

Invention and Innovation, Third Edition

Recommended Hours of Instruction: 67 Required Hours and 23 Enrichment Hours

Assessment Blueprint

Interpretation of Columns on EbD™ STEM Course Blueprints

No.	Heading	Column information
1	STL Standard/Benchmark	The standard and benchmark addressed from <i>Standards for Technological Literacy</i> (e.g., 1A). The primary source is the appropriate column in the <i>Standards Responsibility Matrix</i> .
2	STL Depth of Coverage	This is a number from 1-4, with 4 representing the greatest depth of coverage, a benchmark that is addressed to sufficient depth that it must be assessed.
3	NCTM Standard/Enabling Statement	The Middle School NCTM Standard/Enabling Statement designation is derived from <i>Principles and Standards for School Mathematics</i> (NCTM, 2000). It will be a combination of numbers and letters (e.g., 1A) from the <i>Mathematics Standards Matrix</i> .
4	NCTM Depth of Coverage	This will be a number from 1-4, with 4 representing the greatest depth of coverage, a benchmark that is addressed to sufficient depth that it must be assessed.
5	AAAS Standard	The Middle School AAAS Standards designation is derived from <i>Benchmarks for Science Literacy</i> (AAAS, 1993/2009). It is a combination of numbers and letters (e.g., 1A) from the <i>Science Standards Matrix</i> .
6	AAAS Depth of Coverage	This will be a number from 1-4, with 4 representing the greatest depth of coverage, a benchmark that is addressed to sufficient depth that it must be assessed.
7	Unit Titles and Objective Statements	Statements of unit titles and specific objective. Each objective begins with an action verb and makes a complete sentence when combined with the stem "Students will learn to. . ." (The stem appears once in Column 7.) Outcome behavior in each objective statement is denoted by the verb plus its object.
8	Course Weight	Shows the relative importance of each objective and unit. Course weight is used to help determine the percentage of total class time that is spent on each objective.
9	RBT Designation (If Included)	Classification of outcome behavior in competency and objective statements in Dimensions according to the Revised Bloom's Taxonomy. (Cognitive Process Dimension: 1 Remember, 2 Understand, 3 Apply, 4 Analyze, 5 Evaluate, 6 Create) (Knowledge Dimension: A Factual Knowledge, B Conceptual Knowledge, C Procedural Knowledge)

Engineering byDesign™
A National Standards-Based Model for K–12 Technological Literacy

STL		NCTM		AAAS		Unit Titles and Objective Statements (Students will learn to:)	Course Weight (Total = 100%)	RBT Designation
STL Standard/ Benchmark	STL Depth of Coverage	NCTM Standard/ Enabling Statement	NCTM Depth of Coverage	AAAS Chapter/ Section/ Grade	AAAS Depth of Coverage			
1	2	3	4	5	6	7	8	9
N/A	N/A	N/A	N/A	N/A	N/A	Unit 1: Introduction to Invention and Innovation	10%	N/A
1F	4			1C/M6*	4	Describe new products and systems that have been developed to solve problems. Identify new products and systems that cannot be done without the help of technology.	1%	
1G	4			1C/M3	3	Explain that the development of technology is a human activity and is the result individual or collective needs and the ability to be creative.	1%	
1H	4					Explain how technology is closely linked to creativity. Discuss how creativity has resulted in innovations to technology.	.5%	
2S	4					Differentiate between trade-offs in the decision making process. Formulate careful compromises when deciding which trade-offs are acceptable.	1%	
6E	4			3A/M3	4	Identify recent innovations to products or systems that have led to changes in society. Describe inventions or innovations that changed society and created new needs and wants.	1%	
6F	4					Select a technological device and analyze the social and cultural priorities and values reflected by that device.	1%	
6G	4			3B/M1	3	Examine societal expectations that have boosted the acceptance and use of a product or system.	1%	
7C	4	11V 18B	3 4	3B/M4a	4	Examine the slow, methodical processes of tests and refinements as they relate to the	1%	

