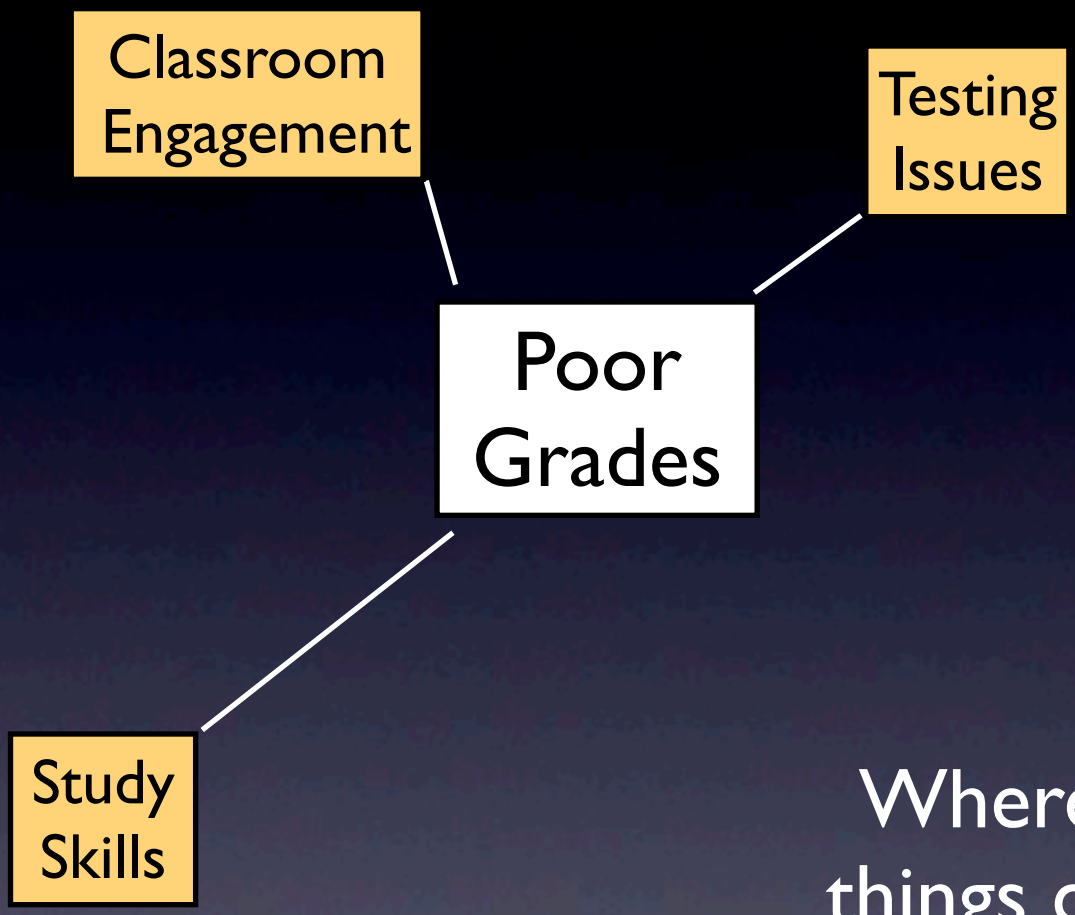
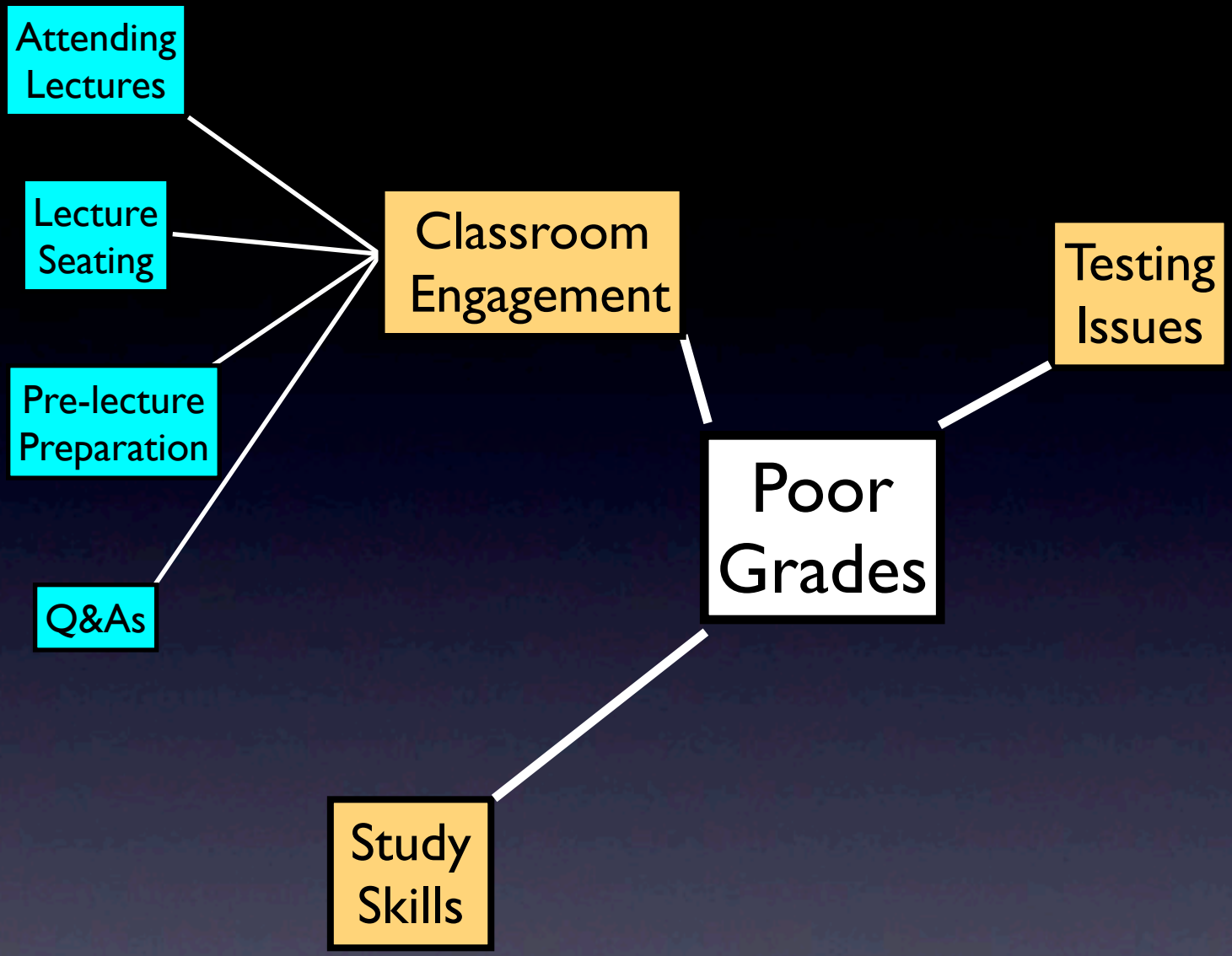
Promoting Student Learning with Spaced Study Sessions, Concept Mapping and Rehearsal Learning

