. List and explain bacterial succession in milk and explain the process of milk spoilage.</p> <p>Lesson C3-4 Algin Worms Explain how alginates react with calcium to form a thicker food product. Explain the use of thickening agents in the food industry and give specific examples of products that contain these agents. Explain the effect of temperature on the gelling process.</p> <p>Lesson C2-7 Yogurt Production Describe the composition of yogurt. Explain how fermentation and anaerobic respiration are needed to create the yogurt product.</p> <p>AEN:FS102 Chemistry of Foods The student will be</p>

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>able to discuss and identify the chemical substances in the foods people eat and understand their relationship to normal functioning of the body</p> <p>AEN:FS106 Avoiding Food Deterioration The student should understand that deterioration of food includes changes in organoleptic quality, nutritional value, food safety, aesthetic appeal, color, texture, and flavor. The role of food science is to minimize negative changes as much as possible.</p> <p>AEN:FS110 Processing Foods with radiant and Electrical Energy Students will understand how and why irradiation, microwaves and ohmic heating offer advantages for food preservation</p>
<p>D.12.5 Identify patterns in chemical and physical properties and use them to predict likely chemical and physical changes and interactions</p>	<p>A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced: e.g. , biotechnology D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p>	<p>Lesson C2-10 Effect of Antibiotics on Bacteria Understand the function and purpose of antibiotics. Explain the way that bacteria can cause infections. Understand how bacteria can be spread from host to host.</p> <p>Lesson D1-5 pH and Fermentation Explain the processes involved in fermentation and how organisms obtain energy. Explain the purpose of the pH scale and how pH is calculated. Name three microorganisms that cause fermentation to occur. Explain the advantages and disadvantages of fermentation in food processing. Explain factors that can affect the fermentation process.</p> <p>Lesson D2-4 Salt as a Food Preservative Describe the uses of salt as a food preservative and</p>

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>explain why salt is an effective food preservative. Discuss the relationship between moisture content in meat products and microbial activity.</p> <p>Lesson C1-3 Controlling Molds with Food Preservatives Describe how different microbes cause food spoilage. Describe methods used in controlling food contamination. Explain the methods used in preventing the growth of microbes in food. Explain methods for decreasing food contamination.</p> <p>Lesson C2-5 Pasteurized Milk as an Ecological System for Bacteria Describe the composition of milk. Explain the processing of raw milk and the pasteurization process. List and explain bacterial succession in milk and explain the process of milk spoilage.</p> <p>Lesson C3-4 Algin Worms Explain how alginates react with calcium to form a thicker food product. Explain the use of thickening agents in the food industry and give specific examples of products that contain these agents. Explain the effect of temperature on the gelling pro</p> <p>Lesson C2-7 Yogurt Production Describe the composition of yogurt. Explain how fermentation and anaerobic respiration are needed to create the yogurt product.</p> <p>AEN:FS102 Chemistry of Foods The student will be able to discuss and identify the chemical substances in the foods people eat and</p>
--	--	---

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education*
Biotechnology

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>understand their relationship to normal functioning of the body</p> <p>AEN:FS106 Avoiding Food Deterioration The student should understand that deterioration of food includes changes in organoleptic quality, nutritional value, food safety, aesthetic appeal, color, texture, and flavor. The role of food science is to minimize negative changes as much as possible.</p> <p>AEN:FS110 Processing Foods with radiant and Electrical Energy Students will understand how and why irradiation, microwaves and ohmic heating offer advantages for food preservation</p>
<p>D.12.6 Through investigations, identify the types of chemical interactions, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions</p>	<p>A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world</p> <p>A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber</p> <p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced: e.g. , biotechnology</p> <p>D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities.</p> <p>D.12.5 Describe how biotechnology can enhance food and fiber production</p> <p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources</p> <p>E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity</p> <p>E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber</p>	<p>Lesson C2-10 Effect of Antibiotics on Bacteria Understand the function and purpose of antibiotics. Explain the way that bacteria can cause infections. Understand how bacteria can be spread from host to host.</p> <p>Lesson D1-5 ph and Fermentation Explain the processes involved in fermentation and how organisms obtain energy. Explain the purpose of the ph scale and how ph is calculated. Name three microorganisms that cause fermentation to occur. Explain the advantages and disadvantages of fermentation in food processing. Explain factors that can affect the fermentation process.</p> <p>Lesson C1-3 Controlling Molds with Food Preservatives Describe how different microbes cause food spoilage. Describe methods used in controlling food</p>

