Concept Map Versus Matrix Note Taking: Achievement, Attitude, and Note-Taking Effects

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Introduction

Students have difficulty learning from text because information is presented in blocks (paragraphs) and lines (sentences) that **obscure text relationships**.

Planets

Mercury is an inner planet and is 36 million miles from the sun. Its revolution time around the sun is 3 months. Its orbit speed (miles/second) is 30. Its diameter (miles) is 3,000. Mercury has a rocky surface.

Venus is an inner planet and is 67 million miles from the sun. Its revolution time around the sun is 8 months. Its orbit speed (miles/second) is 22. Its diameter (miles) is 8,000. Venus has a rocky surface.

Earth is an inner planet and is 93 million miles from the sun. Its revolution time around the sun is 1 year. Its orbit speed (miles/second) is 19. Its diameter (miles) is 8,000. Earth has a rocky surface.

Mars is an inner planet and is 142 million miles from the sun. Its revolution time around the sun is 2 years. Its orbit speed (miles/second) is 15. Its diameter (miles) is 4,000. Mars has a rocky surface.

Jupiter is an outer planet and is 483 million miles from the sun. Its revolution time around the sun is 12 years. Its orbit speed (miles/second) is 8. Its diameter (miles) is 89,000. Jupiter has a slushy surface.

Saturn is an outer planet and is 886 million miles from the sun. Its revolution time around the sun is 30 years. Its orbit speed (miles/second) is 6. Its diameter (miles) is 75,000. Saturn has a slushy surface.

Uranus is an outer planet and is 2 billion miles from the sun. Its revolution time around the sun is 84 years. Its orbit speed (miles/second) is 4. Its diameter (miles) is 32,000. Uranus has a slushy surface.

Neptune is an outer planet and is 3 billion miles from the sun. Its revolution time around the sun is 165 years. Its orbit speed (miles/second) is 3. Its diameter (miles) is 31,000. Neptune has a slushy surface.

Introduction

Conventional student note taking is not helpful for text learning because students usually record notes in a list-like fashion that also **obscure text relationships** (Kiewra et al., 1991; Jairam & Kiewra, 2010).

Mercury
Miles from sun: 36 million
Revolution time: 3 months
Orbit speed: 30 m/sec
Diameter: 3,000
Surface: rocky
Moons: 0
Rotation time: 59 days

Venus
Miles from sun: 67 million
Revolution time: 8 months
Orbit speed:22 m/sec
Diameter: 8,000
Surface: rocky
Moons: 0
Rotation time: 243 days

Introduction

- Graphic organizers (GO) can help students see and learn text relationships
  - more quickly (Robinson & Skinner, 1996)
  - more effectively (Jairam & Kiewra, 2010)

- GOs are visual representations that display text information in spatial arrangements such as:
  - Hierarchies
  - Sequences
  - Matrices
  - Concept Maps

Introduction

Theoretically, GOs are effective because they are computationally efficient (Larkin & Simon, 1987).

- extract important information from text and position it so that related ideas are close together
- produce spatial patterns that make relationships immediately apparent

Matrix

Planets

	Inner				*Outer*			
	Mercury	*Venus*	*Earth*	*Mars*	*Jupiter*	*Saturn*	*Uranus*	*Neptune*
Miles from the Sun:	36 million	67 million	93 million	142 million	483 million	886 million	2 billion	3 billion
Revolution Time Around the Sun:	3 months	8 months	1 year	2 years	12 years	30 years	84 years	165 years
Orbit Speed Miles/Second):	30	22	19	15	8	6	4	3
Diameter (Miles):	3,000	8,000	8,000	4,000	89,000	75,000	32,000	31,000
Surface:	Rocky	Rocky	Rocky	Rocky	Slushy	Slushy	Slushy	Slushy

