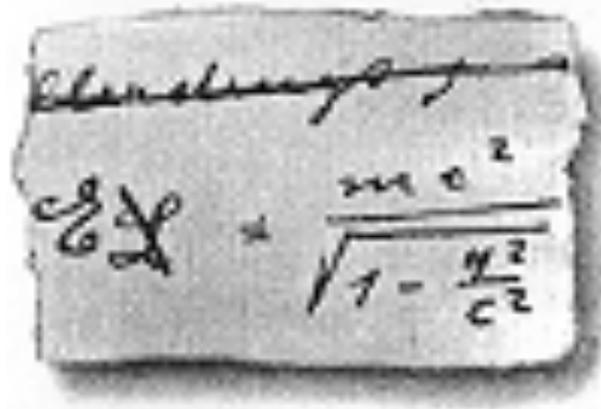# CREATIVITY

Problem Solving

- Creativity occurs during problem solving
  - Poets
    - Expressing feelings within constraints of poem
  - Painters
    - Problems of design, balance, expression
  - Scientists
    - Experiments, theories
- Creative solutions to problems within a domain

Creativity: Definition

- Creative solutions to a problem
  - Novel
  - Useful/appropriate

Definition: Novelty

- Historical Creativity

Definition: Novelty

- Psychological Creativity

Definition: Usefulness

- A problem solution that actually solves the problem

- A problem solution that is relevant to the problem.

Romantic View of Creativity

- Creative individuals
- Possess traits normal individuals lack
  - Personality traits
    - Motivation, self-conviction, risk-taking
  - Problem-solving skills
    - Divergent thinking, remote associations
- Focus on historical creativity

Creative problem solving processes

- Divergent thinking
  - Divergent production tasks
    - Alternate Uses Task

- Remote association
  - Remote associates task

Divergent Thinking

- Fluency
    - The number of ideas produced
- Flexibility
    - The divergence of the ideas produced
- Originality
    - The uniqueness of the ideas produced
- Elaboration
    - The detail of the description of the ideas produced

Alternate Uses Task

Given: a NEWSPAPER (used for reading). You might think of the following other uses for a newspaper

1. Start a fire
2. Wrap garbage
3. Swat flies
4. Stuffing to pack boxes
5. Line drawers or shelves
6. Make a kidnap note

1. SHOE (used as footwear)

2. BUTTON (used to fasten things)

3. KEY (used to open a lock)

Remote Associations

- The ability to form connections between unrelated ideas
  - Go beyond task demands
- Remote Associates Task

TUG GRAVY SHOW: _____

Evaluating Romantic View

- Creativity is innate
  - Individuals should be creative throughout lives
  - Creative genius should be recognized for what it is

Evaluating Romantic View

- Creativity tests should predict creative productivity

- RAT

  – Mixed results

    - Grad school – yes

    - Outside of school – lower correlations

- Test creativity as a *general* trait

  – People generally creative within a *specific* domain

Cognitive View of Creativity

- Everybody has the ability to be creative
- Normal cognitive processes
  – Memory retrieval, analogy, problem solving
- Normal knowledge structures
  – Schemas, category knowledge, episodic memory
- Focus on psychological creativity

Cognitive Processes and Knowledge

- Semantic Knowledge
- Episodic Knowledge
  - Effect of examples
- Analogy and conceptual distance

Semantic Knowledge

- Semantic knowledge used to produce novel products
  - Category knowledge
  - Extend what is known
- Ward (1993)

Alien Generation Task

- 94% - Bilateral symmetry
  - Same on both sides of body
- 97% - Standard senses
  - Eyes, ears, mouth
- 97% Standard appendages
  - Arms, legs
- Structural relationships preserved
  - Eyes above nose above mouth
 - Senses contained within the head