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	<p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>contamination. Explain the methods used in preventing the growth of microbes in food. Explain methods for decreasing food contamination.</p> <p>Lesson C2-5 Pasteurized Milk as an Ecological System for Bacteria Describe the composition of milk. Explain the processing of raw milk and the pasteurization process. List and explain bacterial succession in milk and explain the process of milk spoilage.</p> <p>Lesson C3-4 Algin Worms Explain how alginates react with calcium to form a thicker food product. Explain the use of thickening agents in the food industry and give specific examples of products that contain these agents. Explain the effect of temperature on the gelling process</p> <p>Lesson C2-7 Yogurt Production Describe the composition of yogurt. Explain how fermentation and anaerobic respiration are needed to create the yogurt product.</p> <p>AEN:FS102 Chemistry of Foods The student will be able to discuss and identify the chemical substances in the foods people eat and understand their relationship to normal functioning of the body</p> <p>AEN:FS106 Avoiding Food Deterioration The student should understand that deterioration of food includes changes in organoleptic quality, nutritional value, food safety, aesthetic appeal, color, texture, and flavor. The role of food science is to minimize</p>
--	---	--

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		negative changes as much as possible. AEN:FS110 Processing Foods with radiant and Electrical Energy Students will understand how and why irradiation, microwaves and ohmic heating offer advantages for food preservation
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	No significant match found	
D.12.8 Understand the forces of gravitation, the electromagnetic force, and the intermolecular force, and explain their impact on the universal system	No significant match found	
D.12.9 Describe models of light, heat, and sound and through investigations describe similarities and differences in the way these energy forms behave	D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	No significant match found	
Interactions of Matter and Energy		
D.12.11 Using the science themes, explain common occurrences in the physical world	D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources	

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	E.12.3 Explain the impact of climate change on existing agricultural systems E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
D.12.12 Using the science themes and knowledge of chemical, physical, atomic and nuclear interactions, explain changes in materials, living things, the earth's features, and stars	D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.3 Explain the impact of climate change on existing agricultural systems E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber	
E. EARTH AND SPACE SCIENCE	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will::</i>	
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	D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world. E 12.3 Explain the impact of climate change on existing agricultural systems	
Geochemical Cycles		
E.12.2 Analyze the geochemical and physical cycles of the earth and use them to describe movements of matter	D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world E 12.3 Explain the impact of climate change on existing agricultural systems	
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	E.12.2 Analyze benefits, costs, and consequences of land use E.12.3 Explain the impact of climate change on existing agricultural systems. E.12.4 Analyze practices used by farmers to reduce	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	erosion and runoff to maintain soil fertility and productivity	
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	B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.5 Describe how biotechnology can enhance food and fiber production. D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources. E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact. E.12.2 Analyze benefits, costs, and consequences of land use E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment.	Lesson B2-4 Fuels from Crops Explain the advantages of using fuels made from crops. Describe the chemical nature of ethanol. Explain what renewable resources are used to create biofuels and why they are good sources of energy. Explain the processes involved in fermentation and how organisms obtain energy. Explain how ethanol is produced.
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	No significant match	
F. LIFE AND ENVIRONMENTAL SCIENCE	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	
The Cell		
F.12.1 Evaluate the normal structures and the general and special functions of cells in single-celled and multiple-celled organisms	B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products D.12.2 Discuss the impact that climate and water have on	Lesson B3-3 Plant Tissue Testing Name the nutrients needed for plant growth. Explain why nutrients are essential to plants. Explain where and how plants can obtain nutrients. Describe environmental conditions that influence nutrient deficiencies.

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	<p>the food, fiber, and ornamental horticulture production cycles throughout the world D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production. D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources. E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact.</p>	<p>Explain where plants can obtain nutrients if inadequate amounts are present in the soil. Discuss the nitrogen cycle and its effect on plant nutrition.</p> <p>Lesson C1-2 DNA Extraction Explain the genetic information found in cells. Explain the DNA molecule. Explain how DNA is copied. Understand how genes code for a single protein.</p> <p>Lesson C1-3 Biotechnology Identify the major areas of biotechnology in animal science. Explain various molecular biotechnology methods. Discuss applications of molecular biotechnology. Discuss applications of organismic biotechnology.</p> <p>PCSD:ALSNS-02 Genomics/DNA Fingerprinting</p> <ul style="list-style-type: none"> • Understand how DNA fingerprinting and genomics can be used in parent identification and animal genetic evaluation • Describe the process of DNA fingerprinting • Learn which part of the DNA genome is used for DNA fingerprinting • Understand the factors that can increase the accuracy of DNA fingerprinting • Interpret DNA fingerprints • Explore various uses for DNA fingerprinting and genome maps • Recognize the limitations of and problems with
--	--	---

