

Information visualization as it pertains to the classroom

Lauren Monroe



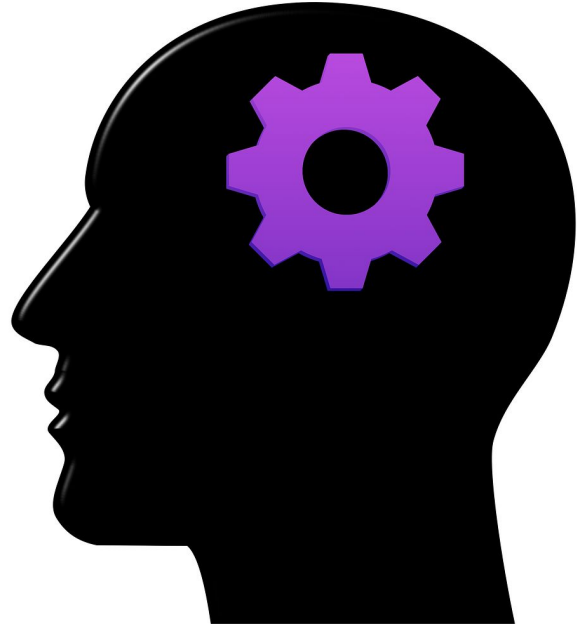
What does it mean?

- “ refers to the use of computer-supported, interactive visual representations of numerical and non-numerical abstract data sets in order to amplify human cognition³ ”
- “ visual representations of abstract data to reinforce human cognition⁴ ”

Why is it important?

Cognitive Resource Theory⁵

Depletion of 'pools of energy'



