

**Using concept maps as cooperative learning activities to explore  
hemodynamic principles  
(Student version)**

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**I. Introduction.** In lecture, you have heard about the relationships between pressure, flow and resistance, along with the various factors that control these entities. This activity will show you how to build and use concept maps, which allow you to manipulate in a concrete manner the causal relationships between and among the various factors that determine blood pressure. It will also allow you to see how more than one factor can have an influence on blood pressure at the same time. Working in groups, you will be asked to explain why you have made certain decisions about the relationships you suggest. This will help you to identify areas where your understanding of the material is sound and where it needs some work.

- II. Objectives/benchmarks.** As preparation for this exercise, you should review the following objectives from your lecture notes and textbook:
- a. Define end-systolic volume and end-diastolic volume.
  - b. Define stroke volume.
  - c. Define heart rate.
  - d. Define cardiac output and explain what determines cardiac output.
  - e. Describe the effects of preload on stroke volume. This would include a description of the Frank-Starling Principle.
  - f. Describe the relationship between end-diastolic volume and preload.
  - g. Describe the effect of myocardial contractility on stroke volume.
  - h. Describe those factors that will affect contractility.
  - i. Describe the effect of afterload on stroke volume. Tell one factor that can affect afterload.
  - j. Describe the autonomic control of heart rate, including listing the neurotransmitters and their effects.
  - k. Describe the effects of selected hormones on heart rate.
  - l. Describe what is meant by "resistance" in the circulatory system and point out where the greatest variation in resistance occurs in the circulatory system.
  - m. Describe how Poiseuille's Law can illustrate the factors that determine resistance.
  - n. Describe the control of resistance.
  - o. Describe the effects of cardiac output and resistance on mean arterial pressure (MAP).
  - p. List the effectors for cardiac output and for resistance and describe their effects on MAP.

After this exercise, you will be able to do the following:

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