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summery of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p align="center">DNA testing</p> <p>AEN:BT109 Producing Clones of Animals Students will be able to explain why producing an animal clone is difficult. They will know when the first clone was produced, will understand the biology involved and will be able to list the steps required to produce a clone.</p> <p>AEN:BT108 Transgenic Animals Students will be able to define and explain the difference between clones and transgenic animals. In addition, they will be able to describe the biology of normal animal reproduction and will be able to list the steps involved in producing a transgenic offspring.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p> <p>AEN:BT104 Developing Technologies from Embryo Research</p>
--	--	--

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
<p>F.12.2 Understand how cells differentiate and how cells are regulated</p>	<p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology</p> <p>D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products</p> <p>D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world</p> <p>D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries</p> <p>D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities.</p> <p>D.12.5 Describe how biotechnology can enhance food and</p>	<p>Lesson C1-2 DNA Extraction Explain the genetic information found in cells. Explain the DNA molecule. Explain how DNA is copied. Understand how genes code for a single protein.</p> <p>Lesson C1-3 Biotechnology Identify the major areas of biotechnology in animal science. Explain various molecular biotechnology methods. Discuss applications of molecular biotechnology. Discuss applications of organismic biotechnology.</p> <p>Lesson B2-1 Exploring Cells (Based on Lesson CC C3-</p>

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education*
Biotechnology**

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	<p>fiber production. D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources. E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact</p>	<p>1) Explains the cell’s role and compare and contrast the types of cells. (prokaryotic and eukaryotic) Describe the components of animal cells and explain their functions. Describe the components of plant cells and explain their functions.</p> <p>PCSD:ALSNS-02 Genomics/DNA Fingerprinting</p> <ul style="list-style-type: none"> • Understand how DNA fingerprinting and genomics can be used in parent identification and animal genetic evaluation • Describe the process of DNA fingerprinting • Learn which part of the DNA genome is used for DNA fingerprinting • Understand the factors that can increase the accuracy of DNA fingerprinting • Interpret DNA fingerprints • Explore various uses for DNA fingerprinting and genome maps • Recognize the limitations of and problems with DNA testing <p>AEN:BT109 Producing Clones of Animals Students will be able to explain why producing an animal clone is difficult. They will know when the first clone was produced, will understand the biology involved and will be able to list the steps required to produce a clone.</p> <p>AEN:BT108 Transgenic Animals Students will be able to define and explain the</p>
--	--	--

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>difference between clones and transgenic animals. In addition, they will be able to describe the biology of normal animal reproduction and will be able to list the steps involved in producing a transgenic offspring.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p> <p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the</p>
--	--	---

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
<p>The Molecular Basis of Heredity</p>		
<p>F.12.3 Explain current scientific ideas and information about the molecular and genetic basis of heredity</p>	<p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology</p> <p>D.12.1 Describe the global utilization of Wisconsin’ food, fiber, and ornamental plant products</p> <p>D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world</p> <p>D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries</p> <p>D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities.</p> <p>D.12.5 Describe how biotechnology can enhance food and fiber production</p> <p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources.</p> <p>E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact</p> <p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Lesson B3-2 Principles of Heredity: Variation in Corn Explain other types of relationships between alleles and how to determine the probable outcome of these relationships. Explain how to determine the genotype of an unknown individual. Demonstrate how the probability is determined for dihybrid crosses. List four examples of mutations and explain how mutations can change the genetic make-up of an organism. Explain how humans have manipulated the genetic make-up of organisms.</p> <p>Lesson C1-1 Animal Genetics and Probability Explain the importance of understanding genetics. Explain how genotype and phenotype are different. Explain how to estimate the heritability of certain traits. Describe sex determination, linkage, crossover and mutation.</p> <p>Lesson C1-2 DNA Extraction Explain the genetic information found in cells.</p>