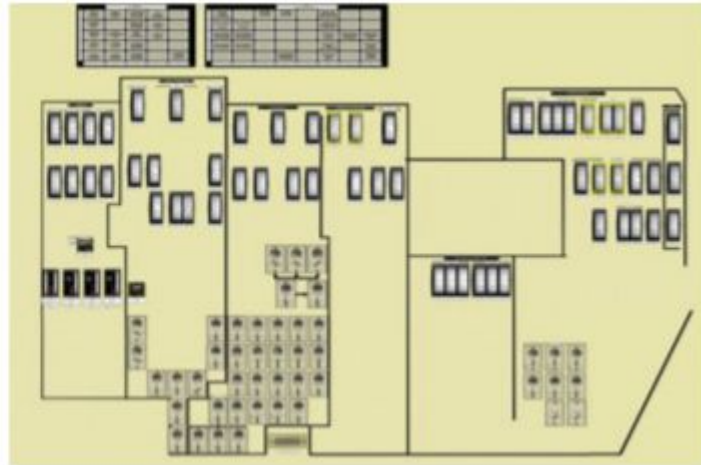
Nuclear Power Plant Operator Error⁶



Detection tasks in nuclear power plant operation

3 Tasks:

- Checking Task
- Detection Task
- Response Implementation Task



Results

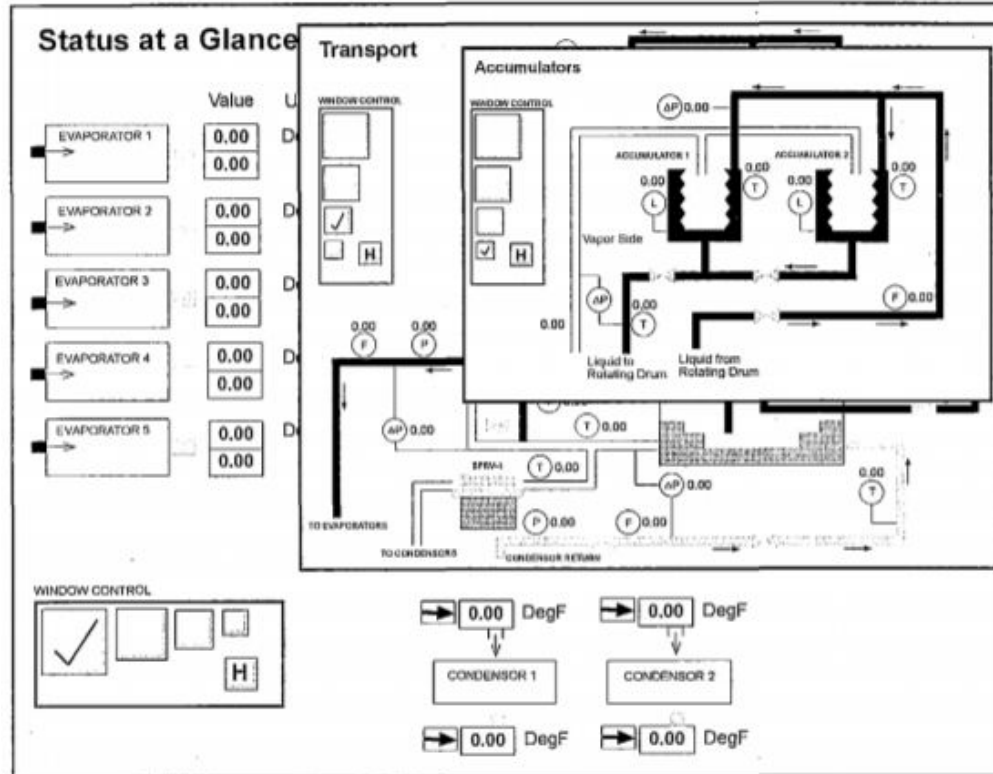


- Decreased Accuracy
 - Increased Response Time
 - Increase in Stress
-
- “a heightened probability of detection errors as a task progresses, accompanied by changes in neurocognitive functioning”

Space Station Freedom⁷



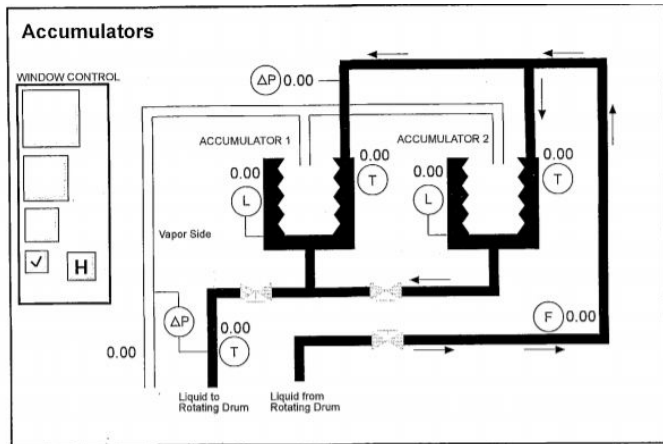
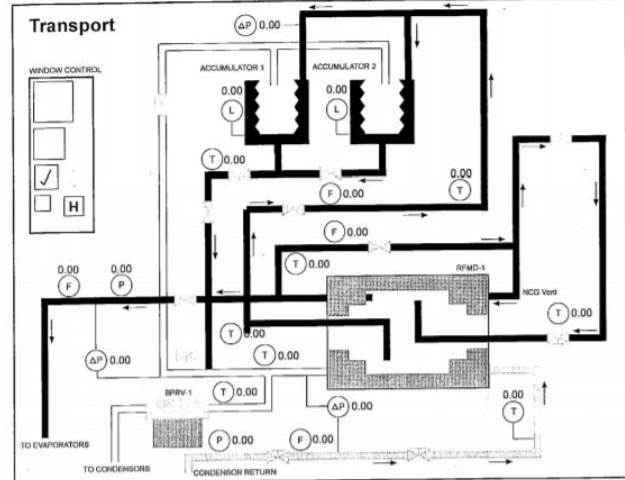
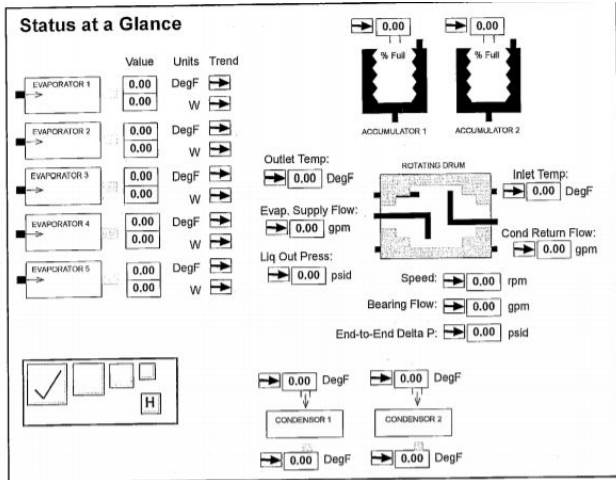
Full Interface Display



What happens when something goes wrong?