Kenneth J. Sufka, Ph.D.
Professor of Psychology & Pharmacology
The University of Mississippi



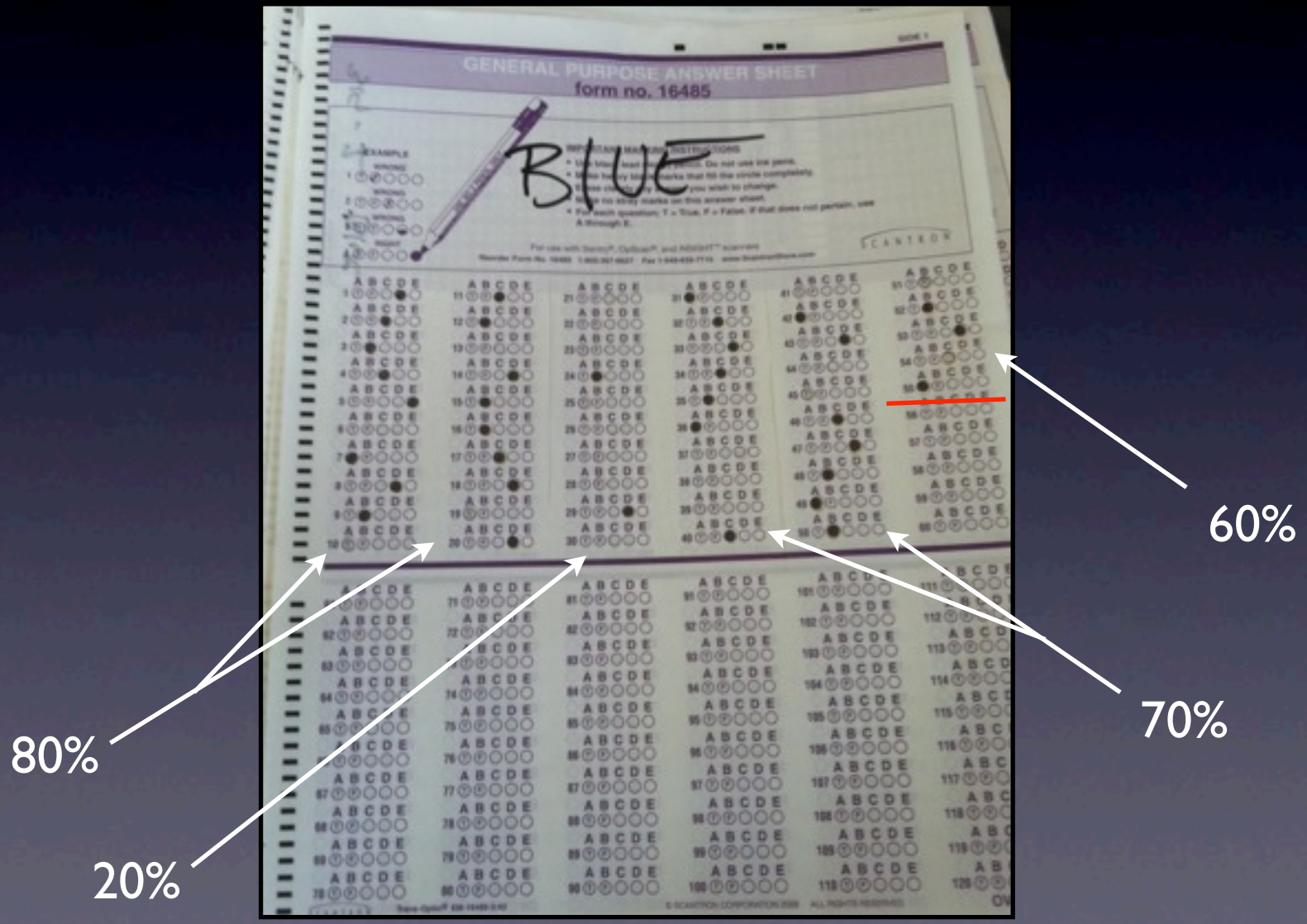
Where do these things come from?


Attending Lectures
Lecture Seating
Pre-lecture Preparation
Q&As
Classroom Engagement
Testing Issues
Poor Grades
Study Skills

- On Classroom Engagement
  - Credé, Roch & Kieszczynka (2010) Class Attendance in College: A Meta-Analytic Review of the Relationship of Class Attendance With Grades and Student Characteristics. Review of Educational Research, 80, 272-295.
    - attendance better predictor of grade/GPA than SAT, HSGPA, study skills & amount study time ($p = 0.44$ & 0.41; 0.49 for science classes)
    - mandatory attendance policy weak effects ($d = 0.21$)
    - student characteristics (conscientiousness, study skills, etc.) weak to moderate predictor of grades ($p =$ 0.16-0.24)

Psy 319: Brain and Behavior

Exam 1 (Fall 2012)



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  - Marshall & Losoonczy-Marshall (2010) Classroom ecology: Relations between seating location, performance and attendance. Psychological Reports, 107, 557-577.
    - 70 classes over 15 yrs, N >1,800 students

Sufka KJ, Hymel KA & Smitherman TA (2012) Supplemental peer instruction: Improving course material mastery. Conference on the First Year Experience, San Antonio, TX.