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>Explain the DNA molecule. Explain how DNA is copied. Understand how genes code for a single protein. Lesson C1-3 Biotechnology Identify the major areas of biotechnology in animal science. Explain various molecular biotechnology methods. Discuss applications of molecular biotechnology. Discuss applications of organismic biotechnology.</p> <p>Lesson B2-2 Examining Cell Division (Based on Lesson CC C3-3) Define the cell theory and examine the importance of mitosis. Identify and describe the five stages of mitosis. Identify and describe the stages of meiosis I and II. Analyze the role of meiosis in spermatogenesis and oogenesis. Compare and contrast mitosis and meiosis.</p> <p>Lesson B2-4 Determining the Heritability of Traits - NEW LESSON Explain how to estimate the heritability of certain traits. (APS B4-4) Predict the genotypes and phenotypes from monohybrid and dihybrid crosses by using Punnett squares. Describe sex determination, linkage, crossover and mutation.</p> <p>AEN:BT127 Improving Crop Production and Quality Students will be able to list a wide range of crop improvements made possible through the application of biotechnology and will be challenged to relate those developments to local crops and conditions.</p>
--	--	---

Crosswalk Between: *Wisconsin's Model Academic Standards for Science and Wisconsin's Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin's Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>AEN:BT129 Developing Crops That Fight Insects Students will be able to explain how an insect-resistant crop variety can be produced, and will be able to list and discuss the benefits and the problems that have emerged following the rapid increase in acreage of Bt cotton and Bt corn hybrids.</p> <p>AEN:BT107 Genetic Engineering of Plant Life Students will be able to discuss genetic engineering from the historic perspective of plant improvement. They will be able to list and describe plant genetic engineering techniques, define terms used and describe the methods used to develop transgenic plants.</p> <ul style="list-style-type: none"> - PCSD:ALSNS-01 Selection Indexes/Predicted Difference - analyze data to study genetic crosses and breeding program - recognize contrasting phenotypes - study dominance, segregation and independent assortment of alleles - compare predicted results with results obtained from actual data <ul style="list-style-type: none"> - PCSD:ALSNS-01 Selection Indexes/Predicted Difference - analyze data to study genetic crosses and breeding program - recognize contrasting phenotypes - study dominance, segregation and independent assortment of alleles - compare predicted results with results obtained from actual data
--	--	---

Crosswalk Between: *Wisconsin's Model Academic Standards for Science and Wisconsin's Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin's Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>PCSD:ALSNS-02 Genomics/DNA Fingerprinting</p> <ul style="list-style-type: none"> • Understand how DNA fingerprinting and genomics can be used in parent identification and animal genetic evaluation • Describe the process of DNA fingerprinting • Learn which part of the DNA genome is used for DNA fingerprinting • Understand the factors that can increase the accuracy of DNA fingerprinting • Interpret DNA fingerprints • Explore various uses for DNA fingerprinting and genome maps • Recognize the limitations of and problems with DNA testing <p>AEN:BT109 Producing Clones of Animals Students will be able to explain why producing an animal clone is difficult. They will know when the first clone was produced, will understand the biology involved and will be able to list the steps required to produce a clone.</p> <p>AEN:BT108 Transgenic Animals Students will be able to define and explain the difference between clones and transgenic animals. In addition, they will be able to describe the biology of normal animal reproduction and will be able to list the steps involved in producing a transgenic offspring.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements Students will be able to explain what benefit could be</p>
--	--	---

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summery of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p> <p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
--	--	---

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

<p>F.12.4 State the relationships between functions of the cell and functions of the organism as related to genetics and heredity</p>	<p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.1 Describe the global utilization of Wisconsin’ food, fiber, and ornamental plant products D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production. D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources. E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Lesson B3-2 Principles of Heredity: Variation in Corn Explain other types of relationships between alleles and how to determine the probable outcome of these relationships. Explain how to determine the genotype of an unknown individual. Demonstrate how the probability is determined for dihybrid crosses. List four examples of mutations and explain how mutations can change the genetic make-up of an organism. Explain how humans have manipulated the genetic make-up of organisms.</p> <p>Lesson C1-1 Animal Genetics and Probability Explain the importance of understanding genetics. Explain how genotype and phenotype are different. Explain how to estimate the heritability of certain traits. Describe sex determination, linkage, crossover and mutation.</p> <p>Lesson C1-2 DNA Extraction Explain the genetic information found in cells. Explain the DNA molecule. Explain how DNA is copied. Understand how genes code for a single protein.</p> <p>Lesson C1-3 Biotechnology Identify the major areas of biotechnology in animal science. Explain various molecular biotechnology methods. Discuss applications of molecular biotechnology. Discuss applications of organismic biotechnology.</p> <p>Lesson B2-3 Understanding Genetics (Based on Lesson CC C3-2)</p>
---	---	--

