

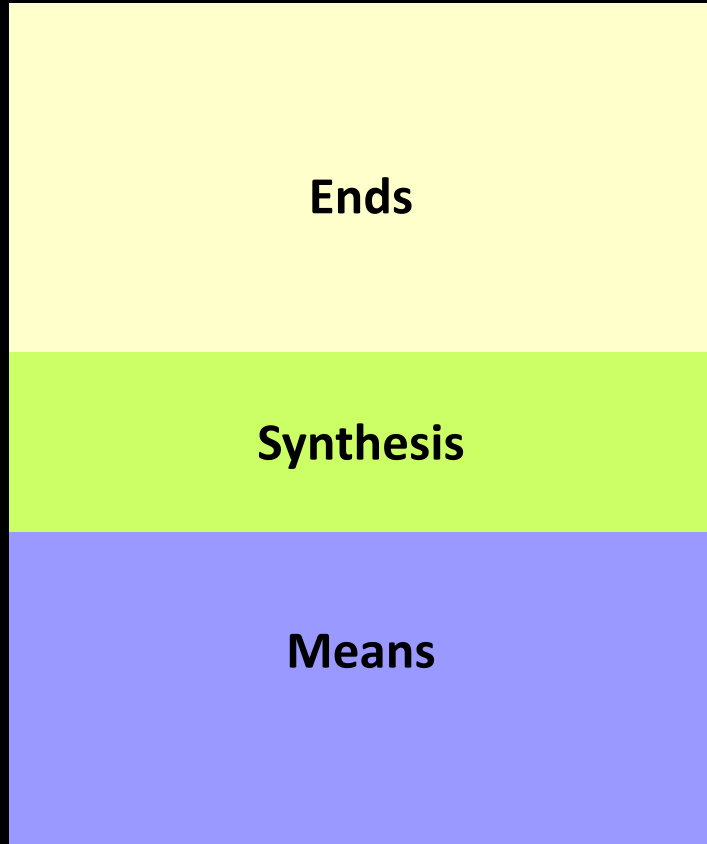
# Teaching Spatial Concepts with GIS: **Design as Method**

## Comments

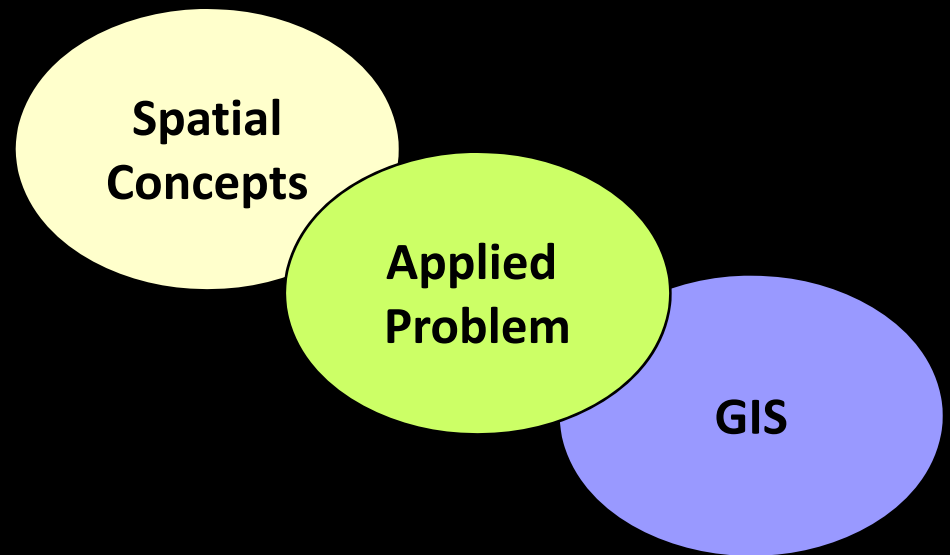
- (1) Use of applied problems (no cookbooks)
- (2) Use of diagrams
- (3) Solving versus setting problems
- (4) Domains and choreography of concepts