STL		NCTM		AAAS		Unit Titles and Objective Statements (Students will learn to:)	Course Weight (Total = 100%)	RBT Designation
STL Standard/ Benchmark	STL Depth of Coverage	NCTM Standard/ Enabling Statement	NCTM Depth of Coverage	AAAS Chapter/ Section/ Grade	AAAS Depth of Coverage			
1	2	3	4	5	6	7	8	9
						evolution of inventions and innovations.		
7D	4					Design a technological improvement for a device that has a highly specialized function.	1%	
7F	4					Identify an invention or innovation that was developed without the knowledge of science.	.5%	
N/A	N/A	N/A	N/A	N/A	N/A	Unit 2: The Engineering Design Process	13%	N/A
8E	4					Recognize the design process as a creative planning process. Demonstrate the steps of the technological design process to design a product or system.	1%	
9G	4					Describe the rules to follow when brainstorming with a group of people. Defend brainstorming as a viable technique when problem solving.	1%	
11H	4			8B/M2	4	Design a product or system outside the classroom-laboratory using the technological design process.	2%	
11I	4	1N 1Q	2 2			Distinguish criteria and constraints for a design.	1.5%	
11J	4					Formulate two-dimensional and three-dimensional representations of a designed solution.	1%	
11K	4	12J 12L	3 3			Evaluate and test a design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.	1.5%	
15H	4					Explain how biotechnology applies the principles of biology to create commercial products or processes. Argue the ethical considerations of using biotechnology to create commercial products and processes.	1%	

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17K	4					Explain that the use of symbols, measurement, and drawings provides a common language to express ideas. Demonstrate the use of symbols, measurement, and drawings to promote clear communication.	1%	
19I	4					Explain how chemical technologies modify or alter chemical substances. Compare the characteristics of two chemical elements with the altered characteristics of their resulting compound.	1%	
19K	4	11V	3			Explain that marketing involves informing the public, selling and distributing a product or system. Develop a marketing campaign to inform the public about a product or system.	2%	

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N/A	N/A	N/A	N/A	N/A	N/A	Unit 3: Invention and Innovation of the Designed World	20%	N/A
1F	4					Describe new products and systems that have been developed to solve problems. Identify new products and systems that cannot be done without the help of technology.	3	
1G	4			1C/M3	4	Explain that the development of technology is a human activity and is the result individual or collective needs and the ability to be creative.	4	
1H	4					Explain how technology is closely linked to creativity. Discuss how creativity has resulted in innovations to technology.	3	
8E	4					Recognize the design process as a creative planning process. Demonstrate the steps of the technological design process to design a product or system.	3	
10G	4					Create, using the design process, an original device or system from their own ideas and imagination. Create, using the design process, an innovation to an existing product or system to improve it.	3	
10H	4	18A	3	3B/M4a	4	Develop a series of experiments to solve a technological problem.	4	
N/A	N/A	N/A	N/A	N/A	N/A	Unit 4: Design and Creativity	22%	N/A
1G	4			8B/M4*	4	Explain that the development of technology is a human activity and is the result individual or collective needs and	2%	

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1	2	3	4	5	6	7	8	9
						the ability to be creative.		
1H	4					Explain how technology is closely linked to creativity. Discuss how creativity has resulted in innovations to technology.	1%	
8E	4					Recognize the design process as a creative planning process. Demonstrate the steps of the technological design process to design a product or system.	1%	
9G	4					Describe the rules to follow when brainstorming with a group of people. Defend brainstorming as a viable technique when problem solving.	1%	
10G	4			8B/M3	4	Create, using the design process, an original device or system from their own ideas and imagination. Create, using the design process, an innovation to an existing product or system to improve it.	2%	
10H	4	18A 18B 18C	3 3 3			Develop a series of experiments to solve a technological problem.	2%	
11H	4					Design a product or system outside the classroom-laboratory using the technological design process.	1%	
11I	4					Distinguish criteria and constraints for a design.	1%	
11J	4	3N 8J	3 4	12C/M2*	3	Formulate two-dimensional and three-dimensional representations of a designed	2%	