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education*
Biotechnology

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summery of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>Describe the importance of understanding genetics and recognize the impact of Gregor Mendel’s development of the basic principles of heredity. Examine the components of DNA and describe its structure. Explain the function and process of transcription and translation. Explain the principle of dominance. (include description of incomplete dominance) Explain the principle of segregation. Explain the principle of independent assortment.</p> <p>Lesson B2-4 Determining the Heritability of Traits - NEW LESSON Explain how to estimate the heritability of certain traits. (APS B4-4) Predict the genotypes and phenotypes from monohybrid and dihybrid crosses by using Punnett squares. Describe sex determination, linkage, crossover and mutation.</p> <p>AEN:BT127 Improving Crop Production and Quality Students will be able to list a wide range of crop improvements made possible through the application of biotechnology and will be challenged to relate those developments to local crops and conditions.</p> <p>AEN:BT129 Developing Crops That Fight Insects Students will be able to explain how an insect-resistant crop variety can be produced, and will be able to list and discuss the benefits and the problems that have emerged following the rapid increase in acreage of Bt cotton and Bt corn hybrids.</p>
--	--	--

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>AEN:BT107 Genetic Engineering of Plant Life Students will be able to discuss genetic engineering from the historic perspective of plant improvement. They will be able to list and describe plant genetic engineering techniques, define terms used and describe the methods used to develop transgenic plants.</p> <ul style="list-style-type: none"> - PCSD:ALSNS-01 Selection Indexes/Predicted Difference - analyze data to study genetic crosses and breeding program - recognize contrasting phenotypes - study dominance, segregation and independent assortment of alleles - compare predicted results with results obtained from actual data <ul style="list-style-type: none"> • PCSD:ALSNS-02 Genomics/DNA Fingerprinting • Understand how DNA fingerprinting and genomics can be used in parent identification and animal genetic evaluation • Describe the process of DNA fingerprinting • Learn which part of the DNA genome is used for DNA fingerprinting • Understand the factors that can increase the accuracy of DNA fingerprinting • Interpret DNA fingerprints • Explore various uses for DNA fingerprinting and genome maps • Recognize the limitations of and problems with DNA testing
--	--	---

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>AEN:BT109 Producing Clones of Animals Students will be able to explain why producing an animal clone is difficult. They will know when the first clone was produced, will understand the biology involved and will be able to list the steps required to produce a clone.</p> <p>AEN:BT108 Transgenic Animals Students will be able to define and explain the difference between clones and transgenic animals. In addition, they will be able to describe the biology of normal animal reproduction and will be able to list the steps involved in producing a transgenic offspring.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p> <p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of</p>
--	--	--

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
Biological Evolution		
F.12.5 Understand the theory of evolution, natural selection, and biological classification	<p>D.12.5 Describe how biotechnology can enhance food and fiber production.</p> <p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources.</p> <p>E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact</p> <p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Lesson C1-1 Animal Genetics and Probability Explain the importance of understanding genetics. Explain how genotype and phenotype are different. Explain how to estimate the heritability of certain traits. Describe sex determination, linkage, crossover and mutation.</p> <p>AEN:BT127 Improving Crop Production and Quality Students will be able to list a wide range of crop improvements made possible through the application of biotechnology and will be challenged to relate those developments to local crops and conditions.</p> <p>AEN:BT129 Developing Crops That Fight Insects</p>

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>Students will be able to explain how an insect-resistant crop variety can be produced, and will be able to list and discuss the benefits and the problems that have emerged following the rapid increase in acreage of Bt cotton and Bt corn hybrids.</p> <p>AEN:BT107 Genetic Engineering of Plant Life Students will be able to discuss genetic engineering from the historic perspective of plant improvement. They will be able to list and describe plant genetic engineering techniques, define terms used and describe the methods used to develop transgenic plants.</p> <ul style="list-style-type: none"> - PCSD:ALSNS-01 Selection Indexes/Predicted Difference - analyze data to study genetic crosses and breeding program - recognize contrasting phenotypes - study dominance, segregation and independent assortment of alleles - compare predicted results with results obtained from actual data
<p>F.12.6 Using concepts of evolution and heredity, account for changes in species and the diversity of species, including the influence of these changes on science, e.g., breeding of plants or animals</p>	<p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries</p>	<p>Lesson B6-3 Tissue Culture Explain asexual propagation. Describe tissue culture and its importance. Explain the advantages of tissue culture over other propagation methods. Identify the tissue culture method of propagation used in the greenhouse industry. Lesson C1-1 Animal Genetics and Probability Explain the importance of understanding genetics. Explain how genotype and phenotype are different. Explain how to estimate the heritability of certain traits.</p>