Correlated Attributes: Feathers vs. Fur

- Sensitive to correlated attributes in categories
  - Mapped onto novel products
- Draw an alien task
  - Feathers condition
    - More likely to have beaks and/or wings
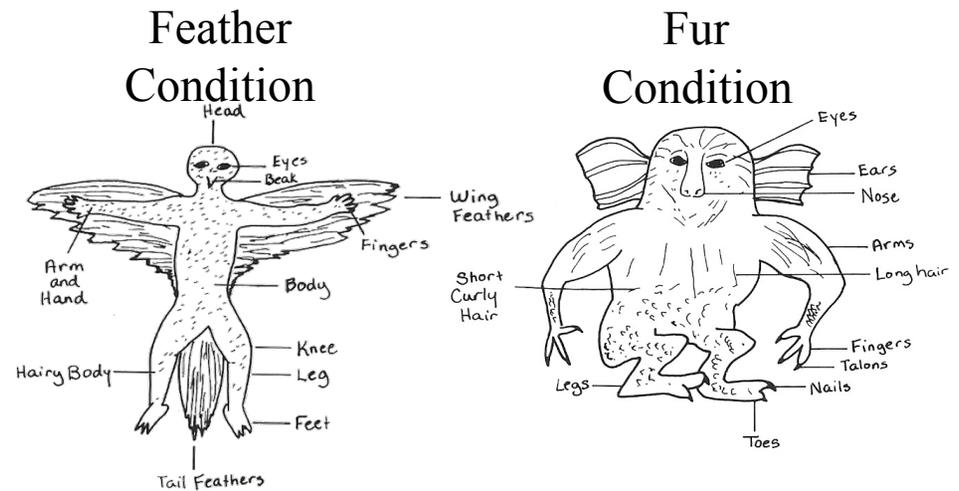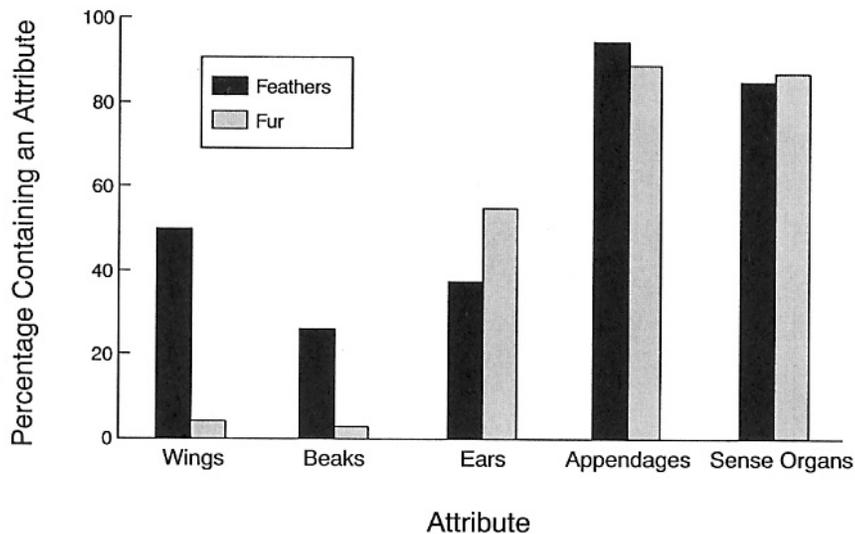
Correlated Attributes: Intelligence

