Mapping Gene Therapy Concepts

Abstract

- Activity 1: This activity provides an introduction to concept mapping, engaging students in thinking about and implementing the process.
- Activity 2: This activity can be used at the beginning and end of the Gene Therapy: Molecular Bandage? module to assess students' understanding of the topic. Word lists are provided for beginning, intermediate and advanced levels.

Learning Objectives

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

Estimated time

- Class time 45 minutes
- Prep time 30 minutes

Materials

- Copies of student pages
- Optional – Inspiration® software and computers.

Instructions

Activity 1: Teaching Concept Mapping

1. As a class, discuss why it would be useful to organize facts, thoughts, ideas, etc.
2. Option 1: Give students the example concept map (page 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.
3. Have students create a concept map on their own using the concept map template (page 2) to check for comprehension. This can be an in-class activity or assigned as homework.

Activity 2: Concept Maps on Gene Therapy

Use concept maps as pre- and post-tests for the Gene Therapy: Molecular Bandage? 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.

1. Pre-test

- Distribute the Beginning Word List (page 3) and instruct students to organize the words on the list into a concept map.
- Optional: Have students create their concept map using Inspiration® software.
- Allow students time to complete their maps without rushing them.
- Collect the maps and file them for reference at the end of the module.

2. Post-test

Three word lists, Beginning, Intermediate and Advanced, are provided.

- Beginning: Covers basic concepts from the module (page 3).
- Intermediate: Requires that students go into more detail (page 4).
- Advanced: Requires even more details (pages 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 and ask students to organize the words on the list into a concept map.
- Optional: 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.

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 gene therapy.
- 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 gene therapy. 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 gene therapy.

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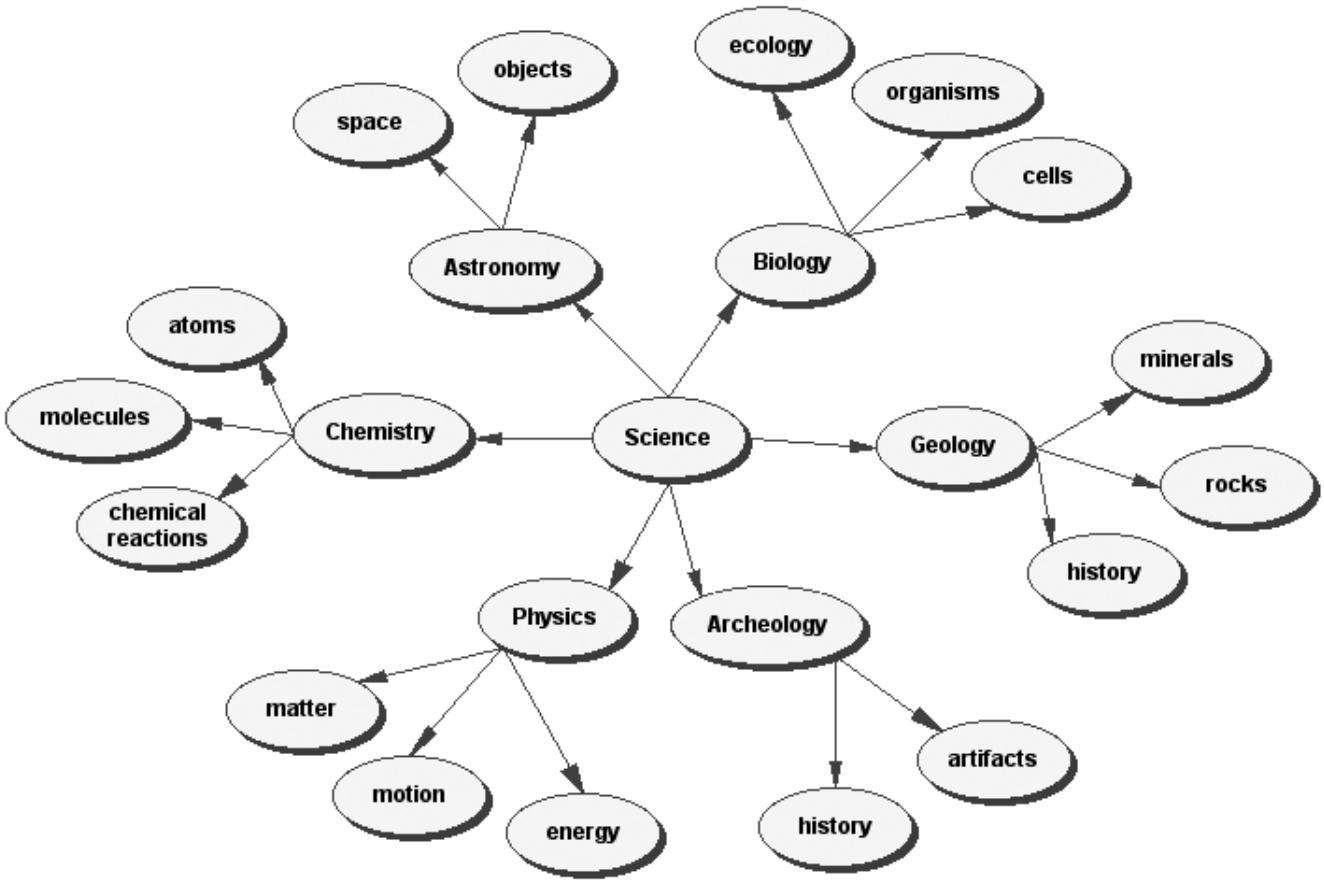
Building a Concept Map



