Teacher Guide: Mapping Pharmacogenomics Concepts

ACTIVITY OVERVIEW

Abstract:
Two activities present ways to use concept maps to assist students in organizing their knowledge about pharmacogenomics.

- Activity 1: Teaching Concept Mapping
  A PowerPoint presentation that provides an introduction to concept mapping, engaging students in thinking about and implementing the process.

- Activity 2: Concept Maps on Pharmacogenomics
  This activity can be used at the beginning and end of the *Pharmacogenomics: Drugs Designed for You* module to assess students' understanding of the topic. Word lists are provided for beginning, intermediate, and advanced levels.

Module:
Pharmacogenomics: Drugs Designed for You

Key Concepts:
Concept mapping

Prior Knowledge Needed:
General knowledge of organizational methods

Materials:
Copies of student pages, pencils and/or pens, blank paper; Inspiration® software and computers (optional).

Appropriate For:
Ages: 12 - 20
USA grades: 7 - 14

Prep Time:
30 minutes

Class Time:
45 minutes

Activity Overview Web Address:
http://gslc.genetics.utah.edu/teachers/tindex/overview.cfm?id=195

Other activities in the ***Pharmacogenomics: Drugs Designed for You*** module can be found at:

http://gslc.genetics.utah.edu/teachers/tindex/

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I. PEDAGOGY

A. Learning Objectives

- Students will be able to organize information using a concept map.

B. Teaching Strategies

1. Timeline

- Beginning of school year:
  - Optional: Order Inspiration® software and install it on computers.

Activity 1: Teaching Concept Mapping

- 4-8 weeks before activity:
  - Optional: Reserve a laptop computer and projector if you plan to use them to show the PowerPoint presentation for Activity 1.
  - Optional: Reserve a computer lab if students will create their concept maps using Inspiration® software.
- 1 day before activity:
  - If you are not showing the PowerPoint presentation on a computer, make overhead transparencies of the slides.
  - Photocopy Student Pages S-1 and S-2.
  - Make an overhead transparency of Student Pages S-1 and S-2.
  - Optional: Make photocopies of the PowerPoint presentation for students.
- Day of activity:
  - Discuss concept mapping and provide examples.
  - Have students create their own concept map in class or as homework.

Activity 2: Concept Maps on Pharmacogenomics

- 4-8 weeks before activity:
  - Optional: Reserve a computer lab if students will create their concept maps using Inspiration® software.
- 1 day before activity:
  - Make photocopies of the appropriate word lists (beginning, intermediate or advanced) from the Student Pages (see S-3 through S-5).
  - Optional: Make overhead transparencies of the word list you plan to use.

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- Day of activity:
  - Distribute the Student Pages and have students create a concept map on paper or using Inspiration® software.

2. Classroom Implementation

Activity 1: Teaching Concept Mapping

- As a class, discuss why it would be useful to organize facts, thoughts, ideas, etc.
- Show the PowerPoint presentation (see Additional Resources), discussing each slide.
  - Advanced students can take notes.
  - Younger students may just follow along on the printouts.
- Option 1: Give students the example concept map (page S-1) and go through it as a class.
  - Have students answer the questions on their own or with a partner.
  - Lead a class discussion of the questions.
    - Discuss why items are placed in one location and not another.
    - Remind students that sometimes things can be placed in multiple places.
- Option 2: Have students create the sample concept map using Inspiration® software.
  - Students can label the Main Idea, Large Topics and Subtopics using the program and then print out the concept map.
  - Proceed with a class discussion as in Option 1, above.
- Have students create a concept map on their own using the concept map template (page S-2) to check for comprehension.
  - This can be an in-class activity or assigned as homework.

Activity 2: Concept Maps on Pharmacogenomics

Use concept maps as pre- and post-tests for the *Pharmacogenomics: Drugs Designed for You* module to assess students' understanding of the topic. The pre-test can assist you in planning where to begin the learning activities for this module, as well as assist students in identifying topics for investigation. Comparing the pre- and post-tests enables you and the students to identify how much they have learned.

