

Appendix I

SCIENCE, TECHNOLOGY, ENGINEERING, & MATH (STEM) YOUTH APPRENTICESHIP

COURSE OUTCOME SUMMARY: OVERVIEW AND TABLE OF CONTENTS

Science, Technology, Engineering, & Math (STEM) Youth Apprenticeship Course Outcome Summary

Course Information

Organization	Center for Career Development & Employability Training (CCDET)- University of Wisconsin- Oshkosh
Developers	Robin Kroyer-Kubicek
Development Date	July 2011

Description

This curriculum describes the performance-based worksite Competencies, Performance Standards, and Learning Objectives for the Wisconsin Youth Apprenticeship (YA) Program in Science, Technology, Engineering, and Math (STEM). The Wisconsin Science, Technology, Engineering, and Math (STEM) YA Program is designed to provide students with a working understanding of core industry skills and occupationally specific technical skills that serve as the standard for occupations in the Science, Technology, Engineering, and Math (STEM) industry. This program provides the framework for educators and industry to work together to produce work-ready, entry-level employees that will compete favorably in a global market, as well as, provide for post-secondary educational advancement while integrating work-based learning in the school and worksite.

The Science, Technology, Engineering, and Math (STEM) YA program competencies are aligned with the national States' Career Cluster Skill Standards maintained by the States' Career Clusters project (<http://www.careerclusters.org/>), as well as applicable skills in the Project Lead the Way (<http://www.pltw.org/>) Curriculum and STEM Academy (<http://www.stem101.org/index.asp>) Curriculum. Science, Technology, Engineering, and Math (STEM) YA students are required to perform all of the Core and Safety skills for the pathway they enroll in. **Level One (one year)** YA students are to choose additional competencies from the REQUIRED Science, Technology, Engineering, and Math (STEM) Unit in the specific pathway. **Level Two (two year)** YA students are to complete all of the Level One requirements plus an additional unit within their chosen pathway.

Pathway choices:

- Engineering & Technology
- Science & Math

EACH competency (work site skill) is listed with its corresponding Performance Standards and Learning Objectives. The Performance Standards describe the behaviors, **as applicable**, that employers should look for in order to evaluate the competency. The Learning Objectives describe the classroom learning content for the required related technical instruction.

This curriculum was developed through a Grant from the Wisconsin Department of Workforce Development to the University of Wisconsin-Oshkosh's Center for Career Development and Employability Training (CCDET).

Curriculum Sources

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- States' Careers Clusters, Science, Technology, Engineering, & Math (STEM) Career Cluster Knowledge and Skills charts for Cluster Skills, Engineering & Technology Pathway, and Science & Math Pathway. <http://www.careerclusters.org/>, accessed September 2010.
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- Wisconsin Administrative Code, Department of Workforce Development, Chapter 270, Child Labor, (dated August 2005) and Wisconsin State Statutes Chapter 106, Apprentice, Employment and Equal Rights Program.
- Wisconsin Department of Workforce Development, Jim Chiolino, Labor Standards Bureau, Child Labor Laws, 2011.
- Wisconsin Department of Workforce Development, Science, Technology, Engineering, & Math (STEM) YA Advisory Review Committee, formed September 2010 for the purpose of revising and updating the Drafting & Design- Engineering, Drafting & Design- Mechanical Design, and Biotechnology Youth Apprenticeship curriculum.
- Wisconsin Department of Workforce Development, Principles of Engineering DACUM dated October, 1994, and Mechanical Design DACUM dated November, 1994.
- Worknet Occupation Task Lists for Biological Technicians, Chemical Technicians, Food Scientists & Technologists, Materials Scientists, Engineering Technicians, Civil Drafters, and Mechanical Drafters accessed August-November 2010 from <http://worknet.wisconsin.gov/worknet/default.aspx>.