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?

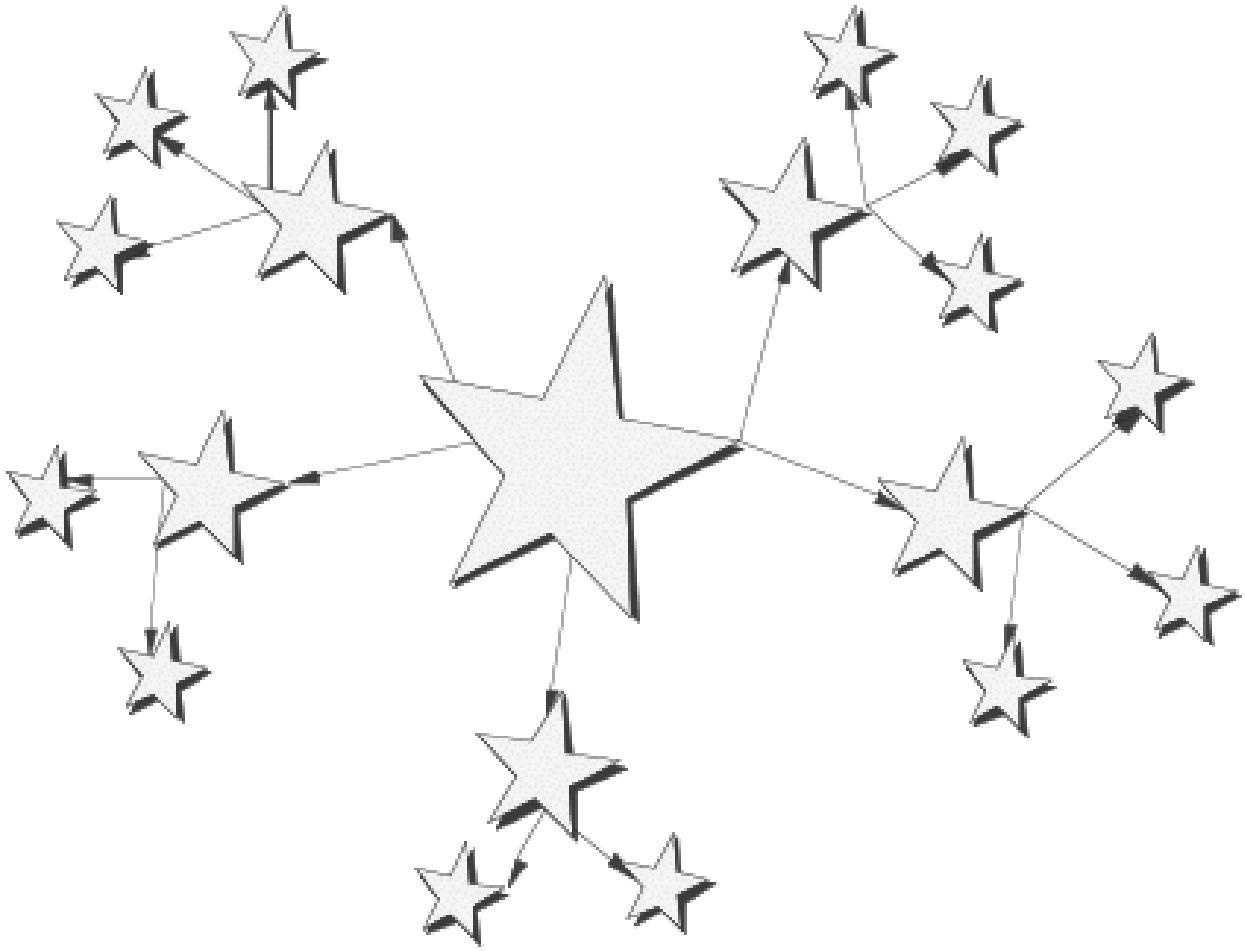
5. Label the following on the sample concept map above: Main Idea, Large Topics, and Subtopics.