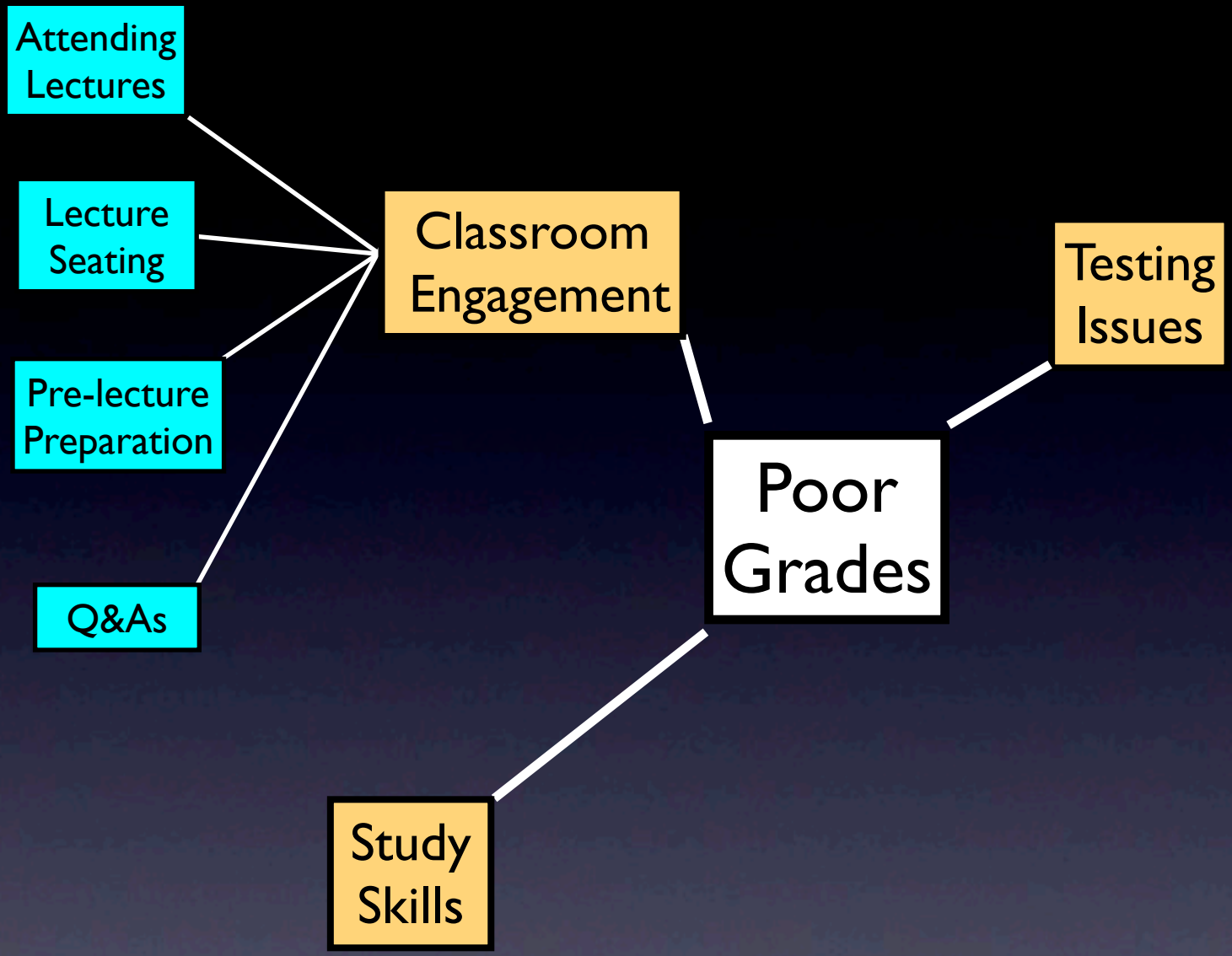
Podium

2	1	2
4	3	4
6	5	6

Group	Zone 1	Zone2	Zone 3	Zone 4	Zone 5	Zone 6
GSP	70%	66%	69%	66%	63%	67%
PS $p<0.005$	86%	83%	87%	80%	77%	66%
GSP $p<0.005$	69%	75%	63%	60%	63%	67%
PS $p<0.05$	84%	86%	75%	79%	80%	79%
GSP	70%	62%	67%	65%	63%	62%
PS $p<0.03$	86%	83%	87%	80%	77%	66%
GSP	71%	69%	66%	64%	72%	64%
PS $p = 0.08$	82%	81%	74%	74%	75%	65%

