

Notes:

MODULE LEARNING GOALS

The following is a summary of the learning goals for *Closing the Environmental Loop*. The academic standards and core skills referenced are directly taught and assessed in this module. The table provides a number and/or letter designation for each skill and standard that corresponds to the full text of the standards and skills, available on the **Ford PAS Web site**.



Activity	Learning Goals	National Academic Standards	Core Skills	How Assessed
1	1.1 Describe the stages in a product's life and identify potential environmental problems at each stage.	NRC: F5 ITEA: 5	B5: Understand Complex Systems	Product Assessment and Test
	1.2 Analyze the relationship between production processes and human health and environmental problems.	NRC: F5 NCSS: 8b McREL: 16 and 19 ITEA: 5	B5: Understand Complex Systems	Product Assessment
2	2.1 Identify the characteristics that make products environmentally sustainable, and analyze a product to determine whether it is sustainable.	NRC: F3 and F4 NCSS: 9d McREL: 19 ITEA: 5 and 13	B5: Understand Complex Systems	Product Assessment, Quiz 1, and Test
	2.2 Explain and illustrate the role of design in the closing of product life cycles.	NRC: F3 and F4 ITEA: 5 and 9	B5: Understand Complex Systems	Product Assessment and Test
	2.3 Explain and illustrate how internal and external forces, or drivers, can motivate companies to change to sustainable manufacturing systems.	NCSS: 5g NBEA: ECON 7 and IB 4 McREL: 19	B5: Understand Complex Systems	Quiz 1 and Test
3	3.1 Identify ways in which the day-to-day operations of schools, manufacturing facilities, and other types of buildings affect the environment.	NCSS: 8b	A3: Interpret and Convey Ideas Visually	Quiz 2
	3.2 Analyze data to interpret trends.	NCTM: 1.3 and 6.2 NBEA: COMP 1 ISTE: 1d and 4c	B1: Use Math to Solve Problems and Communicate D4: Use Information and Communications Technology	Product Assessment

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Activity	Learning Goals	National Academic Standards	Core Skills	How Assessed
3 (cont.)	3.3 Make a reasoned argument, supported by data, in favor of a strategy for reducing a facility's energy consumption.	McREL: 5 ISTE: 4c ITEA: 5	B2: Solve Problems and Make Decisions	Quiz 2
4	4.1 Identify the potential environmental impact of companies in a product supply chain.	NRC: F4 and F5 McREL: 19 ITEA: 5	B5: Understand Complex Systems	Product Assessment and Test
	4.2 Analyze negotiations and identify strategies for achieving "win-win" solutions.	NBEA: COMM 3	C3: Resolve Conflict and Negotiate	Self-Assessment
	4.3 Describe ways in which businesses can cooperate to reduce their environmental impact.	McREL: 19	B2: Solve Problems and Make Decisions B5: Understand Complex Systems	Quiz 2 and Test
5	5.1 Analyze an existing product supply chain and suggest changes to make it more environmentally sustainable.	NRC: F3, F4, and F5 McREL: 16 ITEA: 5	B2: Solve Problems and Make Decisions B5: Understand Complex Systems	Product Assessment and Test
	5.2 Compare the environmental and business impacts of different materials and production processes.	NRC: F3, F4, and F5 NCSS: 8b and 9c ITEA: 5	B5: Understand Complex Systems	Product Assessment
6	6.1 Develop a proposal for improving the design and manufacturing of a specific product in order to reduce its environmental impact.	NRC: E1, F3, F4, and F5 McREL: 14 ITEA: 5 and 11	B2: Solve Problems and Make Decisions B4: Think Creatively	Product Assessment and Test
	6.2 Synthesize research material and prepare an effective presentation.	NCTE/IRA: 4 and 12 NCEE/Pitt: 3c	A3: Interpret and Convey Ideas Visually D3: Learn Through Research	Product Assessment

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CORRELATION WITH ACADEMIC STANDARDS AND CORE SKILLS

The following standards and core skills include those that are directly taught and assessed in *Closing the Environmental Loop* (and appear in the Learning Goals) as well as those that students apply in the course of their work in the module—work that helps students achieve the standards and master the skills. This list provides a brief description of each standard and skill, along with the number and/or letter designation that corresponds to the full text of the standards and skills, available on the **Ford PAS Web site**. Note: As national standards are revised periodically, check the **Ford PAS Web site** to obtain the most up-to-date list for *Closing the Environmental Loop*.