Introduction

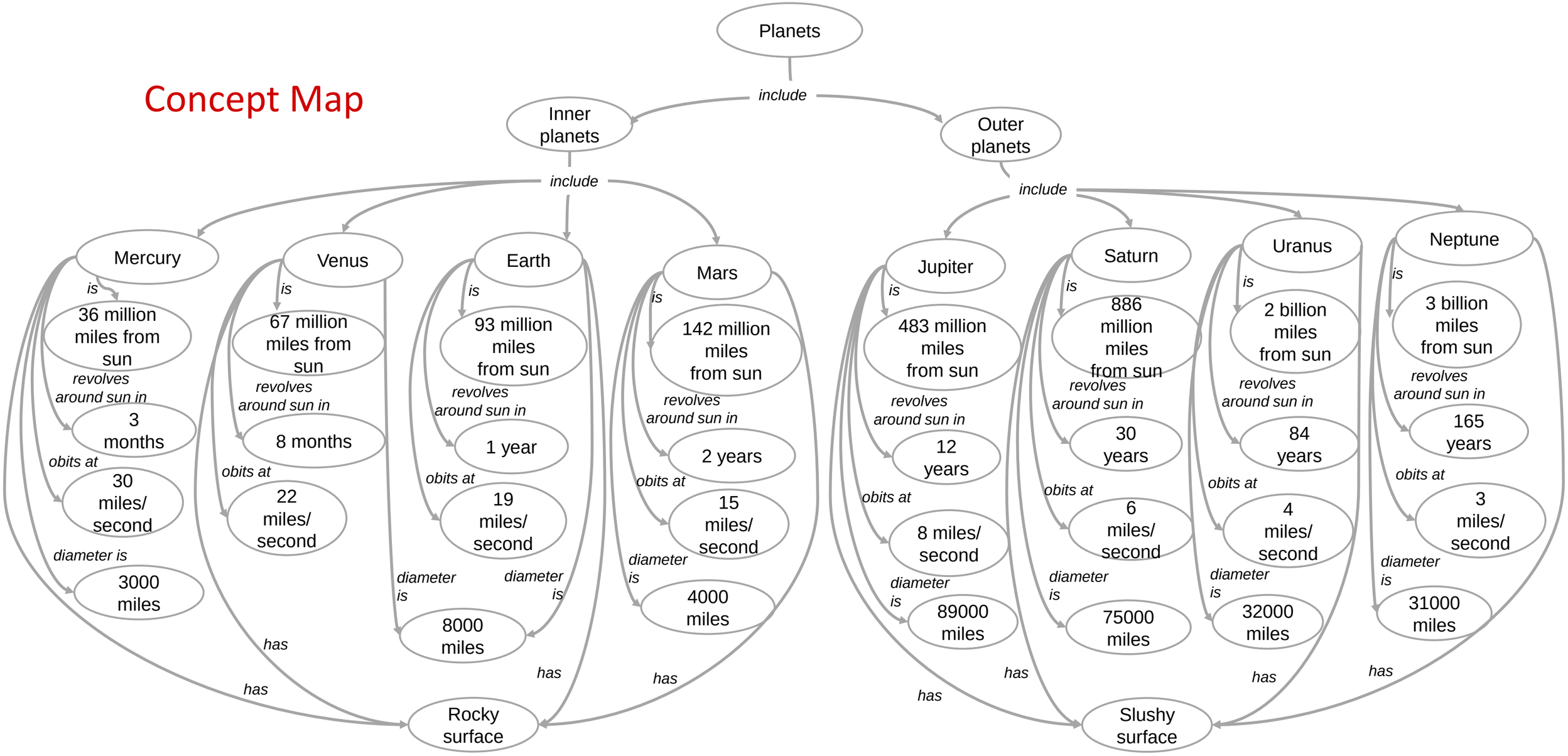
Not all GOs are created equal. Some GOs are more computationally efficient than others.

- matrices are superior to outlines (Kauffman & Kiewra, 2010; Kiewra et al., 1988; Kiewra et al., 1992)
- some matrices are superior to other matrices (Jairam et al., 2011)
- hierarchies are superior to outlines (Robinson & Kiewra, 1995)

Problem Statement

Two of the most widely known and investigated graphic organizers are concept map and matrix. However, there is a lack of scientific research comparing which is more effective. This study compared their effectiveness.

Concept Map


Planets
include
Inner planets
Outer planets
include
include
Mercury
is
36 million miles from sun
revolves around sun in
3 months
obits at
30 miles/ second
diameter is
3000 miles
Venus
is
67 million miles from sun
revolves around sun in
8 months
obits at
22 miles/ second
Earth
is
93 million miles from sun
revolves around sun in
1 year
obits at
19 miles/ second
Mars
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142 million miles from sun
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Rocky surface
Jupiter
is
483 million miles from sun
revolves around sun in
12 years
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Saturn
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886 million miles from sun
revolves around sun in
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Uranus
is
2 billion miles from sun
revolves around sun in
84 years
obits at
4 miles/ second
diameter is
32000 miles
Neptune
is
3 billion miles from sun
revolves around sun in
165 years
obits at
3 miles/ second
diameter is
31000 miles
has
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Slushy surface

Matrix

Two-dimensional cross-classification table or chart

Concept Map

Top-down GOs that represent important concepts, (called nodes), using boxes or circles, and relationships between these nodes, using links