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	<p>D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities.</p> <p>D.12.5 Describe how biotechnology can enhance food and fiber production</p> <p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources</p> <p>E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact</p> <p>E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Describe sex determination, linkage, crossover and mutation.</p> <p>Lesson C1-2 DNA Extraction Explain the genetic information found in cells. Explain the DNA molecule. Explain how DNA is copied. Understand how genes code for a single protein.</p> <p>Lesson C1-3 Biotechnology Identify the major areas of biotechnology in animal science. Explain various molecular biotechnology methods. Discuss applications of molecular biotechnology. Discuss applications of organismic biotechnology.</p> <p>Lesson E3-2 Propagating Plants Asexually Define asexual propagation and identify the advantages and disadvantages of asexual reproduction. List and describe the types of asexual reproduction (cuttings, grafting, budding, layering, division, tubers, rhizomes, stolons, bulbs, corms, tillers, and tissue culture).</p> <p>Lesson E3-3 Investigating Plant Breeding Techniques (Using Crossbreeding and Hybrids) Define plant breeding and examine the history of plant domestication and improvement. Define the process of selection and discuss traits that have been selected for over the past few decades (yield and quality of the crop, drought tolerance, resistance to disease, pests, and herbicides). Define hybrid and describe the three basic types of hybrids (single cross, three-way cross, and double cross). Compare and contrast the four classes (breeder seed,</p>
--	--	---

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summery of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>foundation seed, registered seed and certified seed) of commercial seed.</p> <p>Discuss the advantages of genetic engineering as compared to conventional plant breeding techniques.</p> <p>AEN:BT127 Improving Crop Production and Quality Students will be able to list a wide range of crop improvements made possible through the application of biotechnology and will be challenged to relate those developments to local crops and conditions.</p> <p>AEN:BT129 Developing Crops That Fight Insects Students will be able to explain how an insect-resistant crop variety can be produced, and will be able to list and discuss the benefits and the problems that have emerged following the rapid increase in acreage of Bt cotton and Bt corn hybrids.</p> <p>AEN:BT107 Genetic Engineering of Plant Life Students will be able to discuss genetic engineering from the historic perspective of plant improvement. They will be able to list and describe plant genetic engineering techniques, define terms used and describe the methods used to develop transgenic plants.</p> <ul style="list-style-type: none"> - PCSD:ALSNS-01 Selection Indexes/Predicted Difference - analyze data to study genetic crosses and breeding program - recognize contrasting phenotypes - study dominance, segregation and independent assortment of alleles - compare predicted results with results obtained from actual data
--	--	---

Crosswalk Between: *Wisconsin's Model Academic Standards for Science and Wisconsin's Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin's Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<ul style="list-style-type: none"> • PCSD:ALSNS-02 Genomics/DNA Fingerprinting • Understand how DNA fingerprinting and genomics can be used in parent identification and animal genetic evaluation • Describe the process of DNA fingerprinting • Learn which part of the DNA genome is used for DNA fingerprinting • Understand the factors that can increase the accuracy of DNA fingerprinting • Interpret DNA fingerprints • Explore various uses for DNA fingerprinting and genome maps • Recognize the limitations of and problems with DNA testing <p>AEN:BT109 Producing Clones of Animals</p> <p>Students will be able to explain why producing an animal clone is difficult. They will know when the first clone was produced, will understand the biology involved and will be able to list the steps required to produce a clone.</p> <p>AEN:BT108 Transgenic Animals</p> <p>Students will be able to define and explain the difference between clones and transgenic animals. In addition, they will be able to describe the biology of normal animal reproduction and will be able to list the steps involved in producing a transgenic offspring.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements</p>
--	--	--

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summery of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p> <p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list</p>
--	--	---

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		human and animal health risks that can be reduced by vaccination
The Interdependence of Organisms		
F.12.7 Investigate how organisms both cooperate and compete in ecosystems	E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.2 Analyze benefits, costs, and consequences of land use E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources. E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.2 Analyze benefits, costs, and consequences of land use E.12.3 Explain the impact of climate change on existing agricultural systems E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