- Pre-test
  - Distribute the Beginning Word List (page S-3).
  - Option 1: Have students create a concept map using the Beginning Word List.
  - Option 2: Have students create their concept map using Inspiration® software.
  - Allow students time to complete their maps without rushing them.

- Post-test
  Three word lists are provided.
  - Beginning: Covers basic concepts from the module (page S-3).
  - Intermediate: Requires that students go into more detail (page S-4).
  - Advanced: Requires the most detail (page S-5).

  Use the word list that is appropriate for the material you have covered and/or the level of the students.
  - Distribute the appropriate word list to students.
  - Option 1: Have students create a concept map using the word list given.
  - Option 2: Have students create their concept map using Inspiration® software.
  - Allow students time to complete their maps without rushing them.
  - Return both the pre- and post-test to students.
  - Have students compare the two maps, identifying what items they have learned or still need to learn.

3. Adaptations

- Have students cut apart the words/phrases in the Word Lists so they can move them around into possible groupings. Once they have decided on an organization, the slips of paper can be glued or taped to form a concept map.
- Have students generate their own word lists (either individually or as a class) instead of using the ones in the Student Pages. This can be particularly helpful at the beginning of the module as you assess students' prior knowledge about pharmacogenomics.
- Instead of keeping the pre-test concept map until the end of the module, have students add to and reorganize it as they explore the topic of pharmacogenomics. If they are working on paper, students might make each set of additions in a different color. If they are using Inspiration® software, they can print out a copy of each map they create. This progressive set of concept maps can provide you and the students with a record of changes in their understanding of pharmacogenomics.
- If using the Advanced Concept Map, you may want to have students expand and recreate the map on two sheets of paper taped together.

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II. ADDITIONAL RESOURCES

A. Activity Resources - linked from the online Activity Overview:

http://gslc.genetics.utah.edu/teachers/tindex/overview.cfm?id=195

- PowerPoint: *Building a Concept Map* – Presentation to use with Activity 1.
- Website: *Inspiration*® software – Ordering information, a free trial copy, and other information.

III. MATERIALS

A. Detailed Materials List

Activity 1: Teaching Concept Mapping

- *Building a Concept Map* PowerPoint presentation
- *Building a Concept Map* student pages (S-1 and S-2)
- Option 1: Blank paper, pens/pencils
- Option 2: Computers with Inspiration® software

Activity 2: Concept Maps on Pharmacogenomics

- Beginning, Intermediate or Advanced Word Lists (S-3 through S-5)
- Option 1: Blank paper, pens/pencils
- Option 2: Computers with Inspiration® software

IV. STANDARDS

A. AAAS Benchmarks for Science Literacy

Grades 6-8:

- Habits of Mind: Communication Skills - organize information in simple tables and graphs and identify relationships they reveal.

B. Utah Core Curriculum

Intended Learning Outcomes for Seventh and Eighth Integrated Science:

Students will:

1. Use Science Process and Thinking Skills
   c. Develop and use categories to classify subjects studied.
6. Communicate Effectively Using Science Language and Reasoning
   f. Construct models to describe concepts and principles.

Intended Learning Outcomes for Biology (9-12):

Students will:

1. Use Science Process and Thinking Skills
   c. Evaluate, sort, and sequence data according to given criteria

V. CREDITS

Activity created by:
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NCRR
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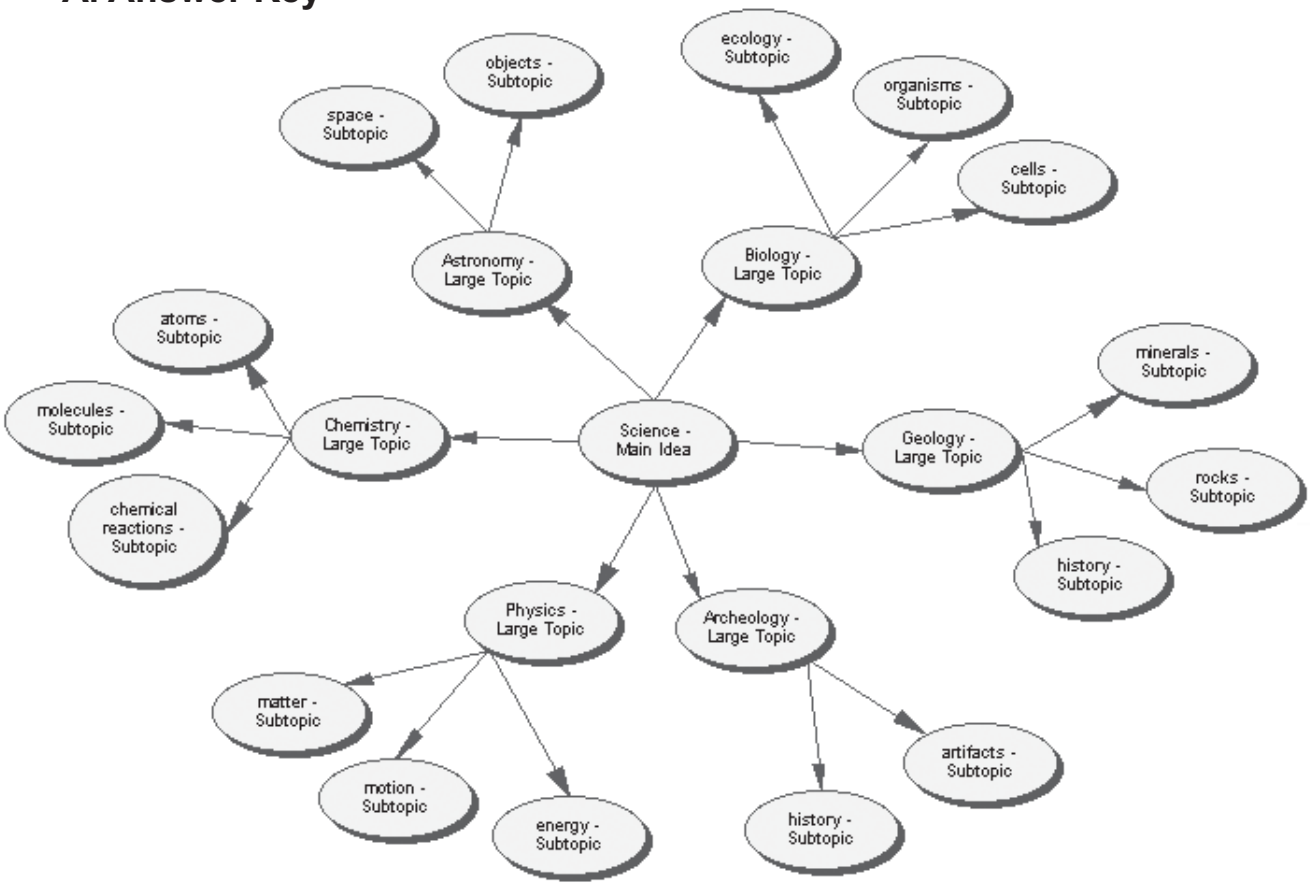
Teacher Reference: Activity 1: Building a Concept Map

A. Answer Key



1. **Why is Science in the center circle?** *It is the Main Idea.*

2. **Why is history in more than one place?** *It is an important Subtopic to both Large Topics. Therefore it must be included with both.*

3. **Do all Large Topics need to have the same number of Subtopics? Why or why not?** *No. If there is a lot of information about a Large Topic, it will need many Subtopics. If there is little information, the Large Topic will have fewer Subtopics.*