Rules for Student Success

1. Go to Class-Always
2. Sit in the Sweet Spot
3. Come to Class Prepared
4. When Lost, Ask Questions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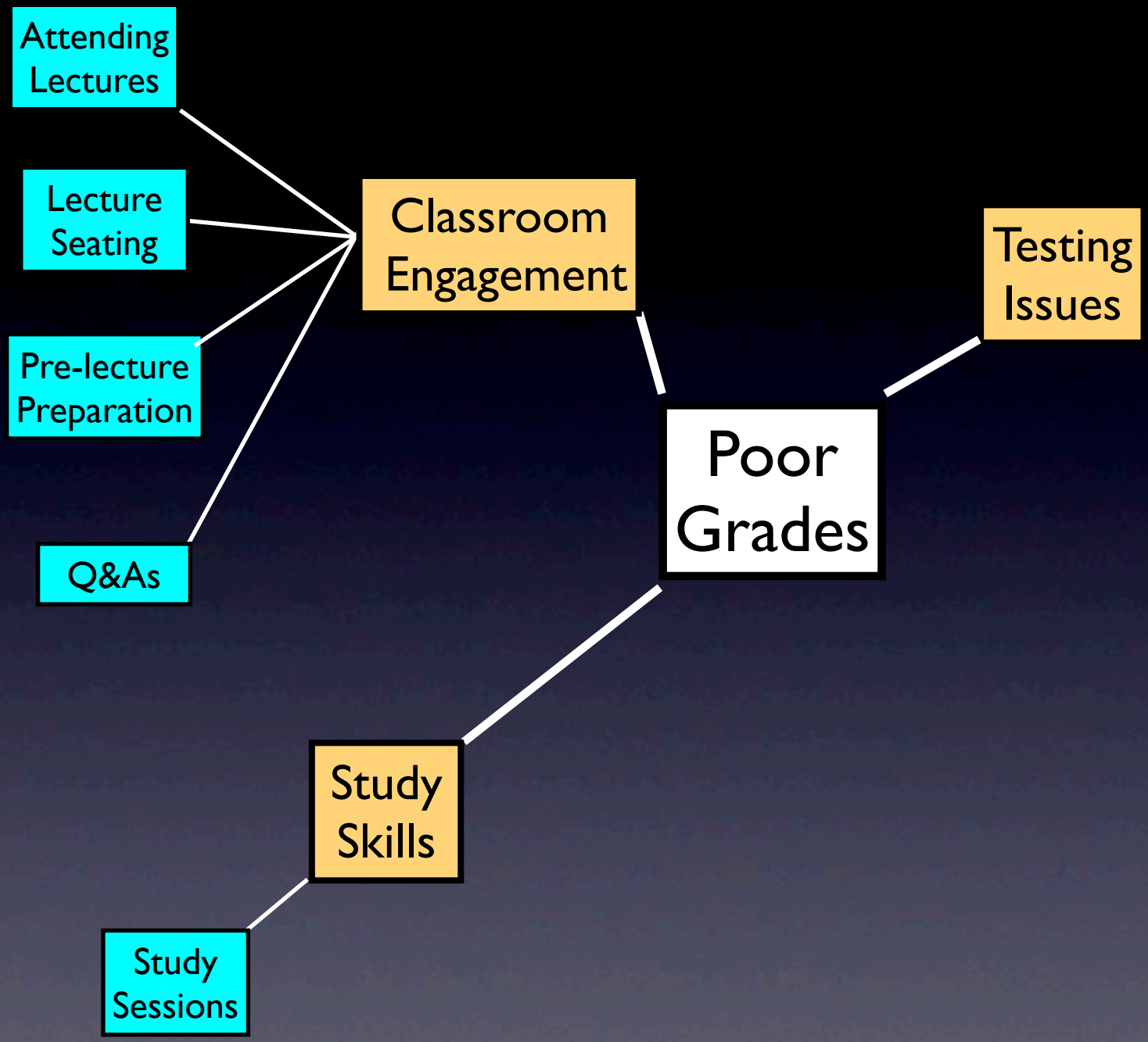
How do students study?