<p>food (plants and animals) and how energy is released by digestion and metabolism</p>	<p>E.12.3 Explain the impact of climate change on existing agricultural systems</p>	
<p>F.12.10 Understand the impact of energy on organisms in living systems</p>	<p>D.12.5 Describe how biotechnology can enhance food and fiber production.</p>	<p>Lesson E4-11 Examining the Roles of Plant Growth Regulators Define plant growth regulator, identify the classes of regulators (auxins, gibberellins, cytokinins, and inhibitors) and describe their functions. List examples of synthetic growth regulators and discuss how and why they are used. Describe commercial uses of plant growth regulators. Define tropism and examine the types of tropisms (phototropism, geotropism, thigmotropism, hydrotropism, chemotropism, thermotropism)</p>
<p>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</p>	<p>A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production. D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.3 Explain the impact of climate change on existing agricultural systems</p>	<p>Lesson C2-9 Growth Hormones in Animals Understand the effects that bovine somatotropin has on the cow. Understand the arguments for and against the use of growth hormones in cows. Appreciate the amount of testing and research a drug a drug needs to go through to be legally marketable. AEN:BT123 Using Pig Parts for Human Replacements Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p>

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
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	D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.5 Describe how biotechnology can enhance food and fiber production E.12.3 Explain the impact of climate change on existing agricultural systems	
G. SCIENCE APPLICATIONS	Agricultural Education Standards	Crosswalk of Local School Curriculum
Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will:</i>	

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

<p>G.12.1 Identify personal interests in science and technology; account for implications that these interests might have for future education, and options to be considered</p>	<p>D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities B.12.5 Explore various career opportunities in the food, fiber, and natural resources industries using available forms of technology B.12.6 Access information identifying the postsecondary education programs, both in and outside of Wisconsin, leading to careers in the food, fiber, and natural F.12.4 Research a career in agricultural business marketing and management</p>	
<p>G.12.2 Design, build, evaluate, and revise models and explanations related to the earth and space, life and environmental, and physical sciences</p>	<p>D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world E.12.3 Explain the impact of climate change on existing agricultural systems E.12.4 Analyze practices used by farmers to reduce soil erosion and runoff to maintain soil fertility and productivity</p>	
<p>G.12.3 Analyze the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community</p>	<p>A.12.1 Identify how political policies and issues shape and influence food and fiber systems A.12.2 Understand the variety, complexity, and size of the agricultural industry in the world A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber B.12.1 Apply knowledge of technology to identify and solve problems B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.1 Describe the global utilization of Wisconsin’s food, fiber, and ornamental plant products D.12.2 Discuss the impact that climate and water have on the food, fiber, and ornamental horticulture production cycles throughout the world D.12.3 Understand how public policy affects the food,</p>	<p>Lesson B2-5 Improving Agricultural Plants and Animals (Based on Lessons CC C3-4 Using Crossbreeding and Hybrids and CC A7-1 Determining the Nature of Biotechnology) Discuss the importance of improved organisms to agriculture. Identify methods used in agriscience to improve organisms. Define biotechnology and examine its use in the past and its capabilities for the present and future. Compare and contrast organismic and molecular biotechnology.</p> <p>Lesson B2-6 Analyzing Organismic and Molecular Biotechnology - NEW LESSON Identify and describe organismic biotechnology methods used to improve plants and animals.</p>

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education*
Biotechnology

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	<p>fiber, and ornamental plant industries D.12.4 Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities. D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.2 Analyze benefits, costs, and consequences of land use E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment</p>	<p>Examine genetic engineering and outline the steps of recombinant DNA technology. Identify and describe transgenic methods such as microinjection and particle injection. Identify examples of plants, animals, or products that have been developed through molecular biotechnology.</p> <p>Lesson B2-7 Determining the Advantages and Disadvantages of Agricultural Biotechnology. (Based on Lesson CC A7-4) Analyze the advantages and progress created by agricultural biotechnology. Analyze the issues, concerns, and potential negative impacts created by agricultural biotechnology. Analyze the benefits of genetically engineered foods. Analyze the concerns of genetically engineered foods. Examine the role of the USDA, EPA, and FDA in regulating biotech products.</p> <p>AEN:BT123 Using Pig Parts for Human Replacements</p> <p>Students will be able to explain what benefit could be gained if organs from pigs could be used for human transplants. In addition, they will gain a general understanding of how this can be accomplished and will be able to discuss why doing it successfully may be difficult</p> <p>AEN:BT103 Mapping and Sequencing Genetic Information Students will be able to define and explain the purpose for gene mapping and sequencing. They will be able to list types of maps being used in the Human Genome Project and will be able to discuss the differences among them.</p>
--	--	---