Jeff Howarth  
Geography Department  
Middlebury College, Vermont

# *Design*

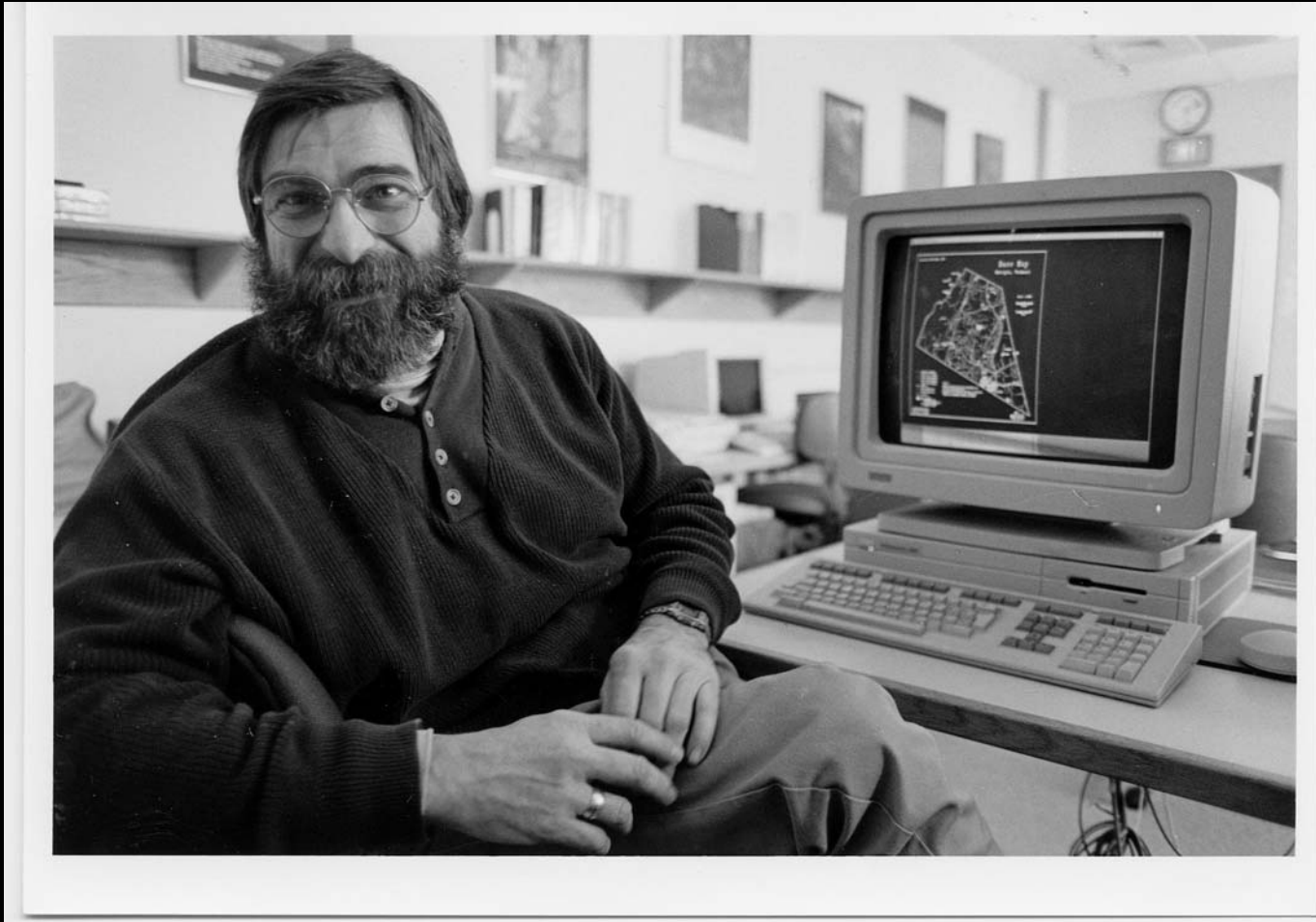


# *Teaching Spatial Concepts with GIS*



***Bob Churchill (1946-2004)***

***Geography Department, Middlebury College, Vermont***



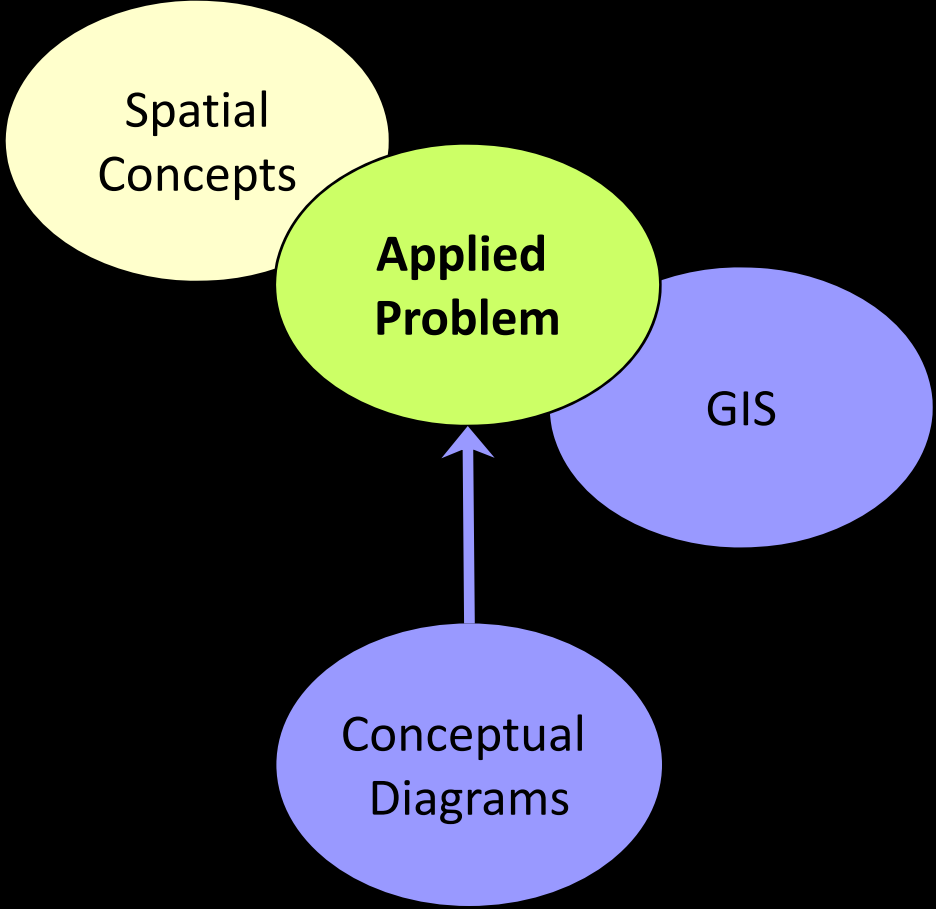
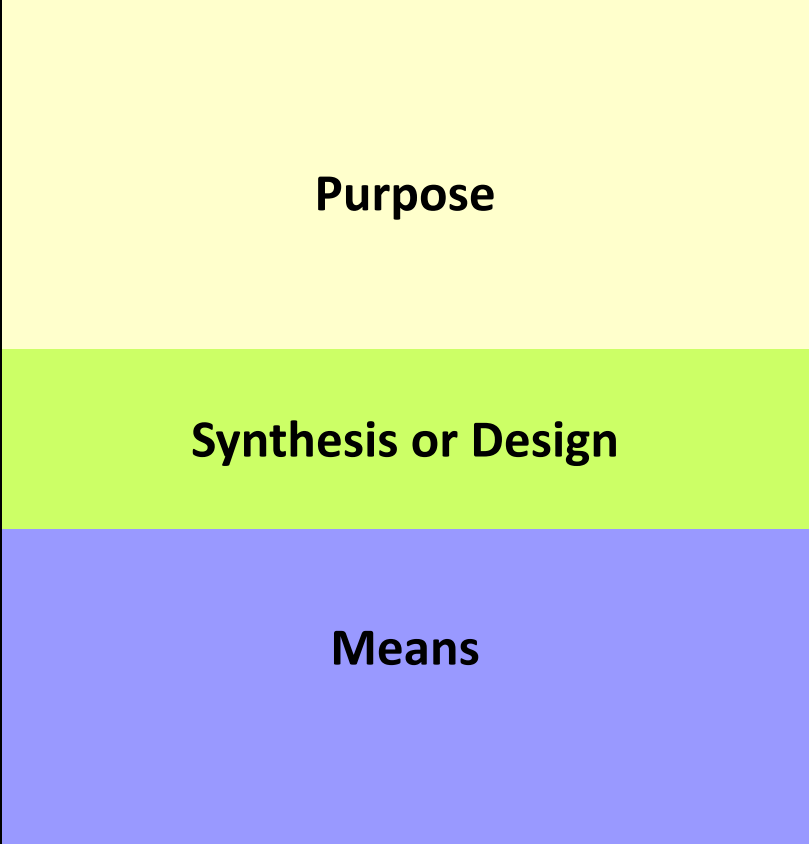
Courtesy Bill Hegman

GEOGRAPHIC INFORMATION SYSTEMS (GG320)  
Department of Geography  
Lab Exercise #5  
October 11-12, 1995

The primary purposes of this exercise are to introduce ARC/PLOT, the ARC/INFO® program for constructing and querying maps and to illustrate the principles of coverage overlays. An applied problem in *Idrisi*® is included for experience and review.