- read over note 2-3x
- re-write lecture notes (but...)
- make and use flash-cards (but...)
- guess how much students study (Delbanco NYRB, 2012)
  - 12 hrs/week; 20 hrs in 1981 & 25 hrs in 1961
  - UC system: 13 hrs studying vs 30 hrs in "other" activities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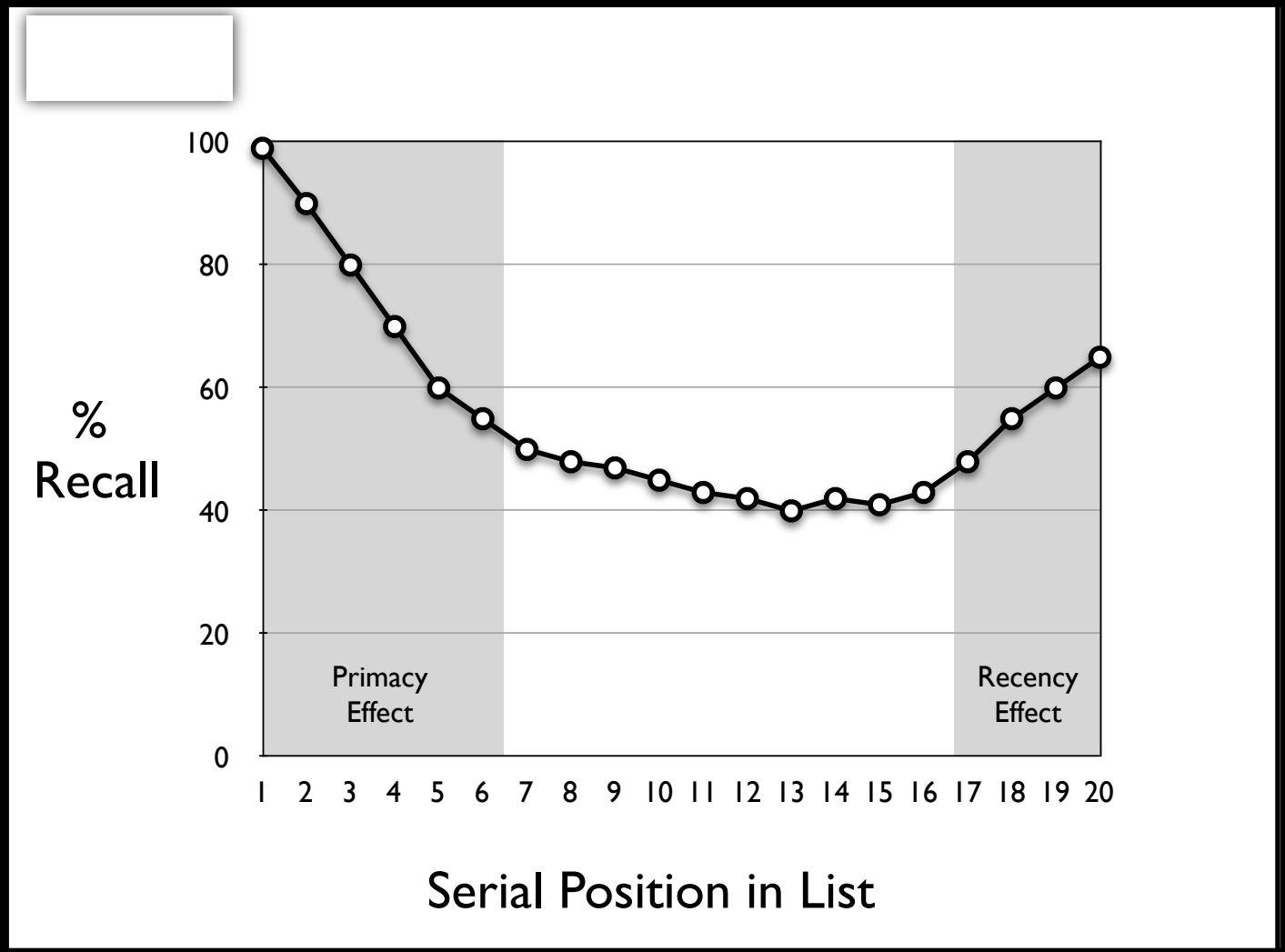
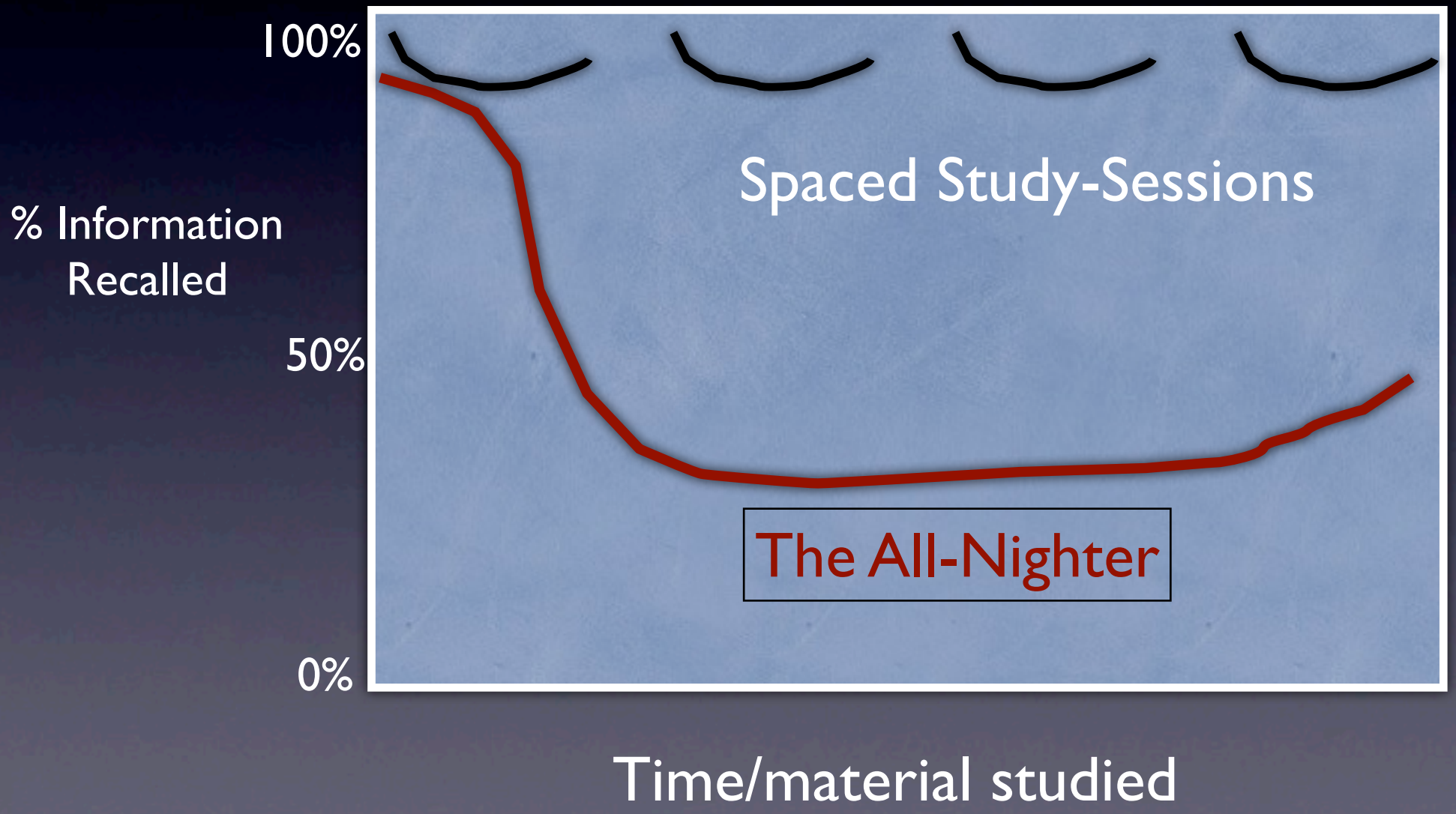
Limits on Working Memory

