STEM Readiness – SUMMARY OF ALL MODULES

Learning Outcomes with Scenario Descriptions

February 2014

MATH (15 Hours)

CRITICAL THINKING AND WORKPLACE COMMUNICATION (15 Hrs)

PROFESSIONAL SKILLS (15 Hours)

Module 1: Introduction to the Course

Introduction of problem – solving methodology
SCENARIO Modules 3 and 4: Beginning and Intermediate Arithmetic

“Rusty” Gallagher has just graduated from S. Seattle Community College as a Composite Technician and has a new job at a local defense contractor. His new income will allow the couple to make some different choices in regards to their budget. They will apply basic math in the decision-making process.

Module 3: Beginning Arithmetic

- Define and recognize digits, place value, whole numbers, decimal points and decimals.
- Apply arithmetic operators to problems involving whole numbers and decimals.
- Identify which arithmetic operator to use in a given situation.
- Apply arithmetic operations to problems involving negative numbers.
- Apply critical thinking skills to larger, real-life situations and evaluate the outcomes.

Module 4: Intermediate Arithmetic

- Identify fractions as they relate to a given scenario.

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• Reduce a fraction to its simplest form.
• Add and subtract like fractions.
• Add and subtract unlike fractions.
• Multiply and divide fractions.
• Convert among fractions, decimals and percents.
• Round numbers to a specific place value.
• Convert given scenarios into algebraic expressions and equations.
• Explain what variables represent in an equation.
• Apply critical thinking skills to larger, real-life situations and evaluate the outcomes.

SCENARIO Module 5: Measuring Systems

Bob is a Composite Technician working on prototyping new car parts for an automotive company. He will use various measuring systems in the design of the new parts.

• Recognize various types of measurements (distance, time, temperature and weight).
• Identify common units used for measurements.
• Identify common measuring tools for each measurement.
• Calculate the area and perimeter of rectangles and squares.
• Calculate the perimeter of polygons.
• Calculate the circumference of circles.
• Calculate the volume of rectangular prisms.
• Convert between English and standard units.
• Convert between metric units.
• Convert between English standard units and metric units.
• Identify significant digits in a value.
• Apply critical thinking skills to larger, real-life situations and evaluate the outcomes.

SCENARIO Module 6: Algebraic Laws

Bob has been promoted and is working on new challenges in composite technology relating to area, perimeter and volume.

• Calculate the volume of a sphere.
• Expand and multiply exponents.
• Simplify expressions using the order of operations.
• Calculate the volume of a cylinder.
• Simplify algebraic expressions by adding/subtracting common terms.
• Apply the distributive property to simplify or expand expressions.
• Substitute known values into an equation and solve.
• Express values using scientific notation.

SCENARIO Module 7: Quantifying Data

Karen is an Environmental Technician helping her friend Tony, a local newspaper reporter, to evaluate charts, graphs, and other data released by the local Pulp and Paper Mill. The mill released the data in response to Tony’s concern that the mill is polluting the Hermoso River and causing fish and water birds to die.

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• Recognize different types of graphs and diagrams.
• Identify types of charts, graphs and diagrams that are appropriate to use based on a given situation.
• Apply the steps for creating a line graph
• Read and Interpret charts, graphs, and diagrams.
• Define mean, median and mode
• Determine the mean of a data set.
• Determine the median and mode of a data set, given a data table.
• Apply critical thinking skills to larger, real-life situations and evaluate the outcomes.

SCENARIO Module 8: Beginning Algebra

Jay is an intern working for ElecAuto, Inc. The company designs and produces electric vehicles. Jay will be testing a wide variety of electric car parts. Many of the tests require him to use algebra as he conducts the measurements to find out if the car parts work correctly.

• Rearrange an equation containing multiplication and division to isolate a variable in one step.
• Substitute known values into an equation and solve.
• Solve equations using the cross-product.

SCENARIO Module 9: Triangles

Kim is working for the JKM Airplane Company and has been selected for an exciting new project, working on JKM's composite airplane, the Jet-C (C stands for Composites). The Jet-C’s wing section was not built at JKM, it was outsourced. Upon arrival from the subcontractor, the wing section unfortunately didn’t pass the scrupulous tests that the JKM company airplane parts must endure. Specifically, the wings weren’t rigid enough and the wings could bend up too high. The engineers at JKM came up with three different potential designs for a rigid composite brace that could be attached to the inside of the wing. This brace would make the wing rigid enough to make the plane safe to fly.