Color change indicates a problem

- 1. what other information is relevant to this event
- 2. remembering where it resides within the virtual space
- 3. recalling what series of navigation mechanisms will call up that display



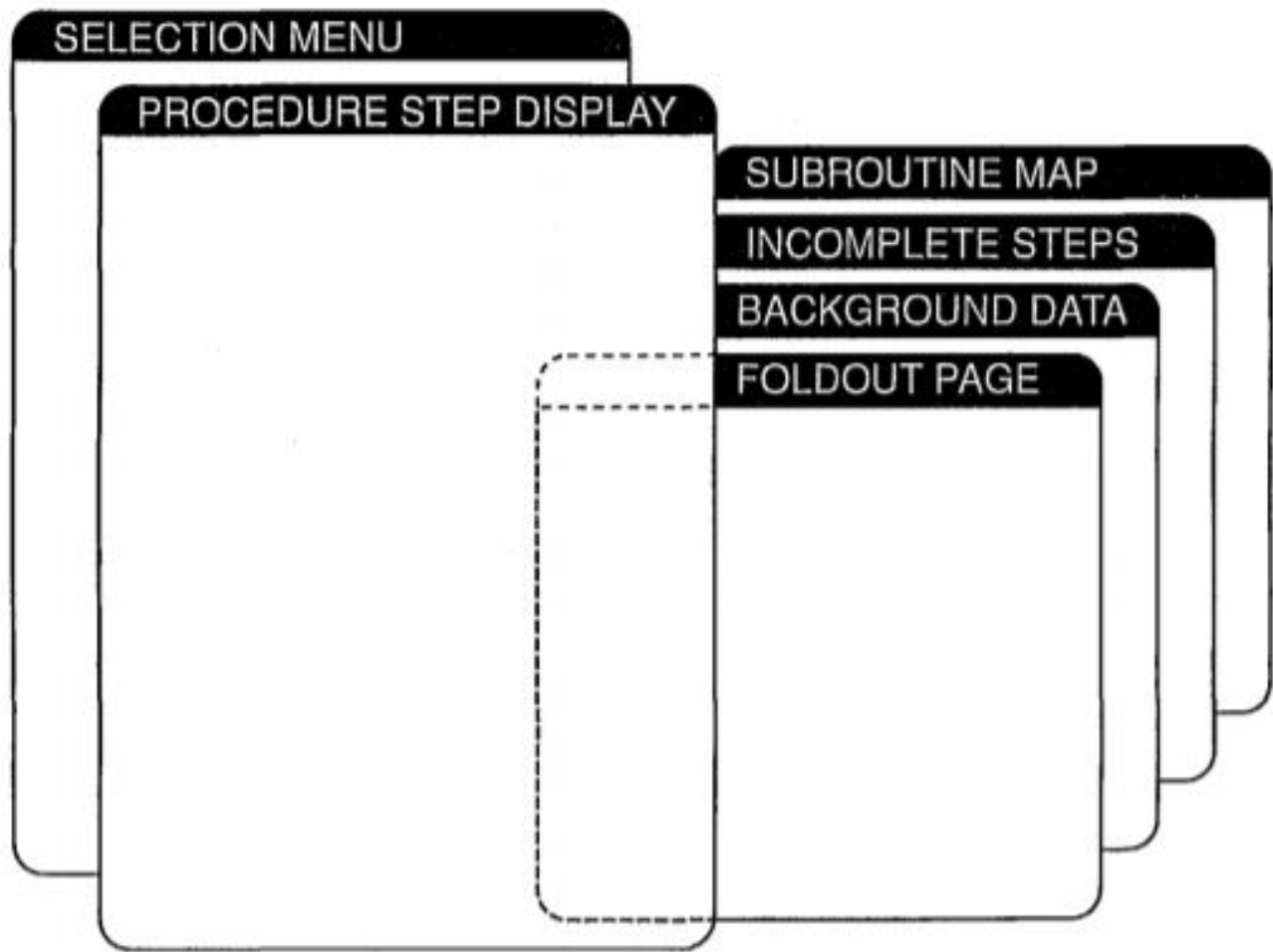
Multiple Displays Problem

- “extra workload and other burdens that can be imposed when the structure of the interface forces serial search for highly interrelated data”