- x n q f c r m
- k h p i x z q f s v j t
- e v t g w h d t b q a o t y k j

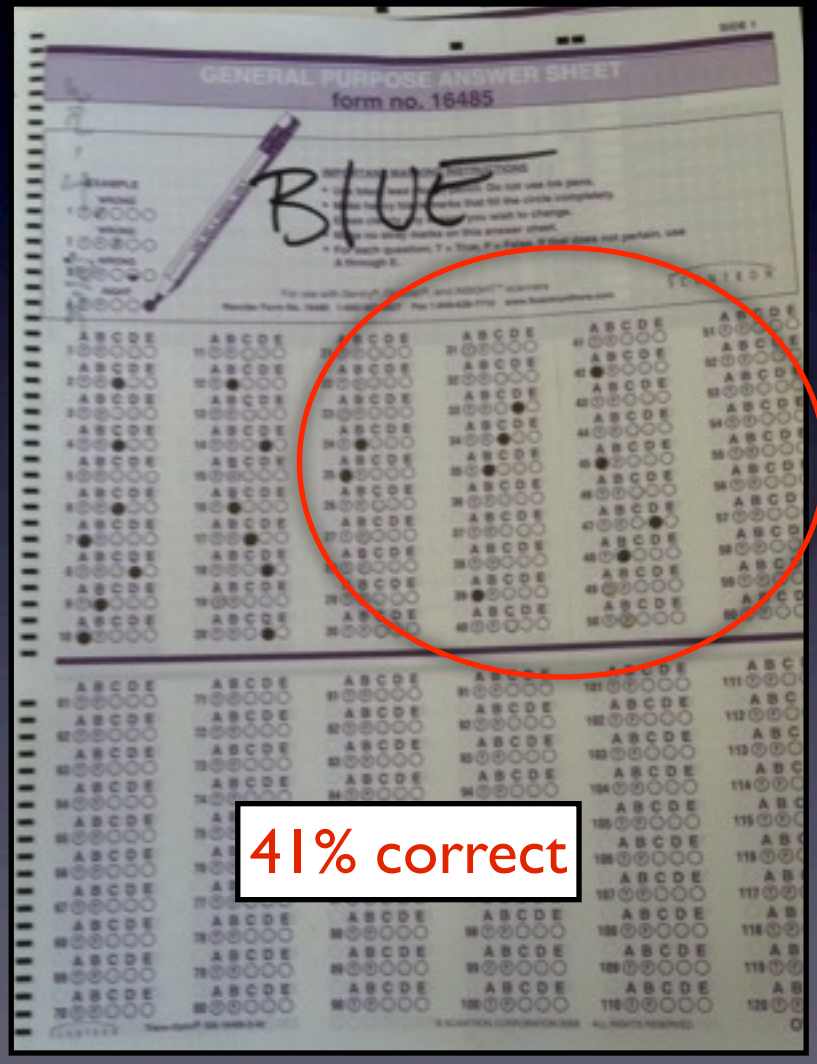
Serial Position Effect

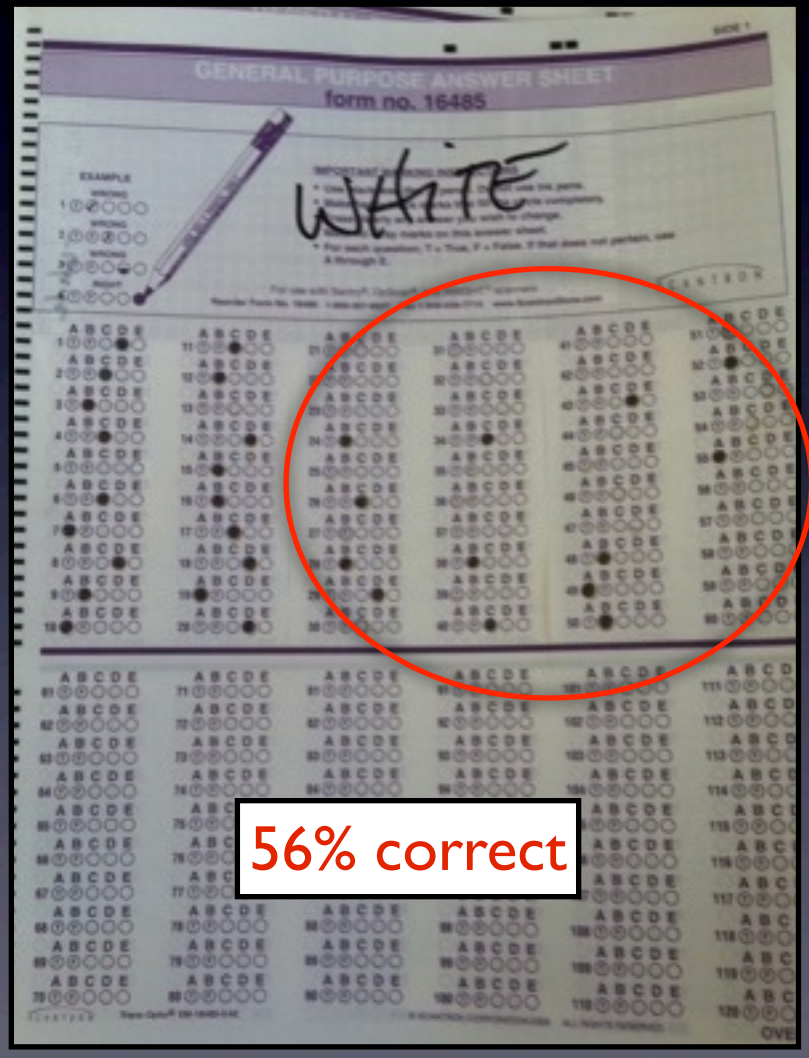


Compare two styles

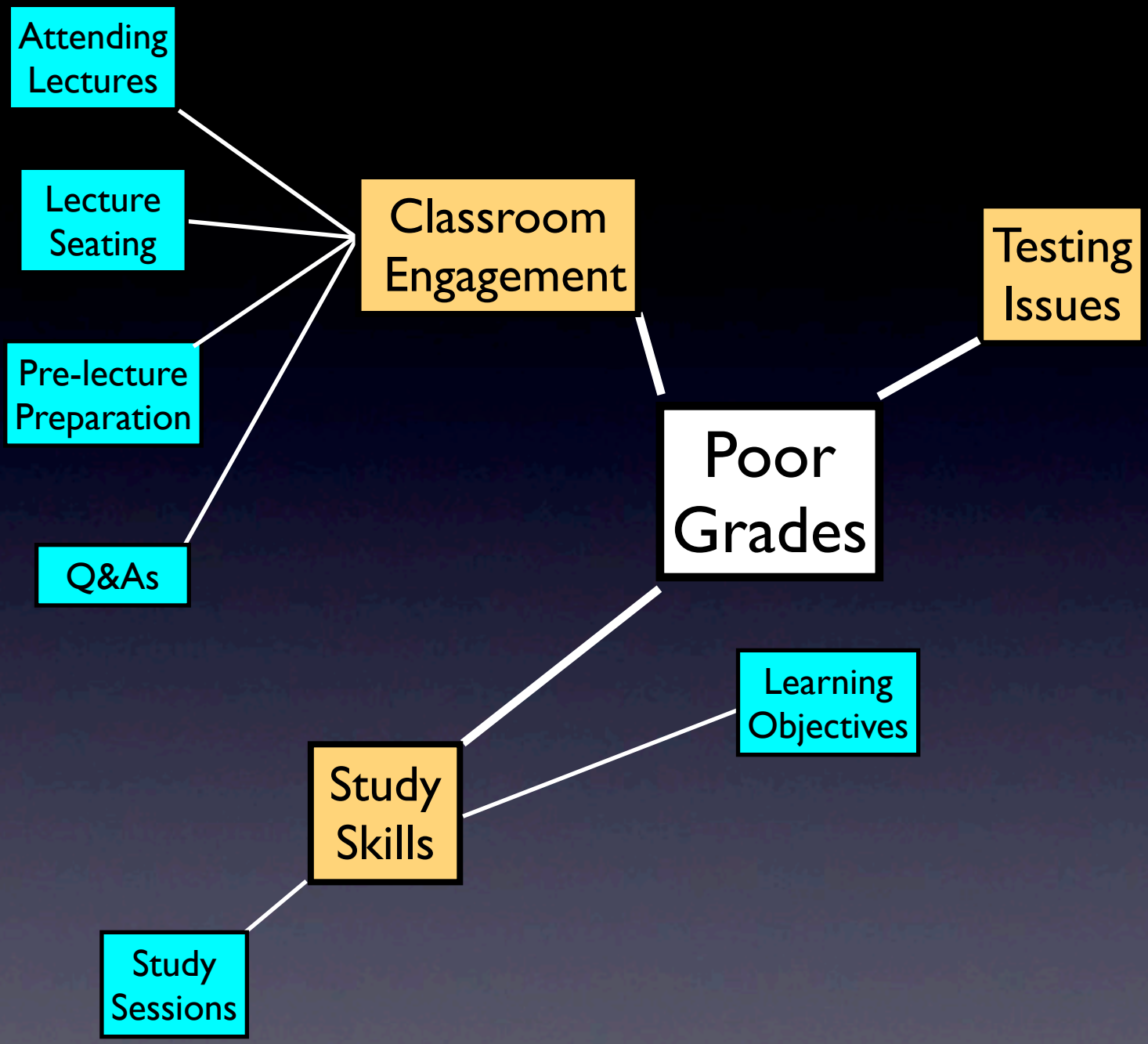


Psy 319: Brain and Behavior





- On Study Sessions
  - Donovan & Radosevich (1999) A meta-analytic review of the distribution of practice effect: Now you see it, now you don't. Journal of Applied Psychology, 84, 795-805.