Planets

Inner | *Outer*

	Mercury	*Venus*	*Earth*	*Mars*	*Jupiter*	*Saturn*	*Uranus*	*Neptune*
Miles from the Sun:	36 million	67 million	93 million	142 million	483 million	886 million	2 billion	3 billion
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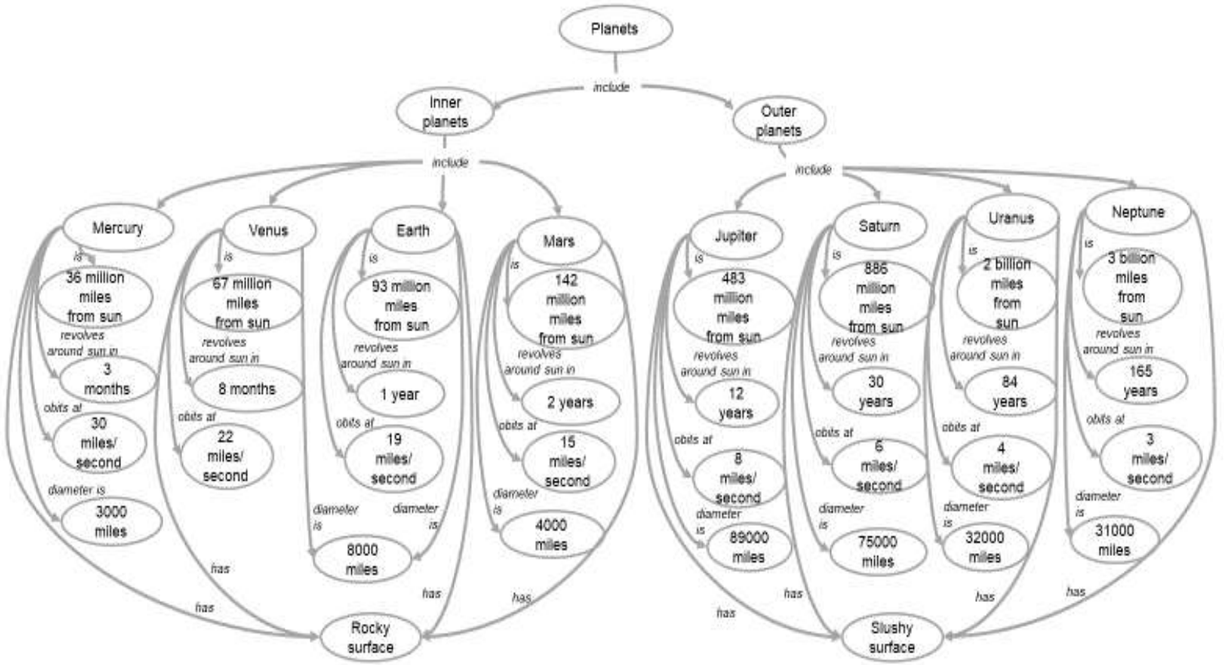
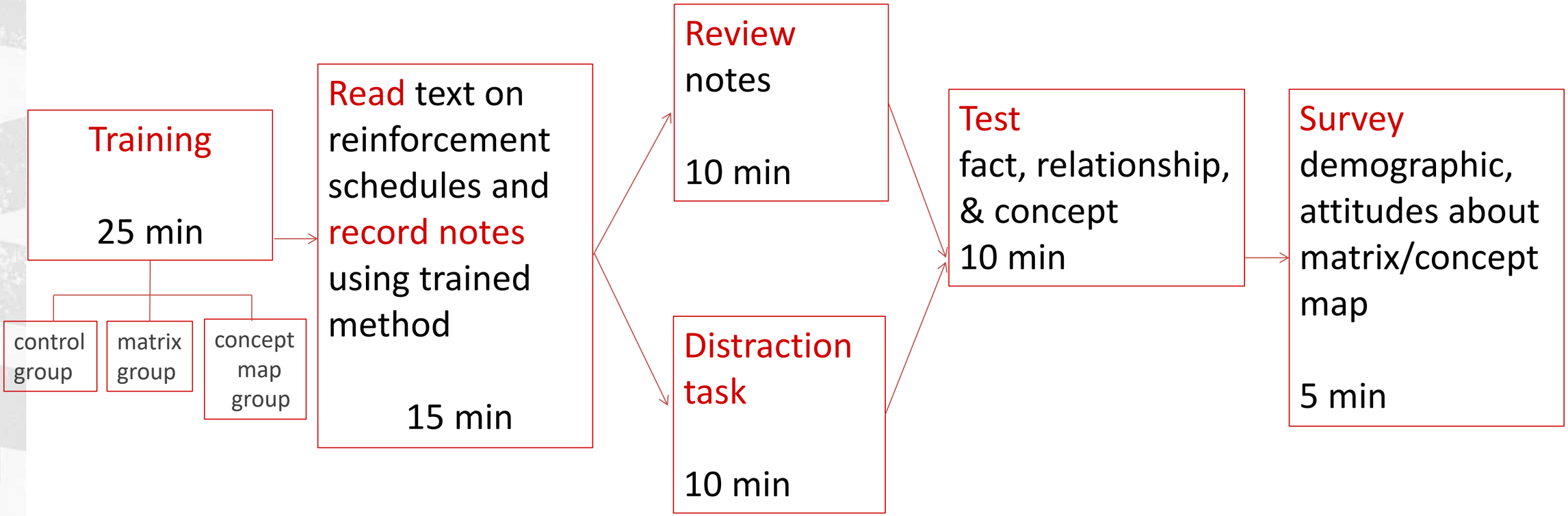
Surface:	Rocky	Rocky	Rocky	Rocky	Slushy	Slushy	Slushy	Slushy