### Vector Overlays in ARC/INFO®:

The town of Middlebury wants to build a scenic walking trail, but state regulations prohibit the siting of new recreational facilities within one-half kilometer of underground petrochemical storage facilities (i. e. gasoline stations). While some soils are simply unsuited to the construction of a highly used trail, soil type also serves as a reasonable surrogate for vegetation cover and terrain. In particular, those soils that are suitable for this project include AmB, CtA, FaC, FnB, NeB, NeD, and NsC. Finally, the area required for the trail should be at least 275,000 square meters. Please use vector overlay in ARC/INFO® to find all areas in the Middlebury vicinity that meet these criteria. Then use ARC/PLOT to construct a map that shows acceptable sites as shaded polygons. The map also should include streams and petrochemical storage sites symbolized appropriately, a title, a neatline or border around the entire map composition, a scale in RF and graphic formats, and anything else you consider useful. Please generate a hardcopy of the final map on the Zeta plotter.

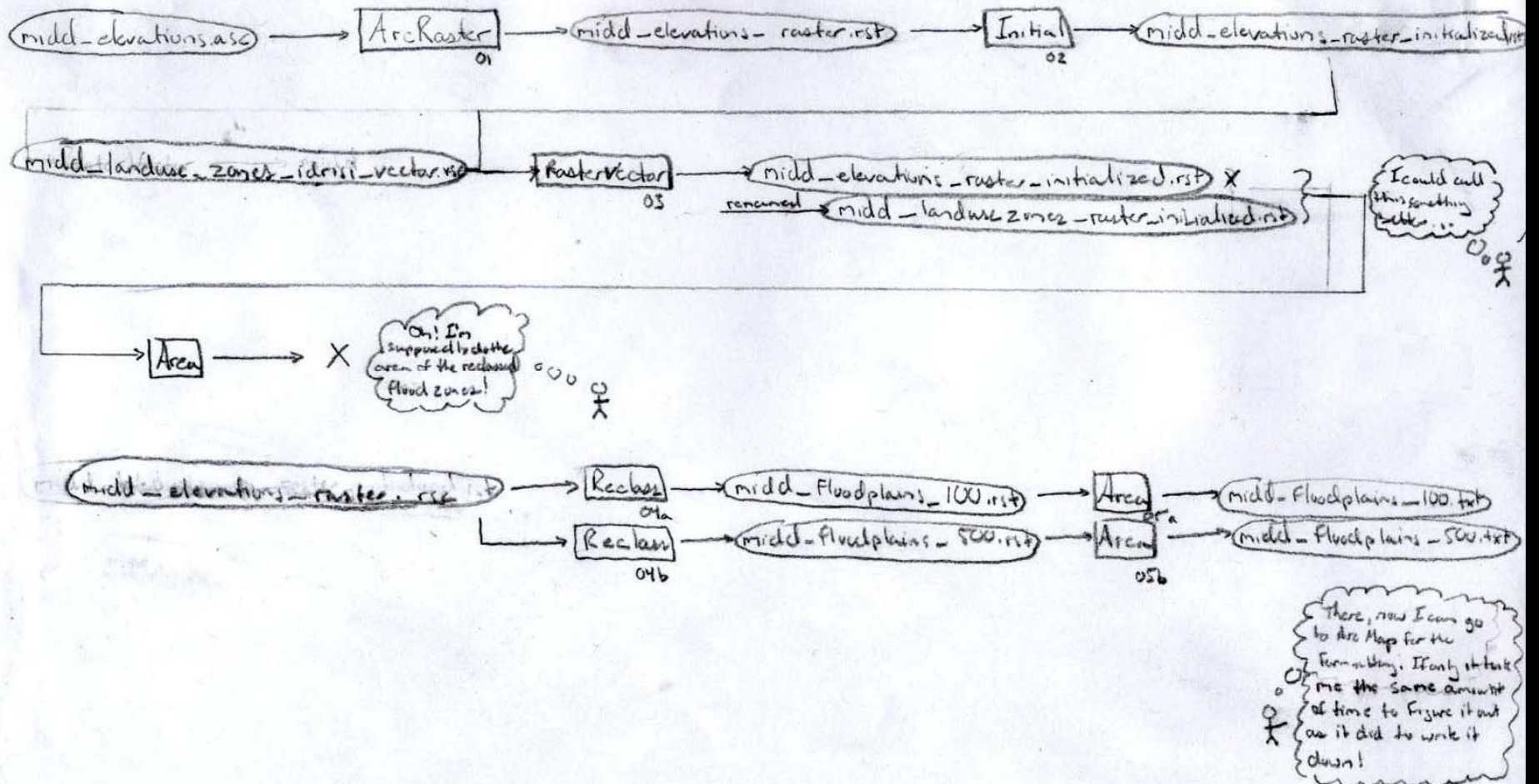


# Diagram

# how they solved the problem

Ben Zorach '10

Flow Chart, Week 1



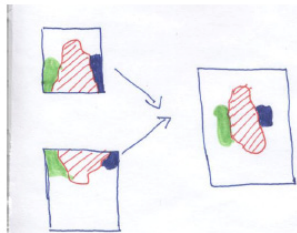
Ben Zorach '10