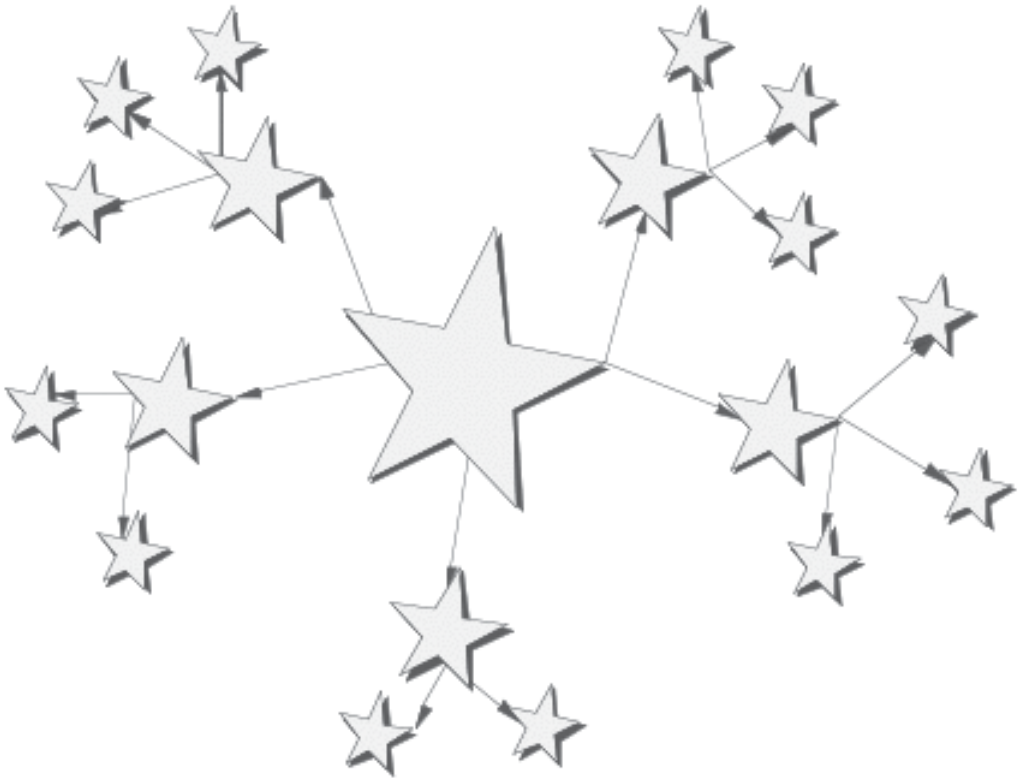
4. **What is the minimum number of Subtopics a Large Topic should have?** *Two*

5. **Label the following on the sample concept map above: Main Idea, Large Topics, Subtopics.** *See above graphic*

6. **Now, design a web of your own using the template on the next page.** *(S-2)*

Teacher Reference: Activity 1: Building a Concept Map

B. Answer Key-Template



- **You may add more stars where you need them.**
- **Make sure you have at least four Large Topics.**
- **Make sure you have at least two Subtopics for each of these.**

Accept answers for logical thinking. Score based on the following rubric:

Organization-

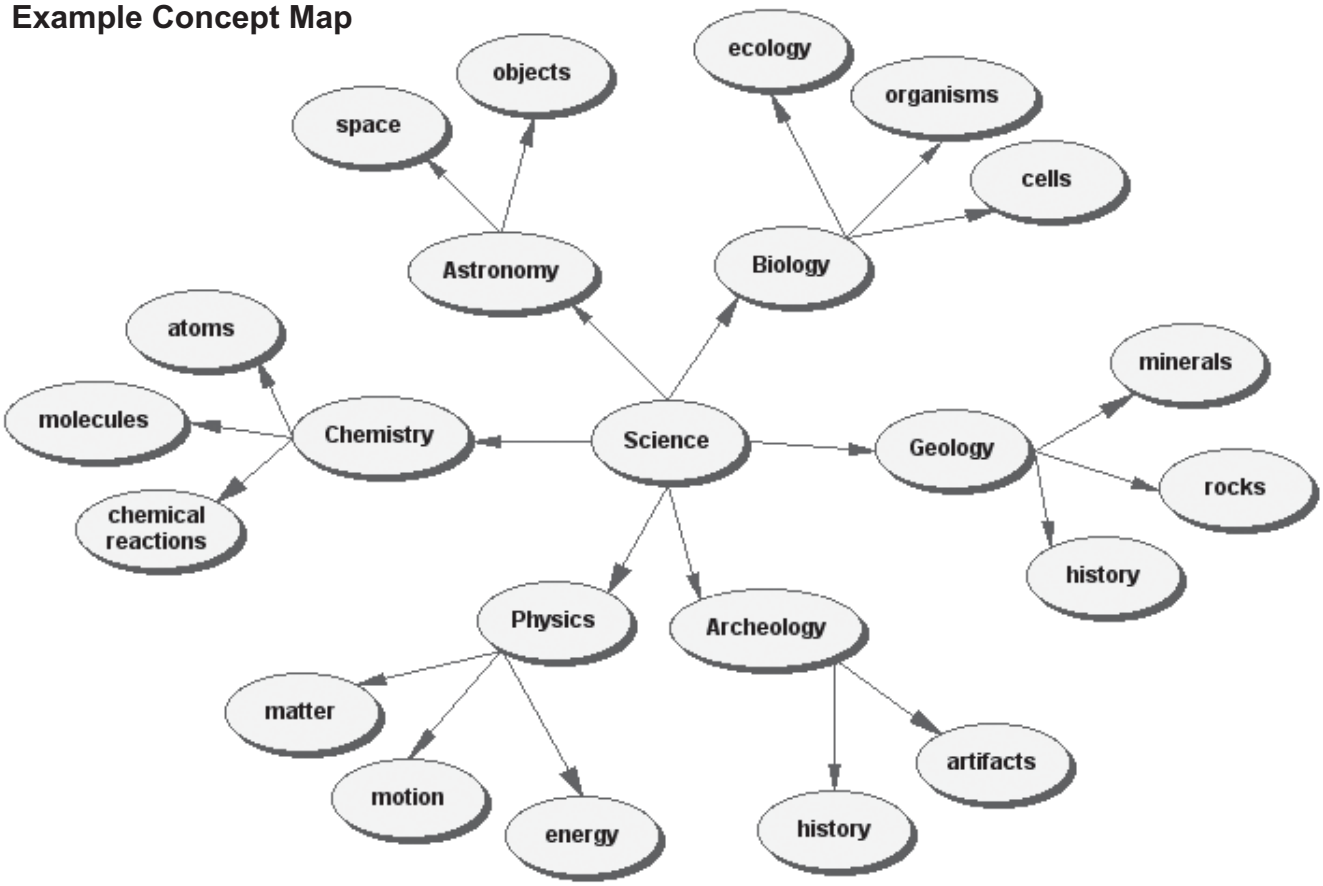
- ***Did the student place the Main Idea in the center of the Map? 0 5***
- ***Did the student include at least 4 Large Topics? 0 1 2 3 4***
  - 1 point for each Large Topic given
- ***Did the student include at least two Subtopics for each Large Topic?***
  - 1 point for each Subtopic

