

Workshop Title: Modeling Cardiac Physiology

Presenters:

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Abstract: Participants will focus on integrating physiology applications by using biomedical engineering to visualize the relationships between structure and function of the cardiovascular system. Participants will have the opportunity to brainstorm and plan how to prepare working models of the heart. Once the models have been approved, designed, engineered, and built, participants will be able to model different pathological conditions in their models such as atherosclerosis. Participants will reflect upon the biophysical and biochemical basis of their creations. Through model-building and testing, participants will trouble shoot their inventions, later reflecting upon what changes were made to their original design and how they can best incorporate the lesson into their pedagogy.

Intended audience: Educators of grades 6-12 who would like to learn innovative ways of introducing student centered learning into their classes. The lesson is focused on cardiac physiology and its applications.

Presenter Biography: Dr. Anjur has taught Science at various institutions for the last 23 years, and currently teaches Biology at the Illinois Mathematics and Science Academy. Sowmya's classes have been developed to be mostly student-centered with many hands-on activities to develop and nurture student creativity and enhance articulation. She incorporates high tech, challenging and inter-disciplinary projects such as the construction of heart models, arduino heart rate and blood pressure monitors and other bioengineering topics into her Physiology classes.

Materials provided: Each participant receives both a paper and electronic copy of (1) the anatomy of the cardiovascular system (2) the working of the mechanical and electrical systems of the heart, (3) a list of possible cardiac pathologies, and (4) scenarios and questions that could be used for small group discussions. Participants will also receive assorted materials to construct their heart and pump "blood" through it.

Rough Agenda:

1. **Review of cardiac physiology:** approximately 20 minutes.
 - a. mechanical and electrical systems of the heart
 - b. cardiac pathologies
 - c. fluid flow and factors affecting fluid flow in a closed system
 - d. integrating biophysics and engineering

2. **Brainstorming and Planning:** approximately 20 minutes

- a. brainstorming different models
 - b. getting instructor approval
 - c. using different materials to build the heart
 - d. planning fluid flow in the heart
3. **Construction and preparation of the heart model:** approximately 60 minutes
 4. **Reflection on the model and pedagogy considerations:** approximately 20 minutes

Total time is 120 minutes

Audio/Visual and Computer requirements: Ideally, participants will have wireless internet access and laptop power at each seat, but the workshop could proceed without these as internet use will not be central to the workshop and laptop use will be brief. We will also need a digital projector (for presenters) and a flipchart with pens (for publicly recording comments and suggestions). Windows and Mac laptops will be supported.

Laptop Required: all participants will need a laptop for researching material during the workshop.

Space and Enrollment restrictions: Enrollment must be limited to 25 due to safety and space concerns since this is considered a laboratory activity. Assorted materials for constructing hearts will be supplied so that participants can try different designs before they decide upon their final version. Access to sinks or buckets is necessary to test fluid flow through the models.

Other critical information: Previous versions of this workshop have been presented locally to both teachers and students. Audience feedback has generally been positive and student engagement has been high.