# Diagram

# graphic manual of spatial operations

## ArcGIS Data Management Operations

### MOSAIC TO NEW RASTER

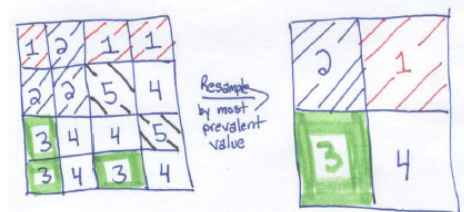


*Objective:* Combine several adjacent rasters into a new, larger raster

*Parameters:*

- 1) Since coordinate info is already included, user does not need to specify order of rasters in mosaic
- 2) Cell size of new raster
- 3) Mosaic method (determines method used to combine overlapping areas)

### RESAMPLE



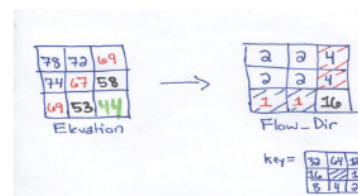
*Objective:* Sample data from input raster and creates output raster of new proportions by altering cell size

*Parameters:*

- 1) Cell size of output raster
- 2) Resampling technique (algorithm used to calculate values of new cells)

## ArcGIS Neighborhood/Focal Operations

### FLOW DIRECTION

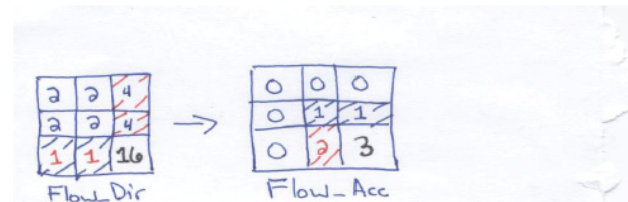


*Objective:* Create new raster in which each cell's value corresponds to relative location of adjacent cell with lowest elevation value. Thus, the new value for each cell expresses the direction of flow from that cell.

*Parameters:*

- 1) Whether to "force all edge cells to flow outward" (\*normally not used\*) or to allow them to follow normal flow rules

### FLOW ACCUMULATION



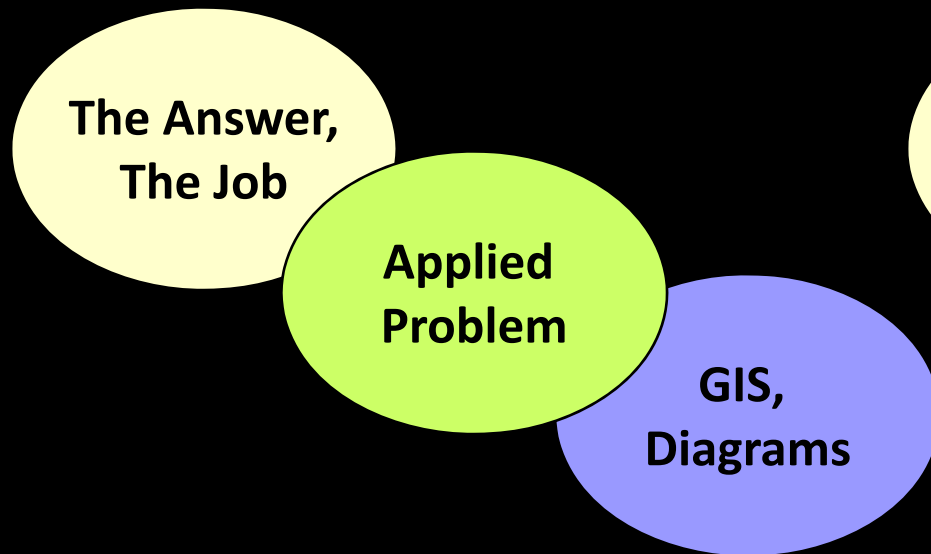
*Objective:* Create new raster (from Flow Direction output) where each cell's value indicates accumulated flow into that cell.