Total Points awarded _____/29

Name _____ Date _____

Building a Concept Map

Example Concept Map



1. Why is Science in the center circle? _____

_____

2. Why is history in more than one place? _____

_____

3. Do all Large Topics need to have the same number of Subtopics? Why or why not?

_____

_____

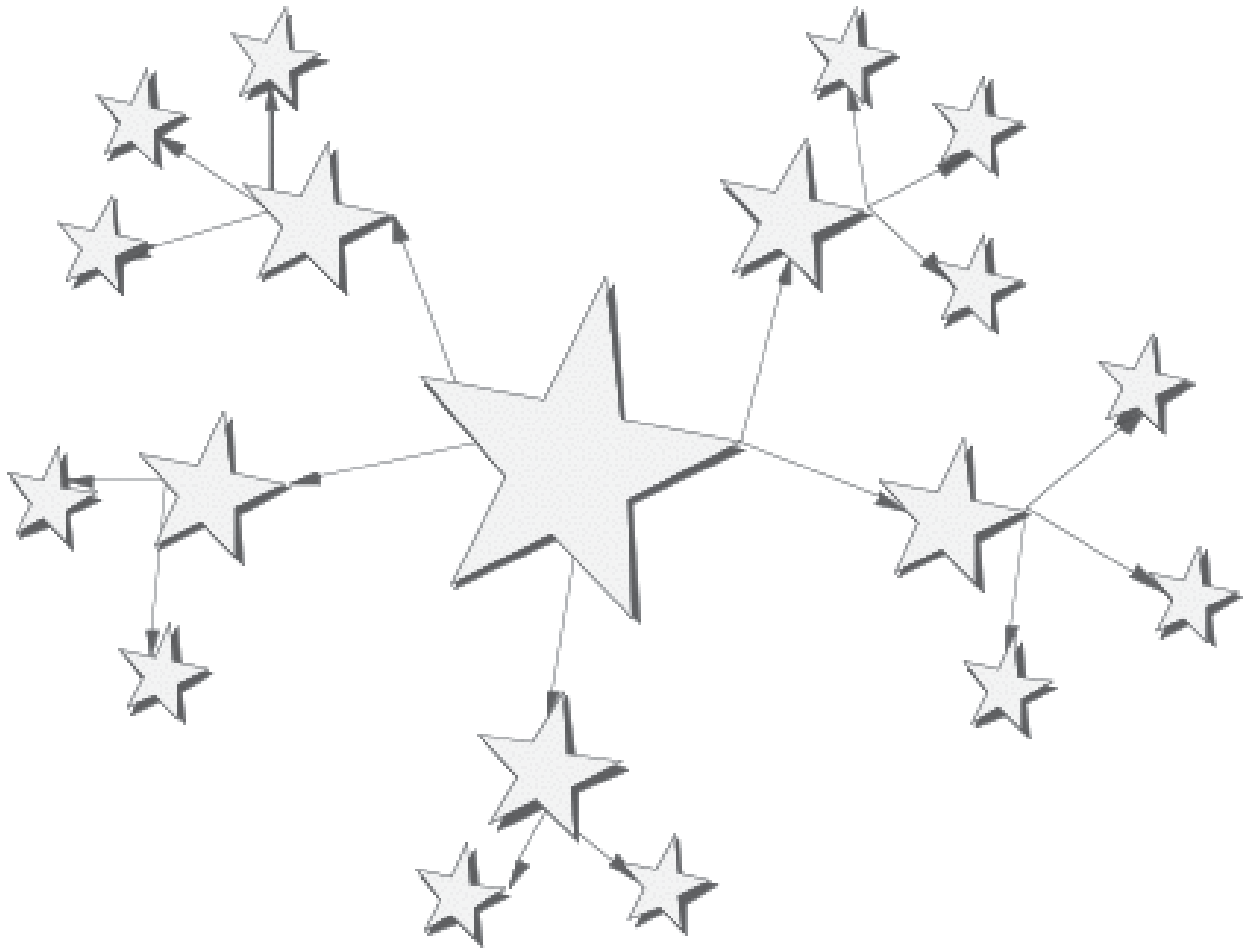
4. What is the minimum number of Subtopics a Large Topic should have? _____

5. Label the following on the sample concept map above: Main Idea, Large Topics, and Subtopics.

6. Now, design a concept map of your own using the template on the next page (S-2).

Building a Concept Map

Concept Map Template



- **You may add more stars where you need them.**
- **Make sure you have at least four Large Topics.**
- **Make sure you have at least two Subtopics for each of these.**

Name_____ Date_____

Mapping Pharmacogenomics Concepts

Beginning Concept Map Word List

Pharmacogenomics

Pharmacogenetics

Drug Response

Drug Development

Individual

Large Population

Increased Efficacy

Diagnostic Tests

Predict Drug Response

Personalized Medicine

Disease Risk

Genes

Gene Products

Genetic Profile

Name_____ Date_____

Mapping Pharmacogenomics Concepts

Intermediate Concept Map Word List

Pharmacogenomics

Pharmacogenetics

Drug Response

Drug Development

Individual

Large Population

Increased Efficacy

Diagnostic Tests

Predict Drug Response

Personalized Medicine

Disease Risk

Genes

Gene Products

Genetic Profile

Single Nucleotide Polymorphism (SNP)

Reduce Side Effects

Mapping Pharmacogenomics Concepts

Advanced Concept Map Word List

Pharmacogenomics

Pharmacogenetics

Drug Response

Drug Development

Individual

Large Population

Increased Efficacy

Diagnostic Tests

Predict Drug Response

Personalized Medicine

Disease Risk

Genes

Gene Products

Genetic Profile

Single Nucleotide Polymorphism (SNP)

Reduce Side Effects

Haplotype

SNP Profile

Gene Expression Profiling

Microarray Analysis

Protein Expression Analysis