6. Now, design a concept map of your own using the template on the next page.

NAME _____ DATE _____

Building a Concept Map

- 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 _____

Beginning Concept Map Word List

Targeting the right tissue

Immune response

Vectors

Single gene disorders

Naked DNA

Activating the gene

Disruption of existing genes

in vivo

Integrating the gene

Fit inside vectors

Keys to success

Viruses

Candidate diseases

Liposomes

Procedure

Integration into the germline

Risks/Challenges

ex vivo

NAME _____ DATE _____

Intermediate Concept Map Word List

Targeting the right tissue

Immune response

Vectors

Single gene disorders

Naked DNA

Activating the gene

Disruption of existing genes

in vivo

Integrating the gene

Fit inside vectors

Keys to success

Viruses

Candidate diseases

Liposomes

Procedure

Integration into the germline

Risks/Challenges

ex vivo

Enhancement

Viral ligands must match cell receptors

Gene integrates into the middle of a functioning gene

Herpes Simplex Virus

Vector injected into the body

No dominant-negative mutations

Preventative medicine

Transcription and translation must take place

The introduced gene is passed on to offspring

Retroviruses

Cosmetic Purposes

Adeno-associated viruses

Vector injected into cells removed from the body; these cells are then returned to the body

Adenovirus

NAME _____ DATE _____

Advanced Concept Map Word List

Targeting the right tissue

Immune response

Vectors

Single gene disorders

Naked DNA

Activating the gene

Disruption of existing genes

in vivo

Integrating the gene

Fit inside vectors

Keys to success

Viruses

Candidate diseases

Liposomes

Procedure

Integration into the germline

Risks/Challenges

ex vivo

Enhancement

Viral ligands must match cell receptors

Cosmetic Purposes

Adeno-associated viruses

Vector injected into cells removed from the body; these cells are then returned to the body

Adenovirus

Gene integrates into the middle of a functioning gene

Herpes Simplex Virus

Vector injected into the body

No dominant-negative mutations

Preventative medicine

Transcription and translation must take place

The introduced gene is passed on to offspring

Retroviruses

Triple-helix forming oligonucleotides

Repairing mutated proteins

New approaches

Antisense

SMaRT

Preventing the production of mutated proteins

Ribozymes