- Draw an alien task - intelligence
  - More likely to look humanoid
  - More likely to possess artifacts
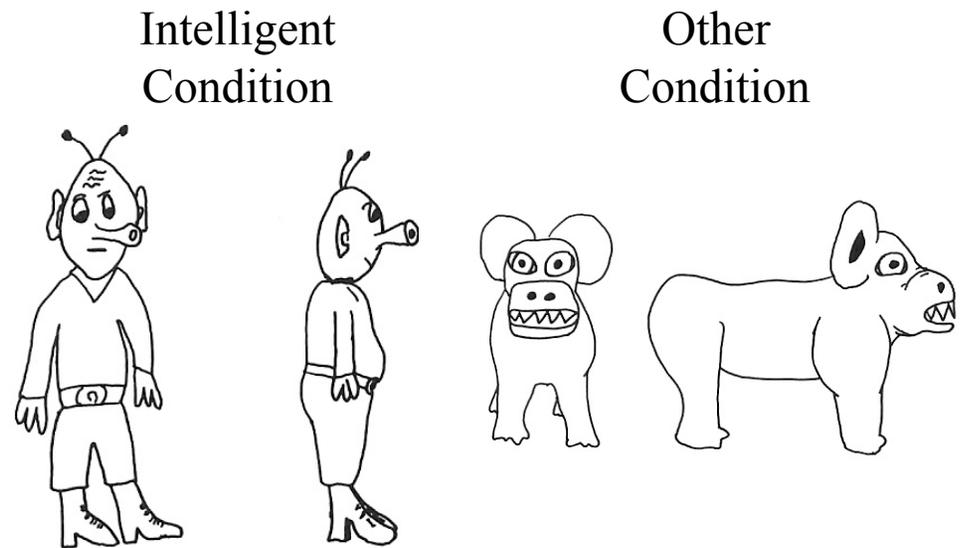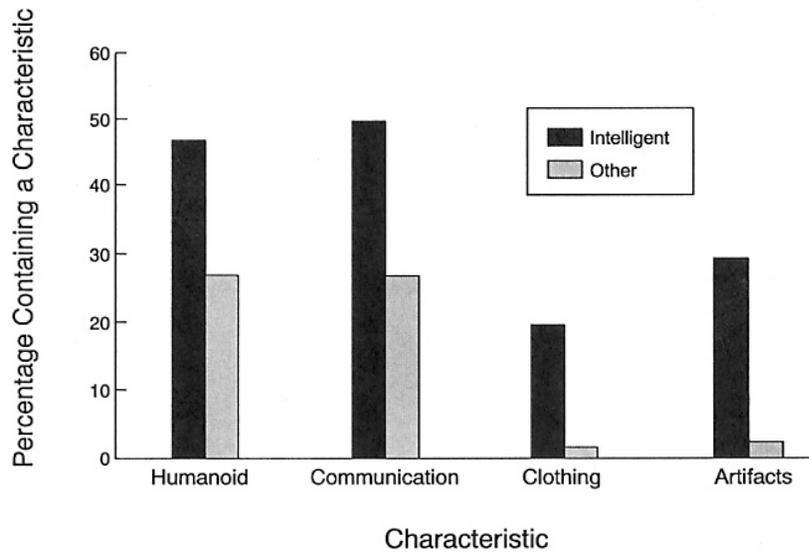
Output Dominance

- Category structure affects production
- High dominance category exemplars
  - More likely to be used as models for novel product

Path of Least Resistance

- Generating novel ideas is difficult
- Model novel exemplars on existing category exemplars
  - High dominance exemplar first to come to mind
- Provides an easy first approach to task

Episodic Memory

- Effect of examples
- Smith, Ward & Schumacher (1993)
  - Shown three examples
    - Four legs
    - Tail
    - Antennae
  - Generation task
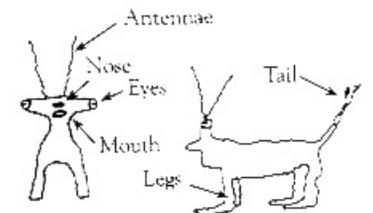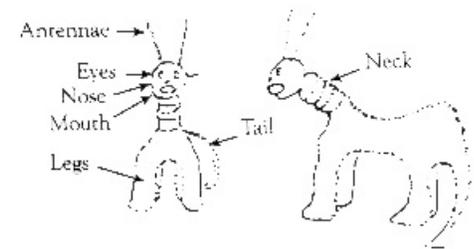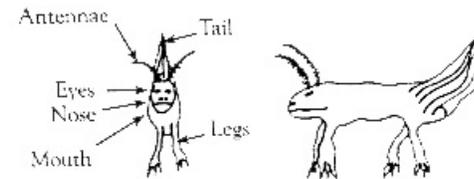
Conformity Effect

- Constraining effects of recently encountered examples
  - Features incorporated into novel product
- Demonstrated in a variety of domains
  - Toys
  - Spill-proof disposable cups
  - Novel category names

Analogy and Creativity

- Normal cognitive process
  - Used by young children
  - Used in a primitive form by apes
- Problem solving heuristic
  - Good for solving ill-defined problems
- Historically associated with creative problem solving