English Language Arts: Standards for the English Language Arts

National Council of Teachers of English (NCTE) and the International Reading Association (IRA)

1. Read a wide range of texts, including fiction, nonfiction, and classic and contemporary works, for a variety of purposes.
3. Comprehend, interpret, evaluate, and appreciate texts, drawing on many strategies.
4. Adjust spoken, written, and visual language to communicate effectively with a variety of audiences and for different purposes.
5. Write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
6. Create, critique, and discuss texts.
7. Gather, evaluate, and synthesize data from a variety of sources to communicate a particular purpose or to a particular audience.
8. Gather and synthesize information and create and communicate knowledge, using a variety of technological and information resources.
12. Use spoken, written, and visual language to accomplish own purposes.

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English Language Arts: New Standards Performance Standards, English Language Arts

National Council on Education and the Economy (NCEE) and the University of Pittsburgh (Pitt)

1. Reading

1c: Read and comprehend informational materials and produce written or oral work that summarizes information.

2. Writing

2a: Write a report appropriate for a purpose, audience, and context, with an organizing structure, appropriate facts and details, and a sense of closure.

2e: Write a persuasive essay that includes appropriate information and arguments and uses a range of strategies to elaborate and persuade.

3. Speaking, Listening, and Viewing

3b: Participate actively in group meetings, displaying appropriate turn-taking behaviors, offering and soliciting comments or opinions, responding appropriately, giving reasons, and expanding on responses when asked.

3c: Prepare and deliver a presentation that shapes information to achieve a particular purpose and to appeal to the interests and knowledge of audience members.

Mathematics: Principles and Standards for School Mathematics

National Council of Teachers of Mathematics (NCTM)

1. Number and Operations

1.3: Compute fluently and make reasonable estimates.

5. Data Analysis and Probability

5.3: Develop and evaluate inferences and predictions that are based on data.

6. Problem-Solving

6.2: Solve problems that arise in mathematics and in other contexts.

9. Connections

9.1: Recognize and apply mathematics in contexts outside of mathematics.

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Science: National Science Education Standards

National Research Council (NRC)

E. Science and Technology

E1: Develop abilities for technological design.

F. Science in Personal and Social Perspectives

F3: Understand natural resources.

F4: Understand environmental quality.

F5: Understand natural and human-induced hazards.

F6: Understand science and technology in local, national, and global challenges.

Social Studies: Curriculum Standards for Social Studies

National Council for the Social Studies (NCSS)

4. Individual Development and Identity

4h: Work independently and cooperatively to accomplish goals.

5. Individuals, Groups, and Institutions

5g: Analyze how groups and institutions meet individual needs and promote the common good.

8. Science, Technology, and Society

8b: Make judgments about the transformation of the physical world and human society by science and technology.

8f: Formulate strategies and policies for influencing the public on technology-society issues.

9. Global Connections

9c: Analyze effects of changing technologies on the global community.

9d: Analyze persistent, contemporary, and emerging global issues.

Business Education: National Standards for Business Education

National Business Education Association (NBEA)

Business Law

BL 8: Explain the legal rules that apply to environmental law and energy regulation.

Communication

COMM 3: Incorporate appropriate leadership and supervision techniques, customer service strategies, and personal ethics standards to communicate effectively with various business constituencies.

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Business Education: National Standards for Business Education (continued)

Computation

COMP 1: Apply basic mathematical operations to solve problems.

Economics

ECON 7: Analyze the role of government in economic systems, especially the role of government in the U.S. economy.