*Parameters:*

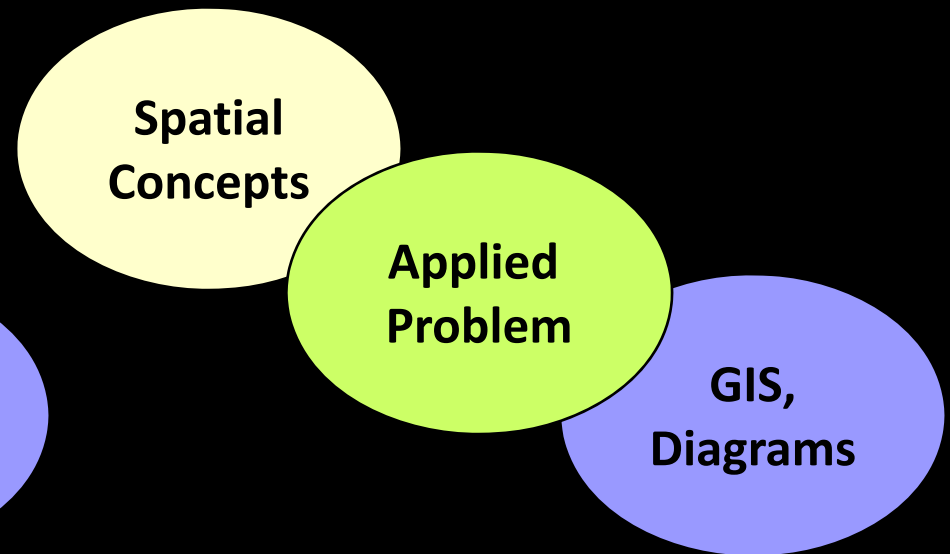
- 1) Output as float or integer format

# *Two Perspectives of Ends*

## *Student's Perspective*



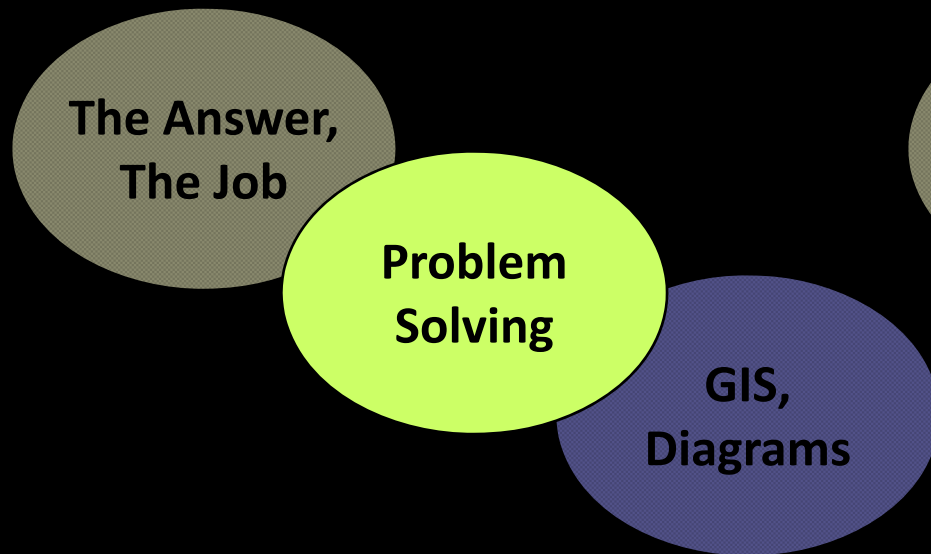