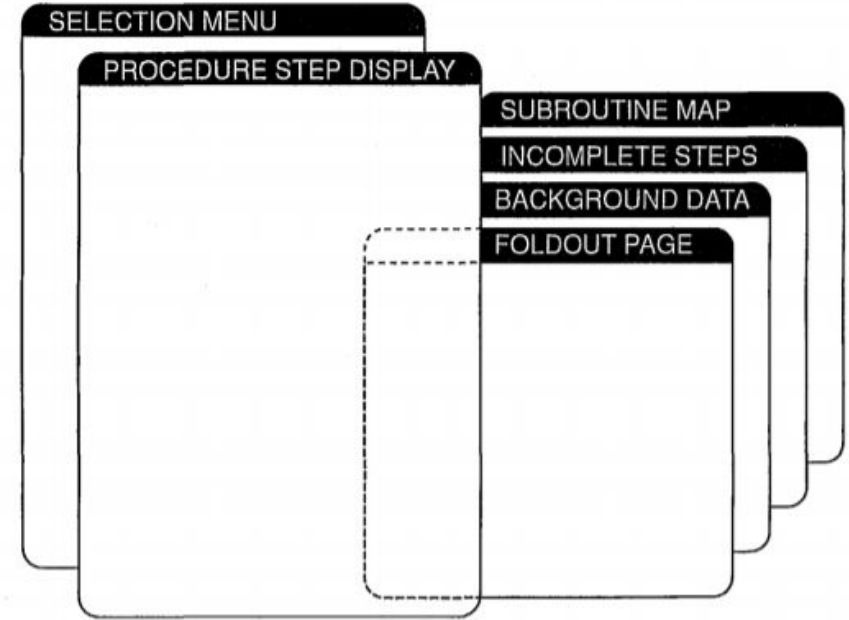
What to do?

- Navigation
- Orientation information
- Shift attentional focus
- Adapt to a changing environment



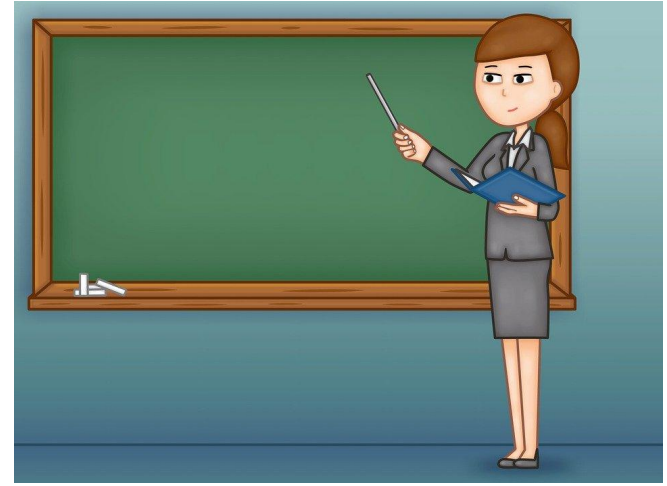
For most users...

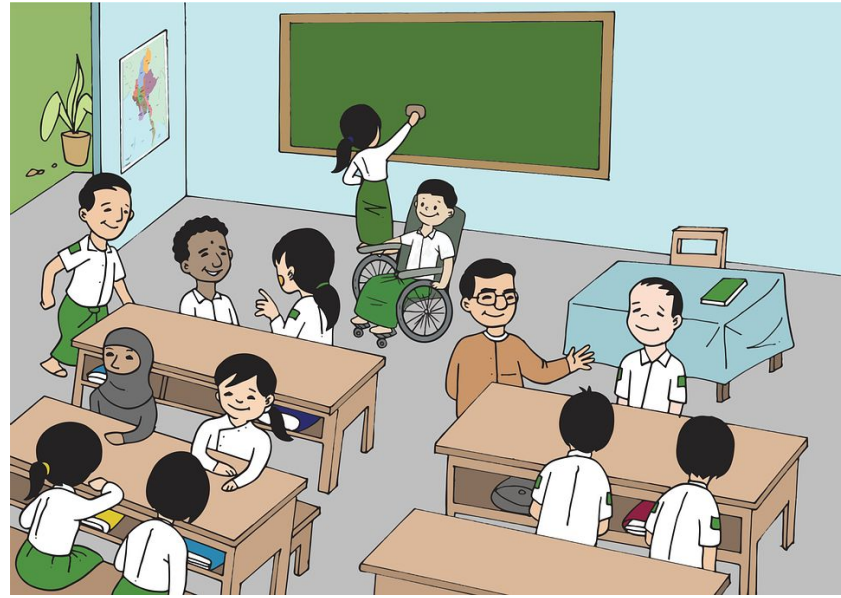
- content and options need to be seen in parallel
- longshot and local views need to be seen in parallel



Why Education?

