

Southwest Center for Microsystems Education (SCME)  
University of New Mexico

# A Systematic Approach to Problem Solving Learning Module

## Learning Module Contents

Learning Module Map  
Activity: Thinking Creatively  
A Systematic Approach to Problem Solving Primary Knowledge (PK)  
Brainstorming Activity  
Problem Solving Activity I – The Lawn  
Problem Solving Tools PK  
Problem Solving Activity II – A MEMS Process Problem

*A learning module map is provided for the instructor as a suggested outline on how to use this learning module.*

***This learning module introduces a systematic approach to solving problems by using a six-step process. This approach is used throughout industry to solve simple to complex problems. Activities provide the opportunities to this six-step process in a real life situation as well as MEMS process problem.***

Target audiences: High School, Community College, Industry Technologists,  
University

Made possible through grants from the National Science Foundation Department of Undergraduate Education #0830384, 0902411, and 1205138.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and creators, and do not necessarily reflect the views of the National Science Foundation.

Southwest Center for Microsystems Education (SCME) NSF ATE Center  
© 2013 Regents of the University of New Mexico  
Content is protected by the CC Attribution Non-Commercial Share Alike license.  
Website: [www.scme-nm.org](http://www.scme-nm.org)

# **A Systematic Approach to Problem Solving Learning Module Map Instructor Guide**

This learning module guides the participants through a six-step approach to solving problems, both simple and complex problems. Several activities are provided that allow the participants to test their ability to think creatively, to solve a simple, every day type problem, and to solve a more complex problem that could be experienced in a fabrication facility.

The following learning module map is a suggested lesson plan on how to use this learning module in your curriculum. However, each of these units is a stand-alone lesson or activity which can be used in a variety of subject matters.

The *Systematic Approach to Problem Solving Learning Module* consists of the following:

- Learning Module Map
- Activity: Thinking Creatively
- A Systematic Approach to Problem Solving PK (Reading materials)
- Brainstorming Activity
- Problem Solving Activity – The Lawn
- Problem Solving Tools PK (Reading materials)
- Problem Solving Activity – A MEMS Process Problem

As you can see, there is no assessment for this learning module. Participants should be assessed throughout the module on their use of a systematic approach to solving problems, their communication skills (written and oral), and their ability to work with others.

This Instructor Guides (IG) contains all of the activities' Instructor Guides. The IGs contain all of the answers to the activities. However, many of the “answers” are variable and should be assessed by the instructor based on the answer's demonstration of satisfying the objectives.

Following is a suggested Learning Module Map on how to use this learning module. Each activity contains additional instructions on how to execute the activity to the benefit of the learner.

## Learning Module Map for A Systematic Approach to Problem Solving

*This learning module introduces a systematic approach to solving problems by using a six-step process. This approach is used throughout industry to solve simple to complex problems. Activities provide the opportunities to this six-step process in a real life situation as well as MEMS process problem.*

Learning Module SCOs (6):

- Activity: Thinking Creatively
- A Systematic Approach to Problem Solving PK
- Brainstorming Activity
- Problem Solving Activity – The Lawn
- Problem Solving Tools PK
- Problem Solving Activity – A MEMS Process Problem

Following is a “suggested” outline on how to present this learning module. As the instructor, you may choose to use all or part of the SCOs, depending on the level of your students, and the curriculum in which this material is used.

IMPORTANT STEPS	KEY POINTS	REASONS
Have the participants complete the activity: Thinking Creatively	This activity allows participants to evaluate their ability to think creatively with and without the support of others.	Employers expect technicians and engineer to be able to “think outside of the box” and to generate new and creative ideas. They also expect employees to listen to and accept the help and ideas of others.
Reading Material: Present “A Systematic Approach to Problem Solving”	This reading material presents the six-steps of problem solving and explains the function of each step as well as presents examples.  Short activities are included that allow the participants to continue to evaluate their own abilities to think creativity and outside of the box.	Participants need to understand each step and the purpose and criteria of each step. They also need to see that by following this six-step approach, difficult problems can be solved more quickly and efficiently than shooting from the hip.

<p>Brainstorming Activity</p>	<p>Participants work together as a team to develop ideas for two different scenarios.</p>	<p>In this activity, participants should not only learn how to brainstorm effectively, but see that brainstorming with at least one other person can help to generate more ideas that one could come up with on his own.</p>
<p>Activity: The Lawn</p>	<p>This activity allows the participants to practice the six-steps of problem solving on a familiar and relatively simple problem.</p>	<p>Participants practice the six steps of problem solving by working as a team to solve a problem. This activity not only allows them to apply a systematic approach to problem solving, but also to work with others in doing so.</p>
<p>Reading Materials: Problem Solving Tools</p>	<p>This reading material introduces many of the tools that are used in industry to gather, collect and present information and data.</p>	<p>Technicians and engineers should be familiar with problem solving tools and know what they present and how to interpret them. The data from these tools can be used to identify that a problem exists, help troubleshoot a problem, identify the best way to solve a problem, and analyze if the problem has been solved.</p>
<p>Problem Solving Activity: A MEMS Process Problem</p>	<p>This activity presents a typical and real problem that can occur in a microfabrication facility. Participants use the materials and tools that they have acquired from this learning module to solve this problem.</p>	<p>This activity simulates a real experience that one might have as a technician or engineer in a microfabrication facility or any manufacturing environment.</p> <p>Participants have to use effective communication skills, team skills and problem solving skills to solve this problem.</p>

Assessment	Participants should be assessed on how they apply a systematic approach to problem solving, how they communicate with others, and how well they work with the other participants in a problem solving team.	Problem solving skills, effective communication techniques, and teamwork are all entry-level requirements for technicians and engineers in microtechnology fields and manufacturing facilities.
------------	---	---

*Support for this work was provided by the National Science Foundation's Advanced Technological Education (ATE) Program through Grants. For more learning modules related to microtechnology, visit the SCME website (<http://scme-nm.org>).*