Science, Technology, Engineering, & Math (STEM) Youth Apprenticeship
Table of Contents
REQUIRED SKILLS

APPENDIX J:

Unit 1: Core Skills

1. Apply academic knowledge
2. Apply career knowledge
3. Communicate effectively
4. Act professionally
5. Demonstrate customer service skills
6. Cooperate with others in a team setting
7. Think critically
8. Exhibit legal and ethical responsibilities
9. Use basic technology
10. Use resource wisely

Unit 2: Safety

1. Follow personal safety requirements
2. Maintain a safe work environment
3. Demonstrate professional role to be used in an emergency

APPENDIX K:

Unit 3: Engineering & Technology Pathway: Engineering Drafting

1. Apply engineering principles
2. Interpret technical drawings
3. Use measuring devices accurately
4. Organize databases, files, & drawings
5. Reproduce documents & plans
6. Use engineering drafting software
7. Develop one-view drawings
8. Develop 2D (orthographic) view drawings
9. Develop 3D view models
10. Prepare auxiliary views
11. Prepare section views
12. Dimension drawings
13. Apply lettering & basic annotation to drawings
14. Check, revise, & record drawings
15. Participate on an engineering project

APPENDIX L:

Unit 4: Engineering & Technology Pathway: Mechanical/Electrical Engineering

1. Apply manufacturing & mechanical/electrical systems principles
2. Interpret mechanical/electrical technical drawings
3. Develop the engineering problem & plan with team
4. Research physical limitations
5. Research required materials properties
6. Research manufacturing/assembly process & limitations
7. Design prototype with team
8. Prepare prototype technical drawings
9. Assist to build prototype
10. Assist to test & revise prototype
11. Assist to calculate & analyze prototype test results
12. Finalize part/process technical drawings
13. Apply quality concepts to project

APPENDIX M:

Unit 5: Engineering & Technology Pathway: Civil Engineering

1. Apply structural & building principles
2. Interpret civil engineering technical drawings
3. Research codes & site requirements
4. Conduct site analyses with team
5. Assist to compile & analyze site measurements & other data
6. Research structural requirements
7. Assist to create materials specifications
8. Design site structure(s)
9. Draw a working site plan
10. Construct a Bill of Materials
11. Assist to create a project plan
12. Assist to coordinate project activities
13. Apply quality concepts to project

APPENDIX N:

Unit 6: Science & Math Pathway: Bioscience Lab Foundations

1. Apply Bioscience Lab knowledge
2. Use aseptic technique
3. Clean & prepare glassware & instruments
4. Prepare reagents, solutions, and/or buffers
5. Perform calculations and conversions
6. Weigh and measure accurately
7. Operate lab equipment properly
8. Conduct testing according to protocol
9. Record results of testing accurately
10. Maintain accurate records
11. Monitor & maintain lab &/or personal inventory

APPENDIX O:

Unit 7: Science & Math Pathway: Bioscience Applications

Required Competencies

1. Assist to organize & analyze data
2. Prepare a Bioscience presentation (W/S)

Choose a MINIMUM of 6 additional competencies

1. Grow &/or care for plants &/or lab animals
2. Collect plant or animal tissues from source
3. Isolate &/or purify cells, microbes, nucleic acids, &/or proteins
4. Quantify &/or identify cells, microbes, nucleic acids, &/or proteins
5. Culture cells &/or microbes
6. Harvest cells &/or microbes
7. Perform spectroscopy (light, uv, IR, mass, fluorescence)
8. Perform chromatography (gas, TLC, HPLC)
9. Perform flow cytometry
10. Perform microscopy
11. Perform restriction digests
12. Hybridize nucleic acids
13. Perform gel electrophoresis
14. Perform amplification (PCR, RT-PCR)
15. Perform blot assays (Southern, Western, Northern)
16. Perform nucleic acid sequencing
17. Perform cellular assays
18. Perform immunoassays (ELISA)
19. Perform protein assays (Bradford, Lowry)
20. Perform transfection/transformation
21. Perform basic cloning
22. Run expression cloning tests