- “ ... reinforce human cognition”
- “ ... amplify human cognition”





What does previous research have to say about information visualization in the classroom?⁸

Looked at:

- Instructors beliefs and behaviours about classroom technology use
- Technology proficiency in the classroom
- Any information visualization techniques the instructors used

Beliefs

- 86.4% = technology increases job performance
- 87.5 % = technology improved effectiveness
- 88.9% = technology is essential to teaching and learning

Behaviours

- May use tech in general but is not used in “most” of their classes
- teachers’ perception of their teaching practices is truly and markedly different from actual practice

International Society of Technology in Education's 10 Commandment for Effective Information Visualization and Technology use in the classroom

1) vision with support and proactive leadership from stakeholders

2) educators skilled in the use of technology for learning

3) knowledge of content standards and curriculum resources

4) student-centered approaches to learning

5) assessment of the effectiveness of information with technology of and for learning

6) access to current and emerging technologies

7) technical assistance for maintaining and using technology resources

8) community partners who provide expertise, support, and real-life interactions

9) ongoing financial support for sustained technology use

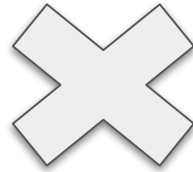
10) policies and standards supporting new learning environments

Goal

Wanted to encourage “authentic problem solving” by selecting specific technology to visualize information

Within Subjects Factorial Study

Task Type
Matching Task - Plant Biology
Learning Task - Anatomy and Physiology



Task Type
Matching Task - Plant Biology
Learning Task - Anatomy and Physiology

A: Memory Task Good Information Visualization

B: Memory Task Bad Information Visualization

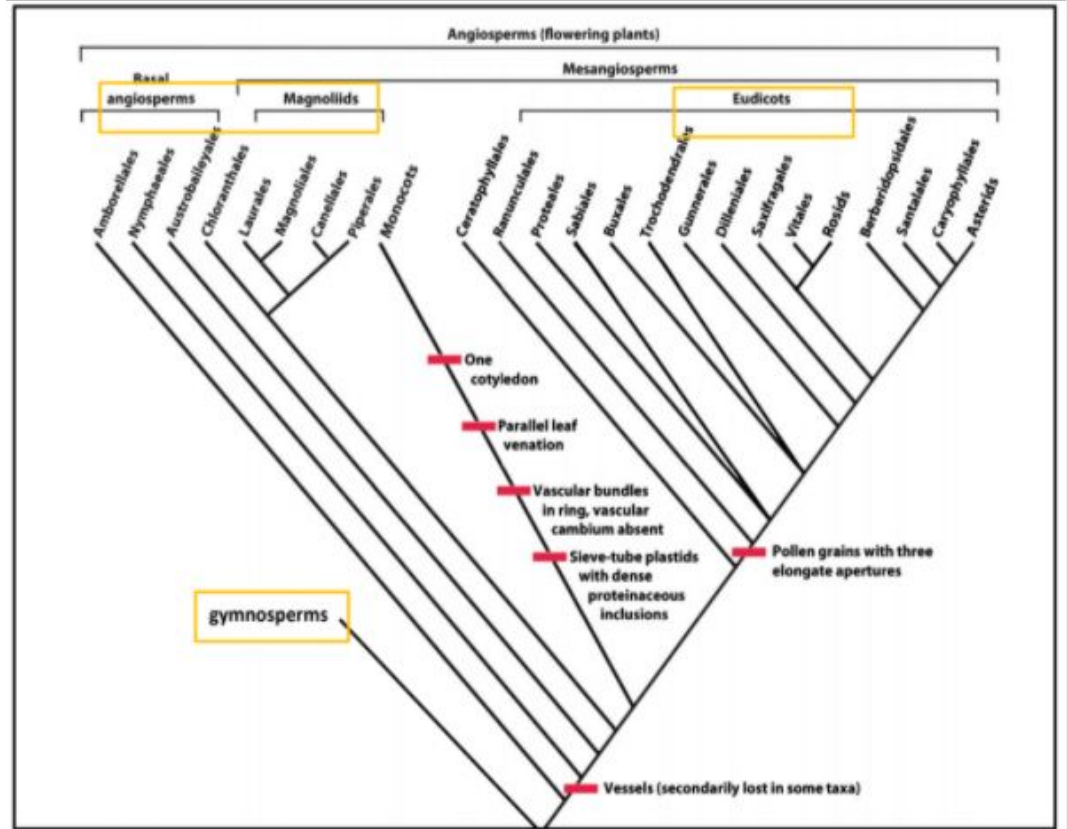
C: Learning Task Good Information Visualization