    - 63 studies w/ 112 effect sizes
    - spaced out-performs massed (d = 0.46)
    - complexity of material study negatively related to magnitude of effect size (r = -0.25)
    - material complexity interacts w/ inter-study interval for best results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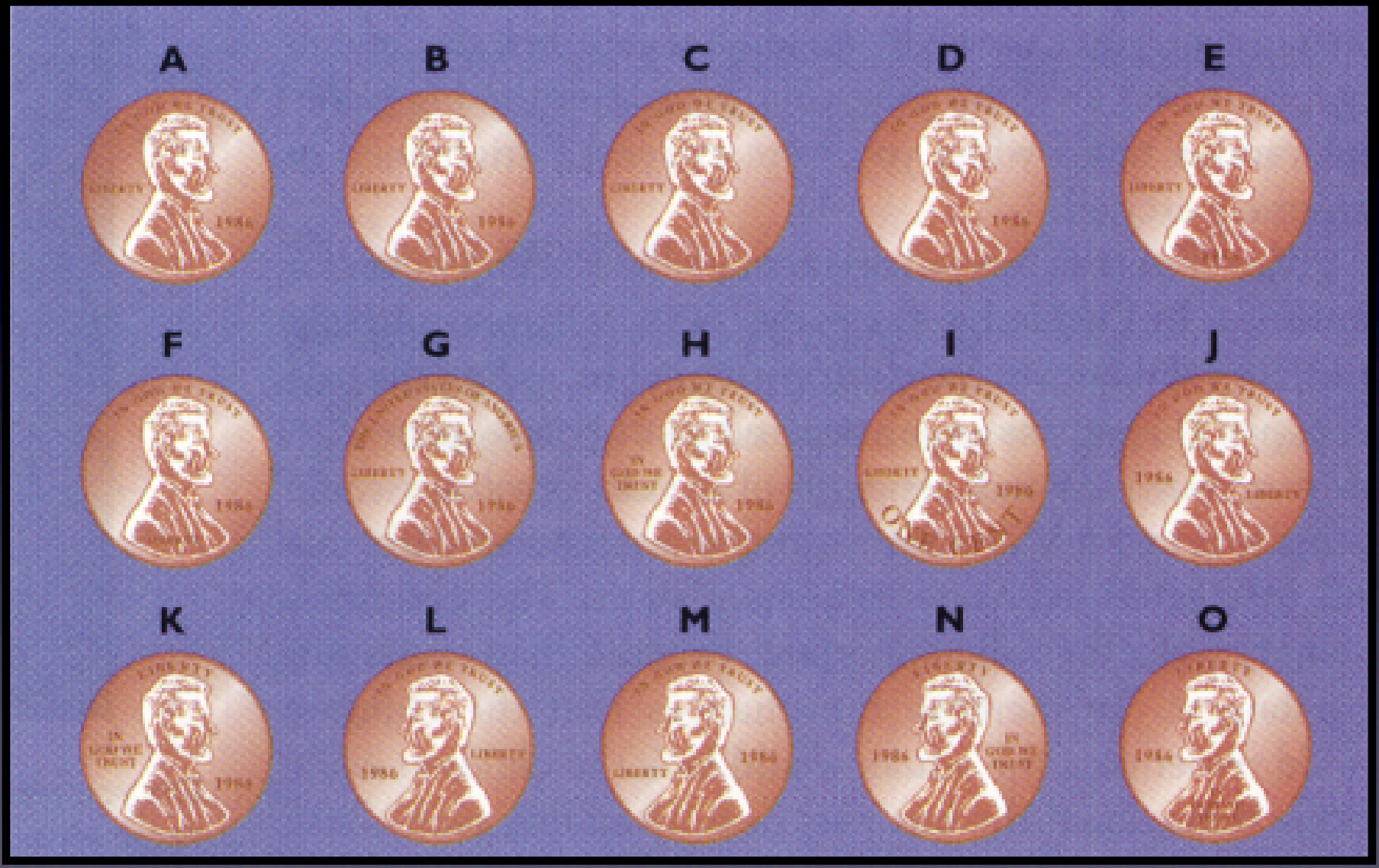
“ If you do not know where you are going, the likelihood of getting there borders on randomness”