## *Instructor's Perspective*





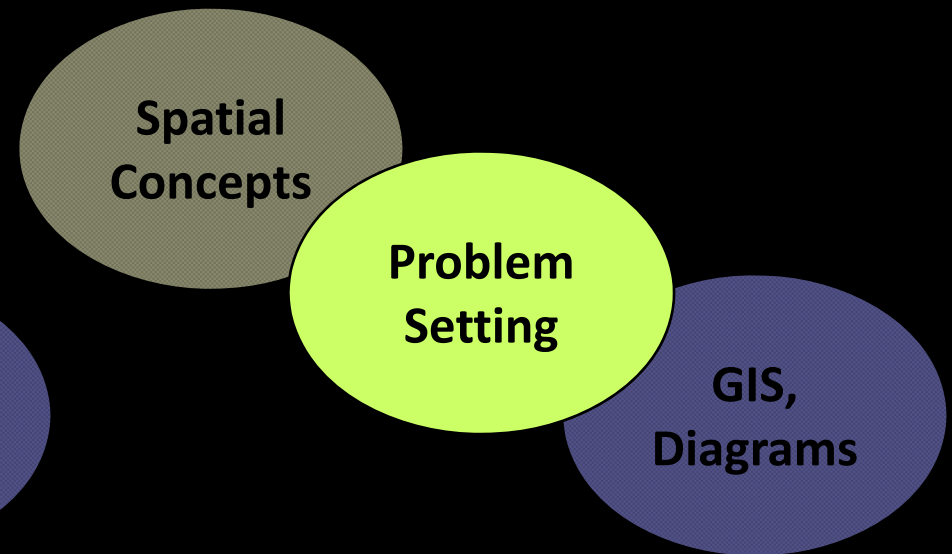
# *Donald Schön (1983)*

## *Instrumentalist*



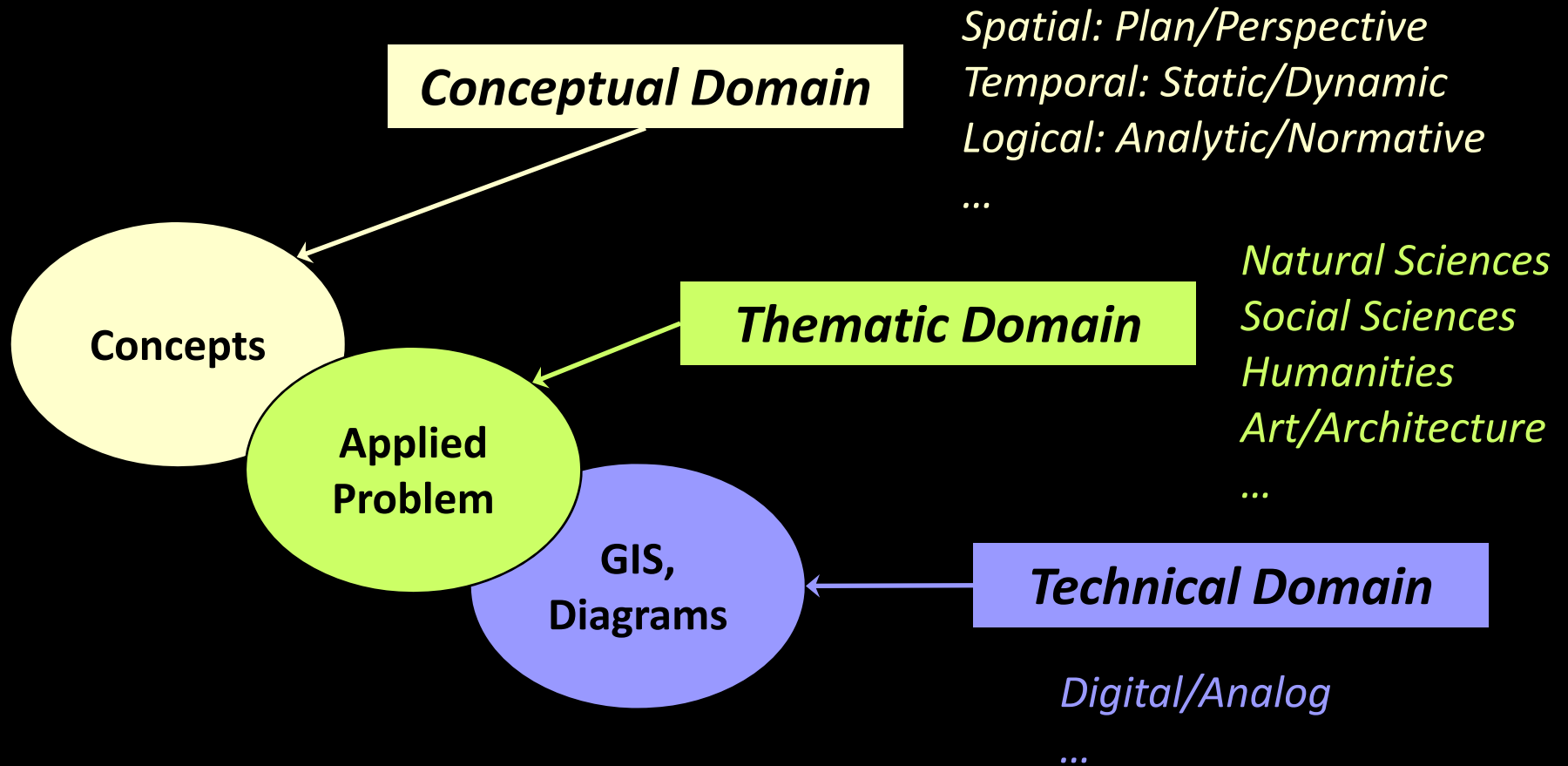
*Given a set of constraints and means, what is the best solution?*