• Identify and name an angle.
• Measure an angle using a protractor.
• Classify triangles by their angles as right, obtuse or equilateral.
• Classify triangles by their sides as equilateral, isosceles or scalene.
• Use the triangle angle sum theorem to determine the measure of an angle in a triangle.
• Determine the measure of an angle by applying the concept of complementary or supplementary angles.
• Identify corresponding sides and angles in similar triangles.
• Determine corresponding angles and sides of similar triangles, using proportions.
• Apply the Pythagorean Theorem to calculate the length of a side of a right triangle.
• Calculate all angles and sides of a right triangle using trigonometry.

SCENARIO Module 10: The Cartesian Plane

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Joshua, a mechatronics technician, works at an auto plant and his job is to make sure the industrial robotic arms are running at 100% capacity. When Joshua arrives at the plant for his shift, he learns that an industrial robotic arm, specifically a welding arm, isn’t working properly. The robotic arm isn’t extending far enough horizontally (left, right) or vertically (up, down).

- Describe the layout and identify the quadrants of the Cartesian Coordinate System.
- Given the point on a graph, determine the ordered pair.
- Given a point on a graph, recognize whether an ordered pair is an x or y intercept.
- Graph points on the coordinate plane given an ordered pair.
- Visually identify whether the slope of a line is positive, negative, zero or undefined.
- Given a line on a graph, determine its slope.
- Given the coordinates of two points, determine the slope of a line, using the slope formula.
- Given the coordinates of two points on a line, determine its linear equation.
- Given a linear equation, graph a line on the coordinate plane.
- Calculate the midpoint between two points on a line.
- Calculate the distance between two points.

Critical Thinking and Workplace Communication (Second 15 hours)

**SCENARIO Module 1: Introduction to Communications and Critical Thinking**

Kelly is a new technician who has just joined the Air Operations Team at ARINC and she will use critical thinking and practice workplace communication in a technical environment. Kelly will learn how to locate and interpret information from flow charts, diagrams, charts and tables and will analyze information from multiple sources to determine actions required in a given situation.

- Locate and interpret key information from text.
- Locate and interpret key information from flow charts and diagrams.
- Locate and interpret information from a chart or a table.
- Analyze information from multiple sources to determine actions required in a given situation.

**SCENARIO Module 2: Oral and Written Communications**

Kelly continues her training in the Air Operations Center and learns to identify key components in an effective summary of information. She practices summarizing information from various sources; and learns how to compose effective email communications for various workplace scenarios. Kelly is learning more about ARINC’s communication processes and procedures.
• Identify key components in an effective summary of information.
• Write a summary of a situation with all necessary components.
• Describe the importance of filling in forms completely and accurately.
• Demonstrate the ability to enter information correctly given a specific set of instructions.
• Listen to a conversation and compose a summary of the information.
• Listen to a conversation and determine information needed to complete a summary of the call.
• Analyze information from multiple sources to determine actions required in a given situation.
• Compose effective email communications for various workplace scenarios.

SCENARIO Module 3: The Big Storm

Kelly and her team apply critical thinking and workplace communication skills to a real life crisis situation. The ARINC team handles a series of incidents as a Big Storm moves up the coast, affecting several different airports along the way.

• Apply critical thinking skills to real life situations and evaluate the outcomes.

SCENARIO Module 4: After Action Reporting

The ARINC Team will have to prepare a series of after action reports and deliver a presentation to senior management about the events and the team’s response during the Big Storm. Kelly will learn how to write a business memorandum and a short essay and will learn how to create and deliver an effective PowerPoint presentation.

• Write an effective purpose statement.
• Compose a professional business memo.
• Write a short essay using proper form.
• Determine most effective layout of information on slides for presentation.
• Describe appropriate public speaking guidelines.

SCENARIO Module 5: Troubleshooting

Technicians apply a systematic troubleshooting process when they are diagnosing problems with cars, equipment, machinery and computers every day. Troubleshooting involves applying critical thinking to determine the cause (or probable cause) of a problem and then determining the best course of action to solve that problem. Gary is a mechatronics technician who applies the troubleshooting process to various types of situations on the job.