History
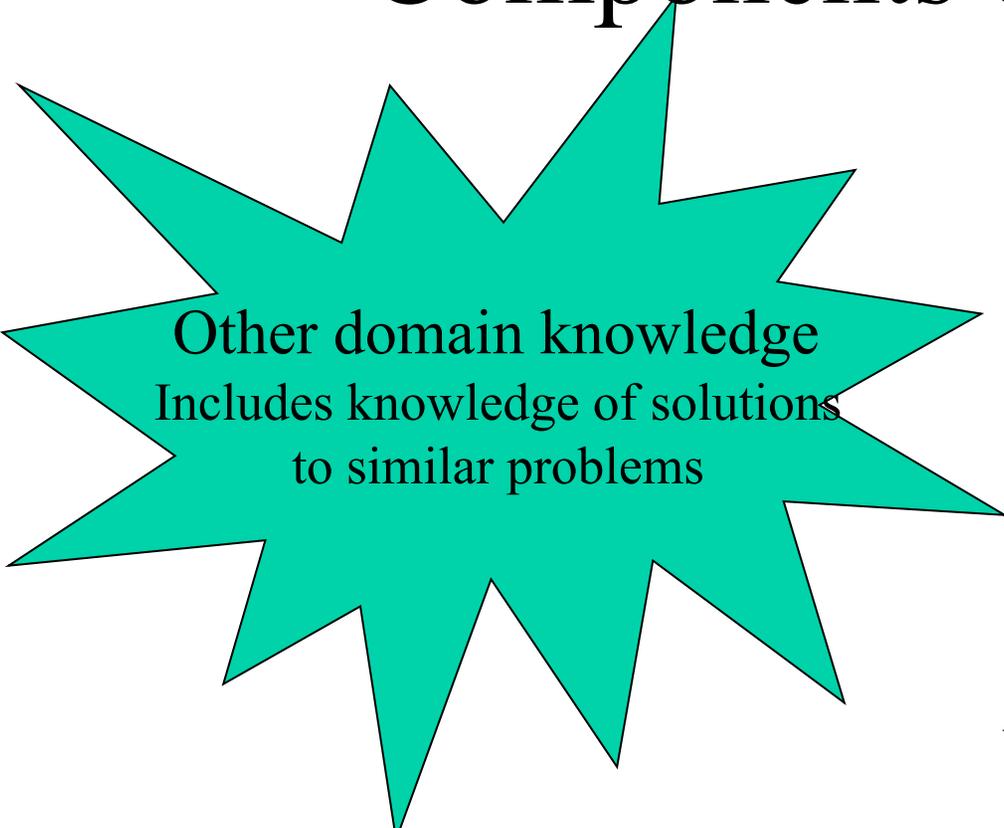
- Samuel Morse
    - Telegraph
- Problem
    - Signal faded
- Analogy
    - Stagecoach horses

History

- Henry Ford
  - Assembly line
- Problem
  - Reduce price
- Analogy
  - Chicago meat packing houses

Components of Analogy

Other domain knowledge
Includes knowledge of solutions
to similar problems

Source Domain
(horse)
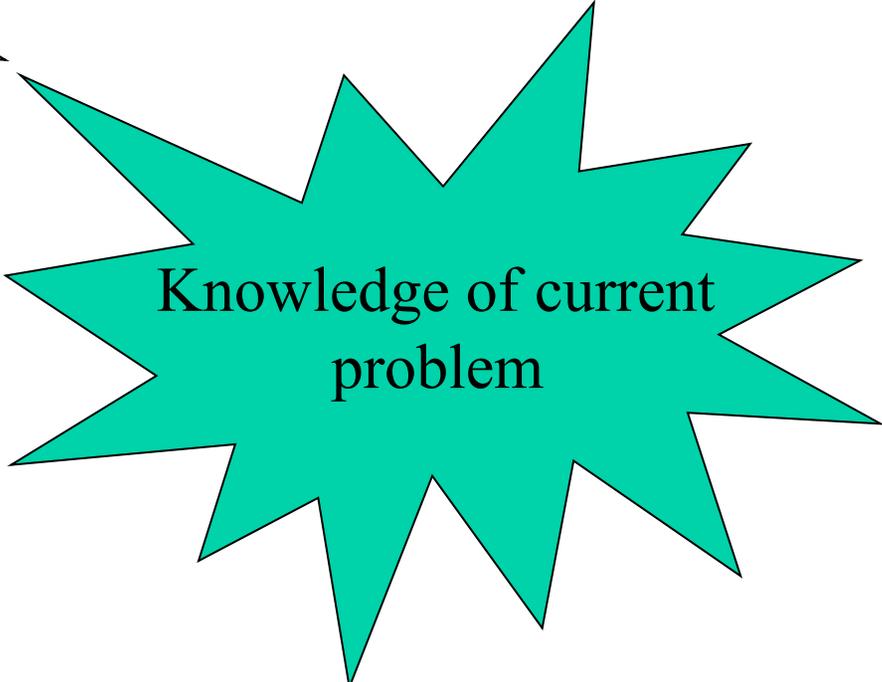
Knowledge of current
problem