## *Framing the Problem*

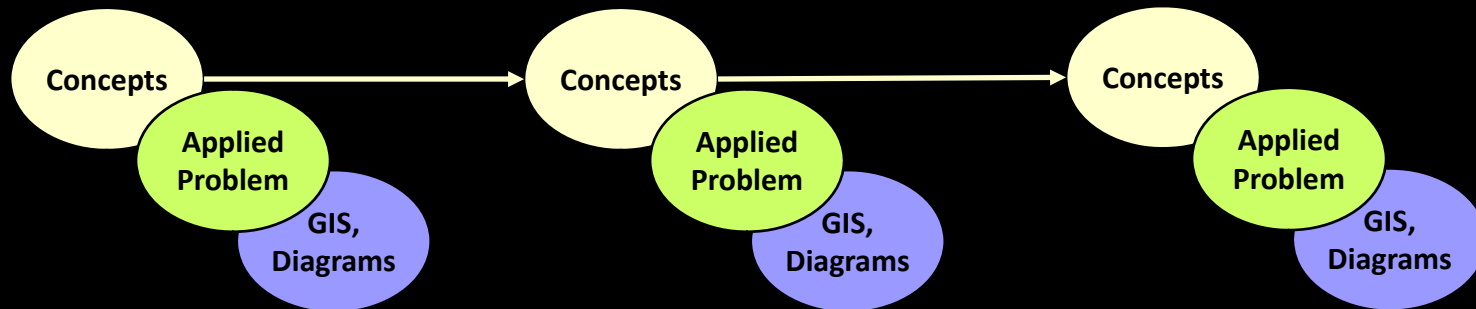


*What ends should be achieved?*

# What are the relevant **domains**?



# What are effective *choreographies*?



*Object vs. Field*

?

?

*Model Flood Zones*

?

?

*Reclassify a DEM*

?

?

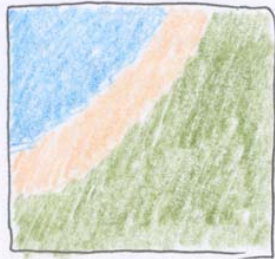
*Based on genealogy (child-parent relations) of concepts*

[jhowarth@middlebury.edu](mailto:jhowarth@middlebury.edu)

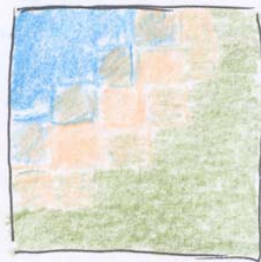
• Scale

Grain:

Shoreline:



10m grain



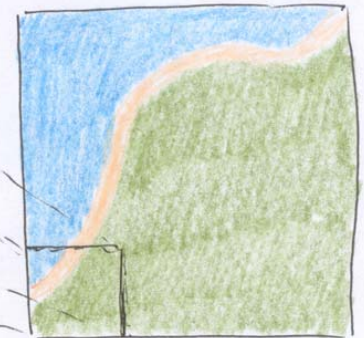
30m grain

Extent:



150m

Smaller



600m

Larger

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