Models as a tool for active learning and enhancing critical thinking skills

Vedham Karpakakunjaram
Biology Department, Montgomery College

**Target audience:**
- Students enrolled in Principles of Biology I (BI 107)

**Goals of the assessment:**
To engage students in active learning and critical thinking:
- Highlight the differences in cellular organization between bacteria, plants and animals
- Establish the link between form and function in cellular structures
- Compare the sizes, shapes and structural components
- These activities were accomplished using 3D models of bacterial, animal and plant cells designed using a computer-aided design software (SolidWorks®) and printed in a Rapid Prototype Printer

**Method:**
- Students were assigned to groups
  - Each group was assigned to identify one type of cell (plant, animal or bacterium) using a combination of cellular structures
- Students engage in active learning and develop critical thinking skills via:
  - Strategizing to identify the cell type
  - Discussing with other groups
  - Summarizing their conclusions in a questionnaire
- Assessed conceptual, analytical and critical thinking skills during the activity

**Learning Outcomes and Assessment**

| Class Average in questions related to cell structure and function |
|---------------------------------|------------------|
| (With Activity) | (Without Activity) |
| 13.7/20 (69%) | 7.2/20 (36%) |

**Results:**
- I observed a significant improvement in student performance, when tested on concepts related to the activity
- Hands-on experience with models and solving the “puzzle” as a team: important components in the learning process and student success

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