• Apply the general troubleshooting process to various situations.

SCENARIO Module 6: Fire on the Production Line

Gary will occasionally encounter larger, more complex problems involving workplace safety issues or extended periods of time when the equipment will not be functioning while they wait for parts to arrive. An equipment fire or major systems breakdown can be a huge problem that can affect the production line and can cost the company a lot of

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money. Workplace safety is also a huge issue on the job and if there is a workplace incident, Gary will be involved in the investigation and after action safety reporting. If the company did not follow proper safety procedures or if they neglected to perform routine maintenance on the equipment, they could face fines or other sanctions from OSHA. Gary and his fellow mechatronics technician, Joe, will investigate the cause of a fire

- Analyze information from multiple sources to determine actions required in a given situation.

Professional Skills
(Third 15 hours)

SCENARIO Module 1: Customer Service

This module will introduce principles of good customer service. The student will review various situations to identify various types of employee and customer behaviors. Students will also determine the most effective strategies and responses for various types of customer service situations.

- Recognize and explain the general principles of good customer service.
- Identify various types of employee behaviors that contribute to a customer’s positive or negative experience with a company.
- Identify various customer types based on common types of customer behaviors.
- Determine the most effective strategies or responses for various types of customer behaviors.

SCENARIO Module 2: Confidentiality

Students will learn how to define confidentiality and identify ways to maintain confidentiality in a variety of situations. The module will also provide important information on appropriate and inappropriate responses to a breach in confidentiality.

- Define confidentiality and explain why it is important to maintain.
- Identify types of information or data that is confidential
- Identify common locations where confidential information is stored and transmitted.
- Identify the different ways that cybercriminals attack computers to steal information or ruin computer files.
- Recognize and explain the role of social media as it relates to the workplace.
- Determine the most appropriate action or response to take in order to maintain confidentiality in a variety of situations.
- Distinguish between appropriate and inappropriate responses to a breach in confidentiality.

SCENARIO Module 3: Organizational Skills and Time Management

Effective organizational skills and time management are critical workplace skills.
**Organizational skills involve the ability to identify tasks, determine the steps in a process, put the steps in order, develop a plan, assemble key tools, and resources and execute the plan. Time management is closely linked to organizational skills and involves the ability to allocate the proper amount of time needed for each task and the ability to stick to a schedule. In this module, students will explore some effective ways to improve their organizational and time management skills.**

- Identify tasks to be accomplished and determine most appropriate way to organize.
- Determine the amount of time needed for each task.
- Determine the steps in a process, place them in order and develop a plan.
- Evaluate the effectiveness of the organizational plan.

**SCENARIO Module 4: Teamwork**

The ability to work successfully with other co-workers on a team project is a critical workplace skill. Teams are often pulled together to solve a problem or complete a project at a specific point in time. In this module, students will identify the stages of team development, evaluate employee behaviors that positively and negatively affect teamwork and identify effective strategies for keeping a team on track.

- Describe the benefits of teamwork in the workplace.
- Identify Tuckman's stages of team development.
- Describe employee behaviors that positively and negatively affect teamwork.
- Recognize and explain the importance of positive interpersonal skills and non-verbal behavior.
- Identify positive leadership behaviors and effective strategies for keeping a team on track.
- Identify strategies for responding to negative team behavior.

**SCENARIO Module 5: The Job Search Process**

Students will learn how to conduct a thorough job search, using key resources to help tailor a resume to the type of job that he or she is seeking. They will also practice writing a resume and an effective cover letter.

- Locate available jobs and match your skills and experience to the requirements.
- Identify types of resumes and purpose for each type: chronological, functional and combination; and determine which format is most appropriate to use for particular situation.
- Describe key elements of effective cover letters.
- Create master application containing all key information needed for job applications.

**SCENARIO Module 6: Professional Image**

Students will learn effective strategies to help them prepare for an interview, project a professional image and conduct that interview with confidence.

- Describe the process of preparing for an interview.
• Describe types of interviews and specific challenges of each.
• Describe the four stages of the interview.
• Answer common interview questions.
• Develop a plan for following up after an interview.