Target Domain
(motorcycle)

Analogical Processes

- Retrieval
  - Retrieve source domain
- Mapping
  - Establish correspondences
- Transfer/Inference
  - Apply solution to target domain

Retrieval

- Retrieving knowledge of a source domain from memory

Space ship

Skates

Airplane

Bicycle

Horse

Train

Motorcycle

Car

Conceptual Distance

Near Domain

Distant Domain
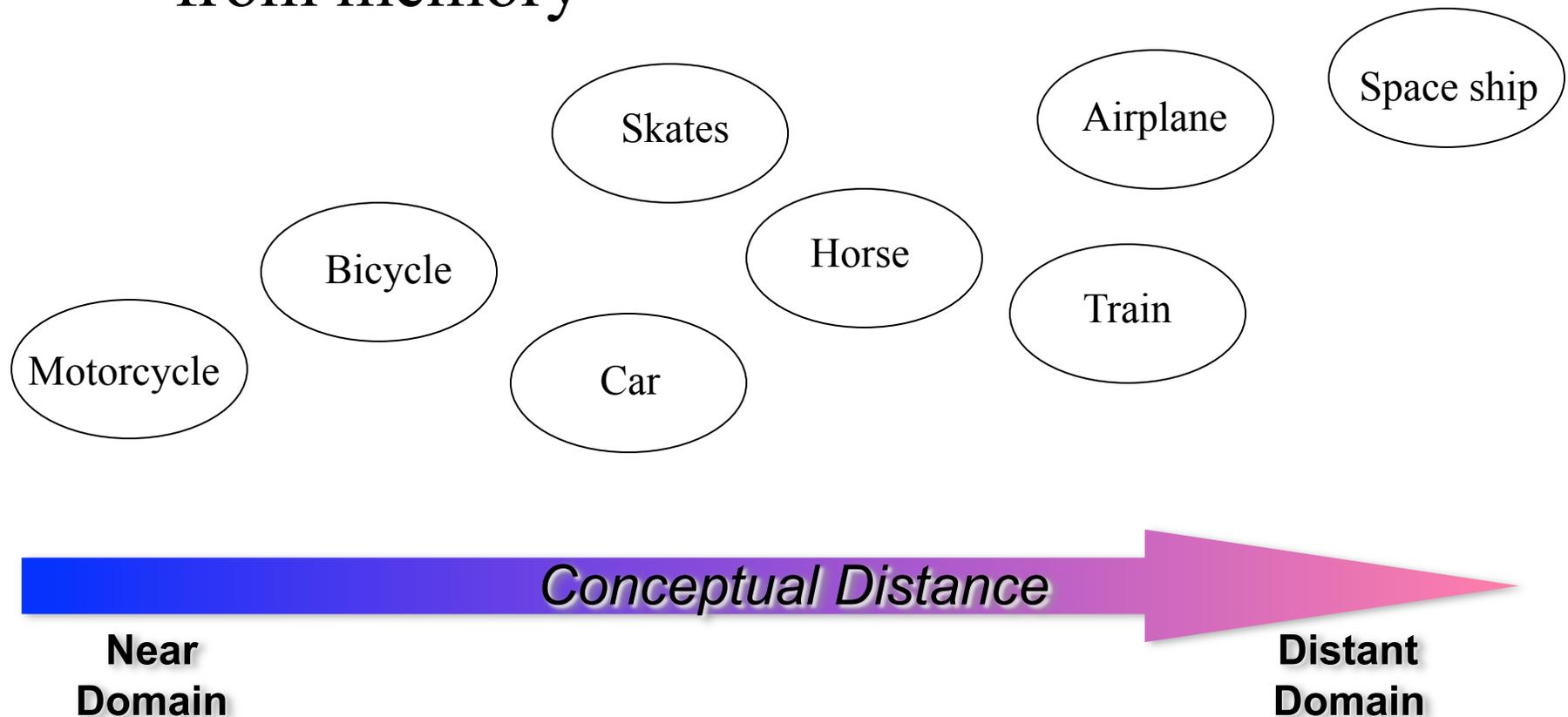
Mapping

- Establishing one-to-one correspondences between domains

Inference/Transfer

- Transfer knowledge between domains
  - Adapt solution to specifics of target domain
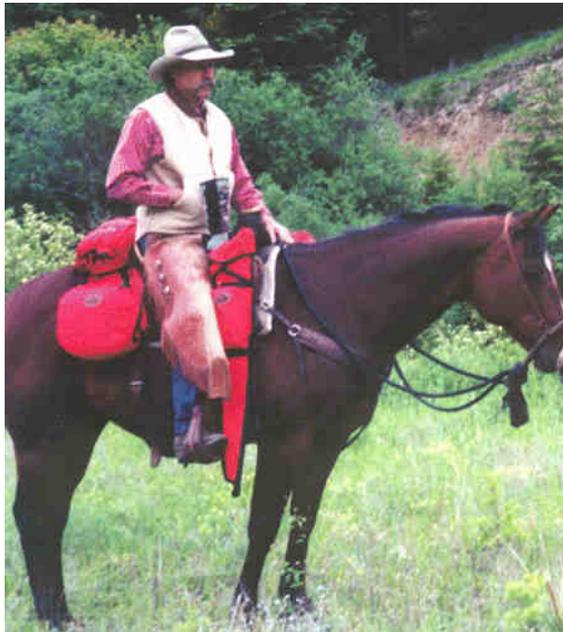
Inference/Transfer

- Source of creative insights
- Insight
  - "AHA!" experience
- Reconceptualization of target domain
  - Innovative solutions generated

Empirical research

- Historically
    - Examines basic analogical processes
- Empirical research examining analogy & creativity lacking
- Current understanding based mainly on retrospective accounts

Retrospective Accounts of Analogy

- Conceptually distant domains lead to creative insights
- Role of analogy
  - Restructure knowledge
- "Is this a valid picture of the role of analogy in creative problem solving?"

Problems with Retrospective Accounts

- Time between insight and reporting insight to others

- Analogy as mental scaffolding
  - Innovators might be unaware of actual processes involved