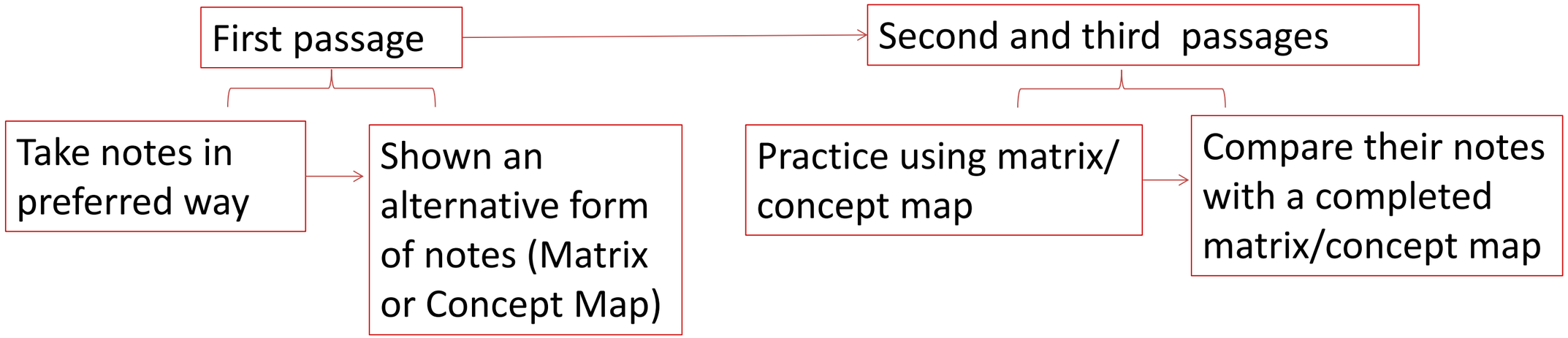
Method

College students (n=176) were assigned randomly to one of three note-taking groups (conventional—the control group, concept map, or matrix) and one of two review groups (review or no review) resulting in 6 groups.



Training

- Conventional note takers practiced taking notes in their preferred way for each of three passages.
- Concept map and matrix note takers:



Survey Results

- Participants had little experience with concept map or matrix note-taking methods and with the reinforcement schedules topic prior to the experiment.

- The three note-taking groups did not differ with respect to any of the demographic variables:
  age, gender, race, year in college, GPA, previous note-taking training, and prior knowledge about reinforcement schedules

Achievement Results

3 (conventional, concept map, or matrix) x 2 (review or no review) ANOVAs were conducted for fact, relationship, and concept learning.

- Conventional note takers learned more relationships than concept map note takers, with matrix note takers falling in between.
- Reviewers learned more relationships than non- reviewers.

Note-taking Results

- Matrix note takers implemented their trained method more successfully than did concept map note takers.
- Matrix note takers recorded more complete notes than both the conventional and concept map note-taking groups.
- Both note-taking indices were positively correlated with fact and relationship scores.

Attitude (Survey) Results

Matrix note takers rated their note-taking method higher than did concept map note takers for all four factors:

- effectiveness
- ease of construction
- enjoyment
- future use

Discussion

1. Conventional note takers achieved more than concept map note takers, but not matrix note takers, on relationship items.
   - This finding is especially telling because the primary purpose of a concept map is relationship learning (Nesbit & Adesope, 2006).

2. Matrix notes were more complete than concept map notes
   - Note completeness is important because it was positively correlated with achievement in the present study and in previous studies (Jairam & Kiewra, 2010; Kiewra, 1985; Nye et al., 1984; Peverly et al., 2014).

Discussion

3. The quality of the matrix notes was better than the quality of the concept map notes

   As was true with previous studies (Swart, 1994; Tseng et al., 2007), students had difficulty producing concept maps as trained.

   Concept maps lacked or misplaced important nodes and links, thereby obscuring potential relationships. Meanwhile, those creating matrix notes were adept at noting and arranging matrix topics, categories, and details.

4. Matrix note takers, relative to concept map note takers, had more positive attitudes about note-taking methods.

Implications

- Matrix notes, because of their completeness, comparative structure, and students' positive attitudes about them, seem a better choice.
- Researchers should continue to investigate the relative merits of concept map and matrix note taking, under varying instructional conditions.

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Thank you!