

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

DNA Microarray Learning Module

This learning module contains seven units:

Knowledge Probe (pre-Quiz)
Primary Knowledge (Reading material)
DNA Hybridization Activity
DNA Microarray Terminology Activity
DNA Microarray Model Activity
DNA Microarray – An Ethical Dilemma?
Final Assessment

This learning module provides an overview of DNA microarrays – types of arrays, applications, interpretation, design, and fabrication. Activities provide the opportunity for students to gain a better understanding of these concepts as well as to discuss the ethical questions surrounding some of the applications and possibilities of these arrays.

A learning module map is provided that is a suggested outline on how to use this learning module.

Target audiences: High School, Community College, 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.

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Website: www.scme-nm.org

Learning Module Map for DNA Microarray

Learning Module: DNA Microarray

Learning Module units:

- Knowledge Probe (pre-assessment)
- DNA Microarray PK
- DNA Hybridization Activity
- DNA Microarray Terminology Activity
- DNA Microarray Model Activity (Kit available through SCME)
- DNA Microarray – An Ethical Dilemma? (Activity)
- Assessment

Following is a suggested map on the implementation of this learning module. This map is strictly a suggestion. You may use any unit in this learning module as a stand-alone unit or activity OR in any sequence that best fits your classroom.

IMPORTANT STEPS	KEY POINTS	REASONS
Knowledge Probe (KP)	This is a pre-assessment that the participants should take prior to starting this learning module.	This KP will determine the participants' current knowledge of DNA microarrays. This KP could be compared with the Final Assessment to determine a level of learning.
Inquiry activity 1	<p>Ask the participants the following: <i>What attributes (physical and emotionally) do you think you inherited from your parents? (Many of these attributes are inherited "genes".)</i></p> <p><i>Today they can actually answer this question by comparing your genes to those of your parents. How do you think they do that?</i></p>	This will get the participants thinking about "genes" and DNA and create a curiosity of "how" we can compare genes or even identify specific genes in an individual.

<p>Inquiry activity 2</p>	<p>Assign each student a letter A, T, G, or C. Have half of the students create a ssDNA sequence. Have the other half “match” correctly to the sequence. Questions that you could ask: <i>What have you just formed?</i> <i>What happens during transcription? (the dDNA separates)</i> <i>What happens during reverse transcription? (the 2 ssDNAs joined together)</i> <i>What if the second ssDNA is from another source and joins to the original ssDNA – what do you have? (a hybrid)</i> <i>What does this have to do with DNA microarrays?</i></p>	<p>This activity gets the participants thinking about DNA and the role of DNA in DNA microarrays. It also ensures that they understand basic DNA terminology such as transcription, reverse transcription, and hybridization.</p>
<p>Assign the primary knowledge (PK) unit as a reading assignment.</p> <p>Review the <u>DNA Microarray</u> PK and have the participant complete the DNA Hybridization Activity.</p>	<p>The DNA Hybridization Activity should be completed when indicated in the PK. This activity uses an online tutorial.</p> <p>A PowerPoint presentation can be downloaded by the instructor from scme-nm.org and presented to all participants.</p>	<p>This introduction will help participants better understand the activities.</p> <p>The DNA Hybridization tutorial allows the participants to further explore DNA hybridization, a very important concept for understanding DNA microarrays.</p>
<p>Complete the activity “DNA Microarray Terminology”</p>	<p>Participants demonstrate an understanding of the terminology associated with DNA microarrays by completing a crossword puzzle or matching table or both.</p>	<p>The terminology associated with DNA microarrays is huge and can be confusing. This activity helps to ensure that the participants have started to develop an understanding of the terms.</p>

<p>Complete the activity “DNA Microarray Model”. (A kit is available through the SCME website @ scme-nm.org)</p>	<p>This activity and kit is a hands-on activity that allows the participants to model the fabrication of a GeneChip® (a type of DNA microarray). The activity also briefly explores microarray interpretation and reliability. There is a BONUS activity in which the participants design a 4x4 array and its masks.</p>	<p>This activity is valuable to both manufacturing technician training as well as biomedical training.</p>
<p>Complete the activity “DNA Microarray – An Ethical Dilemma?”</p>	<p>This group activity allows participants to discuss their personal opinions about some of the controversial uses of DNA microarrays. A group facilitator should be used to keep the discussion focused.</p>	<p>By discussing the ethics of DNA microarrays and their applications, participants will be able to not only express their own personal views, but will be able to hear the views of others and better understanding the applications of DNA and the ethical dilemma they may present.</p>
<p>DNA Microarray Assessment</p>	<p>Give the participants the <u>DNA Microarray</u> assessment.</p>	<p>Participants are evaluated on what they have learned about DNA microarrays, their applications, fabrication and interpretation.</p>

Adapted from Graupp, P. & Wrona, R. (2006) The TWI Workbook: Essential Skills for Supervisors. New York, NY. Productivity Press.

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-support.org/>)