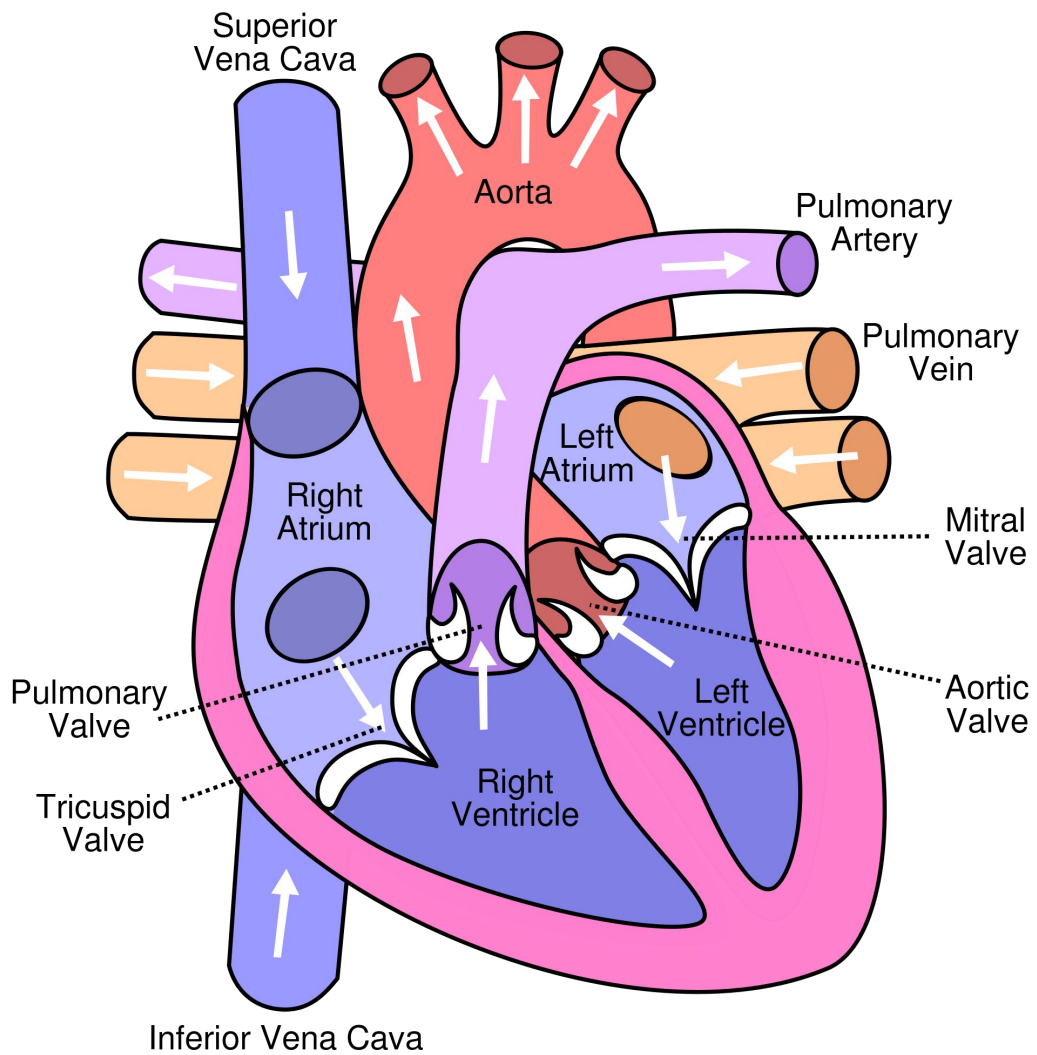
D: Learning Task Bad Information Visualization

	1	2	3	4
1	A	C	B	D
2	D	A	C	B
3	B	D	A	C
4	C	B	D	A

Possible 4 X 4 Latin Square Configuration

- Species separated by traits
- Each branch is a separate species
- The closer related the species are the closer they are to each other physically on the tree







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Thank You!

Any Questions?