Information Technology

IS 5: Identify, evaluate, select, install, use, upgrade, and customize productivity software; diagnose and solve software problems.

IS 18: Explore positions and career paths in information technology.

International Business

IB 4: Describe the factors that define what is considered ethical and socially responsible business behavior in a global business environment.

Engineering: Standards for Engineering Education

Mid-continent Research for Education and Learning (McREL)

5. Understand energy and power types, sources, and conversions.

14. Use the design process to solve problems.

16. Understand various manufacturing processes.

19. Understand the interrelationship of manufacturing and society.

Educational Technology: National Educational Technology Standards

International Society for Technology in Education (ISTE)

1. Creativity and Innovation

1a. Apply existing knowledge to generate new ideas, products, or processes.

1d. Identify trends and forecast possibilities.

2. Communication and Collaboration

2b: Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

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Educational Technology: National Educational Technology Standards (continued)

3. Research and Information Fluency

3b: Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

3c: Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.

4. Critical Thinking, Problem-Solving, and Decision-Making

4c: Collect and analyze data to identify solutions and/or make informed decisions.

6. Technology Operations and Concepts

6b: Select and use applications effectively and productively.

Technological Literacy: Standards for Technological Literacy

International Technology Education Association (ITEA)

5. Understand the effects of technology on the environment.

9. Understand engineering design.

11. Apply the design process.

13. Assess the impact of products and systems.

17. Understand and be able to select and use information and communication technologies.

Core Skills

Based on Equipped for the Future (EFF), National Institute for Literacy (NIFL), and SCANS 2000, The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor

A-Communication Skills

A1-Read with Understanding: Determine reading purpose, select and adjust strategies, analyze and reflect on content, and integrate information with prior knowledge.

A2-Convey Ideas in Writing: Determine writing purpose, organize and present information with appropriate usage and spelling, seek feedback, and revise to enhance effectiveness.

A3-Interpret and Convey Ideas Visually: Interpret and construct visual representations, including symbols, pictures, graphs, blueprints, schematics, flow charts, and concept maps.

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Core Skills (continued)

A4–Speak So Others Can Understand: Determine communication purpose; organize and relay information, paying attention to proper usage, pace, and gesture; and monitor comprehension.

A5–Listen Actively: Attend to oral communication, clarify purpose, use listening strategies, monitor comprehension, and integrate information with prior knowledge.

B–Thinking and Decision-Making Skills

B1–Use Math to Solve Problems and Communicate: Understand and communicate using mathematical representations; solve problems, using mathematical concepts and quantitative, algebraic, or geometric procedures; and verify reasonableness of results.

B2–Solve Problems and Make Decisions: Identify problems, understand root causes, generate and evaluate consequences of alternative solutions, and establish criteria for evaluating effectiveness.

B4–Think Creatively: Use imagination, combine ideas or information in new ways, reshape goals to reveal new possibilities, and make connections between seemingly unrelated ideas.

B5–Understand Complex Systems: Understand how social, organizational, and technological systems work; monitor and correct performance; suggest modifications; and develop alternative systems.

C–Interpersonal Skills

C1–Cooperate with Others: Interact with respect for others' ideas and contributions, seek and offer clear input, and adjust actions in order to jointly accomplish a task.

C2–Advocate and Influence: Define objectives, gather facts to build a case, assess and take into account others' interests and resources, present a clear case, and revise it in response to feedback.

C3–Resolve Conflict and Negotiate: Acknowledge conflict, identify areas of agreement and disagreement, generate “win-win” options, and evaluate and revise approaches.

D–Lifelong Learning Skills

D1–Take Responsibility for Learning: Establish one's own learning goals based on current and future needs, strengths, and learning style; become familiar with a range of learning strategies and opportunities; monitor progress; and apply learning in new situations.

D3–Learn Through Research: Pose questions to be answered, use multiple approaches to find information, and organize, evaluate, analyze, interpret, and report on findings.

D4–Use Information and Communications Technology: Use computers, the Internet, and other technology tools to acquire, process, and manage information, and learn and practice skills.