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

		<p>AEN:BT104 Developing Technologies from Embryo Research Students will be able to list and discuss a wide range of developments that have emerged as the result of embryo research. In addition, students will be introduced to highlights of the science behind a range of technologies from embryo transplanting to cloning, embryo screening and stem cell therapies.</p> <p>AEN:BT105 Understanding Stem Cell Discoveries Students will be able to define pluripotent stem cells and discuss the scientific significance of the discoveries that make it possible to isolate and culture human pluripotent stem cells for use in research and eventually for use in various health care technologies</p> <p>AEN:BT125 Genetically Engineering Vaccines Students will be able to explain the differences between traditional and genetically engineered vaccines. In addition, they will be able to list human and animal health risks that can be reduced by vaccination</p>
G.12.4 Show how a major scientific or technological change has had an impact on work, leisure, or the home	<p>B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology</p> <p>D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources</p>	
G.12.5 Choose a specific problem in our society, identify alternative scientific or technological solutions to that problem and argue its merits	B.12.1 Apply knowledge of technology to identify and solve problems	
H. SCIENCE IN SOCIAL AND PERSONAL PERSPECTIVES	Agricultural Education Standards	Crosswalk of Local School Curriculum

Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and Wisconsin’s Model Academic Standards for Agricultural Education Biotechnology*

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

Performance Standards	Performance Standards	
<i>By the end of Grade 12 students will:</i>	<i>By the end of Grade 12 students will::</i>	
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	A.12.1 Identify how political policies and issues shape and influence food and fiber systems A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries cite examples of conflicts between environmentalists and producers of food and fiber E.12.1 Understand the application of agricultural technologies that can sustain production while reducing environmental impact E.12.2 Analyze benefits, costs, and consequences of land use E.12.3 Explain the impact of climate change on existing agricultural systems E.12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity E.12.5 Analyze the impact and use of chemicals in the production and processing of food and fiber E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment	
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	A.12.1 Identify how political policies and issues shape and influence food and fiber Systems B.12.1 Apply knowledge of technology to identify and solve problems C.12.2 Practice skills relating to communication, problem-solving, and decision-making through individual, group, and team processes D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries E.12.2 Analyze benefits, costs, and consequences of land use	

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	F.12.1 Describe how the production, distribution, and marketing of food and fiber is part of a complex economic system	
H.12.3 Show how policy decisions in science depend on many factors, including social values, ethics, beliefs, and time-frames, and considerations of science and technology	A.12.1 Identify how political policies and issues shape and influence food and fiber systems B.12.1 Apply knowledge of technology to identify and solve problems D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries E.12.2 Analyze benefits, costs, and consequences of land use E.12.6 Analyze benefits, costs, and consequences of processing food and fiber on the environment F.12.1 Describe how the production, distribution, and marketing of food and fiber is part of a complex economic system	
H.12.4 Advocate a solution or combination of solutions to a problem in science or technology	B.12.1 Apply knowledge of technology to identify and solve problems D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries D.12.5 Describe how biotechnology can enhance food and fiber production D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources	
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	A.12.2 Understand the variety, complexity, and size of the agriculture industry in the world A.12.1 Identify how political policies and issues shape and influence food and fiber systems A.12.3 Describe how global interdependence benefits the production and distribution of food and fiber B.12.1 Apply knowledge of technology to identify and solve problems D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries	Lesson B2-4 Fuels from Crops Explain the advantages of using fuels made from crops. Describe the chemical nature of ethanol. Explain what renewable resources are used to create biofuels and why they are good sources of energy. Explain the processes involved in fermentation and how organisms obtain energy. Explain how ethanol is produced.

**Crosswalk Between: *Wisconsin’s Model Academic Standards for Science and
Wisconsin’s Model Academic Standards for Agricultural Education
Biotechnology***

Instructions: Please fill out the third column illustrating how the proposed agriculture class meets the state standards in the first two columns. Information in the third column should include knowledge, concepts and skills, and a summary of the equivalent instructional time for the equivalent course. The first column lists Wisconsin’s Model Academic Standards for Science. Column two illustrates the various agriculture performance standards that have been crosswalked to the science performance standards in the first column.

	D.12.6 Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources E.12.2 Analyze benefits, costs, and consequences of land use E 12.4 Analyze practices used by farmers to reduce erosion and runoff to maintain soil fertility and productivity	
H.12.6 Evaluate data and sources of information when using scientific information to make decisions.	B.12.3 Use technology to acquire, organize, and communicate information by entering, modifying, retrieving, and storing data B.12.4 Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries	
H.12.7 When making decisions, construct a plan that includes the use of current scientific knowledge and scientific reasoning.	B.12.3 Use technology to acquire, organize, and communicate information by entering, modifying, retrieving, and storing data D.12.3 Understand how public policy affects the food, fiber, and ornamental plant industries	

j:\data\bevshell\ag science activities\agscience crosswalk.doc