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STL Standard/ Benchmark	STL Depth of Coverage	NCTM Standard/ Enabling Statement	NCTM Depth of Coverage	AAAS Chapter/ Section/ Grade	AAAS Depth of Coverage			
1	2	3	4	5	6	7	8	9
		11R	4			solution.		
11K	4	13N 13Q	4 3			Evaluate and test a design in relation to pre-established requirements, such as criteria and constraints, and refine as needed.	2%	
15H	4					Explain how biotechnology applies the principles of biology to create commercial products or processes. Argue the ethical considerations of using biotechnology to create commercial products and processes.	1%	
17K	4	11V	3	1C/M6*	4	Explain that the use of symbols, measurement, and drawings provides a common language to express ideas. Demonstrate the use of symbols, measurement, and drawings to promote clear communication.	2%	

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N/A	N/A	N/A	N/A	N/A	N/A	Unit 5: Technology and Society	22%	N/A
4E	3			3B/M2a 3C/M6*	4 3	Compare technological decisions about products or systems that have had both desirable and undesirable consequences.	2%	
4F	4			3C/M5	3	Identify the ethical issues related to the development and use of technology. Defend the ethical issues related to the development and use of technology.	2%	
4G	4	6C	3	3C/M4 7D/M1 7D/M3	3 3 3	Identify economic, political and cultural issues that are influenced by the development and use of technology. Support an economic, political or cultural issue that is influenced by the development and use of technology.	2%	
5E	3					Describe a technology that is used to repair damage caused by natural disasters. Describe a technology that is used to break down waste from the use of a product or system.	1%	
5F	3	14I	4	3C/M2*	3	Identify examples of decisions to develop and use technology that puts environmental and economic concerns in direct competition with one another. Support an environmental or economic concern resulting from the development and use of technology that places them in direct competition with one another.	2%	
6E	4					Identify recent innovations to products or systems that have led to changes in society. Describe inventions or innovations that	1%	

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1	2	3	4	5	6	7	8	9
						changed society and created new needs and wants.		
6F	4	15E 15F	4 4	3C/M7	3	Select a technological device and analyze the social and cultural priorities and values reflected by that device.	2%	
6G	4	16C 16D 16E	4 4 4	7D/M2	3	Examine societal expectations that have boosted the acceptance and use of a product or system.	2%	
7C	4					Examine the slow, methodical processes of tests and refinements as they relate to the evolution of inventions and innovations.	1%	
7D	4					Design a technological improvement for a device that has a highly specialized function.	1%	
7F	4					Identify an invention or innovation that was developed without the knowledge of science.	1%	
13G	3	1P 1Q	3 3			Examine collected data to analyze and interpret trends in order to identify positive and negative effects of a technology.	2%	
18H	4					Describe government regulations that influence the design and operation of transportation systems.	1%	

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N/A	N/A	N/A	N/A	N/A	N/A	Unit 6: Creating a Space Exploration Infrastructure	13%	N/A
4E	3			3B/M4a 6E/M5	4 4	Compare technological decisions about products or systems that have had both desirable and undesirable consequences. Explain that systems fail because they have faulty or poorly matched parts, are used in ways that exceed what was intended by the design, or were poorly designed to begin with.	1%	
4F	4			3C/M5	2	Defend the ethical issues related to the development and use of technology Identify and describe examples of how technology affects humans.	1%	
4G	4			3B/M2a 7G/M5	3 4	Support an economic, political or cultural issue that is influenced by the development and use of technology. Identify, explain, and evaluate what explorers will do on the Moon and the scientific and economic reasons for establishing a lunar outpost. Explain that all technologies have effects other than those intended by the design, some of which may have been predictable and some not. Describe, analyze, and evaluate the impacts that inventions and innovations have had on humans. Identify and describe the reasons for further exploration of the Moon.	1%	
6F	4					Select a technological device and analyze the social and cultural priorities and values	1%	

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						reflected by that device.		