- Possible selection bias

Analogy Research

- Solve parking problem at O.U.
- Manipulate source domain
    - Mall parking
    - Downtown parking
    - Amusement parks
- Examine solutions generated
    - Number of solutions
    - Originality of solutions
    - Practicality of solutions

Performance on Task

- 85 solutions generated
  - Ideas per person
    - 2-12
  - Average
    - 5.0
- High originality
  - Most frequent responses listed by 30% of sample
- Range of practicality

- **Conceptual distance between source and target domains**
  - **Number of ideas generated**
    - $F(2, 54) = .39$, $p > .05$
  - **Practicality of ideas**
    - $F(2,54) = .31$, $p > .05$
  - **Creativity of ideas**
    - $F(2,54) = 2.85$, $p = .07$
      - Amusement – Mall: $p = .43$
      - Amusement – Downtown: $p = .01$
      - Mall – Downtown: $p = .15$

	# Ideas		Practical		Creative	
	M	SD	M	SD	M	SD
Mall	3.4	2.2	6.0	1.1	6.2	.91
Downtown	3.2	2.3	5.8	1.3	5.8	.67
Amusement	3.9	2.8	5.6	1.4	6.4	.72

- **Specifying source domains**
  - Suggested specific solutions to the parking problem
  - Generated by multiple participants

  - Mall
    – Valet Parking

  - Downtown
    – Time limits

  - Amusement park
    – Front of line passes

Geneplore Model

Generation Of Preinventive Structures

Preinventive Exploration And Interpretation

Focus or expand concept

Product Constraints