Charles Brewer, Ph.D.
Professor of Psychology
Furman University


A
B
C
D
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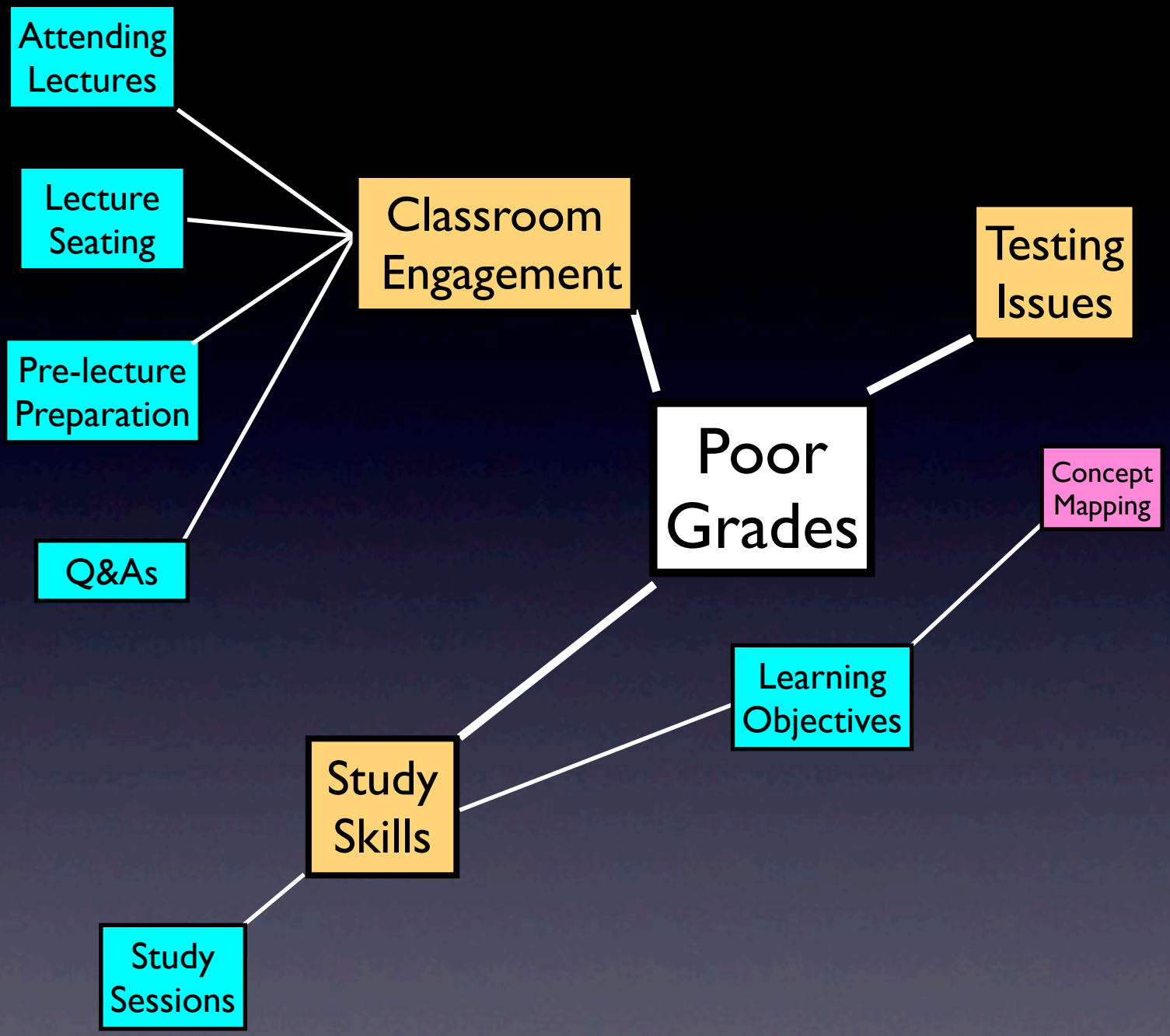
L
M
N
O

- Penny Learning Objectives
  - which way is Lincoln facing?
  - where's the minting date stamped?
  - where's "Liberty" located?
  - where's "In God We Trust" located?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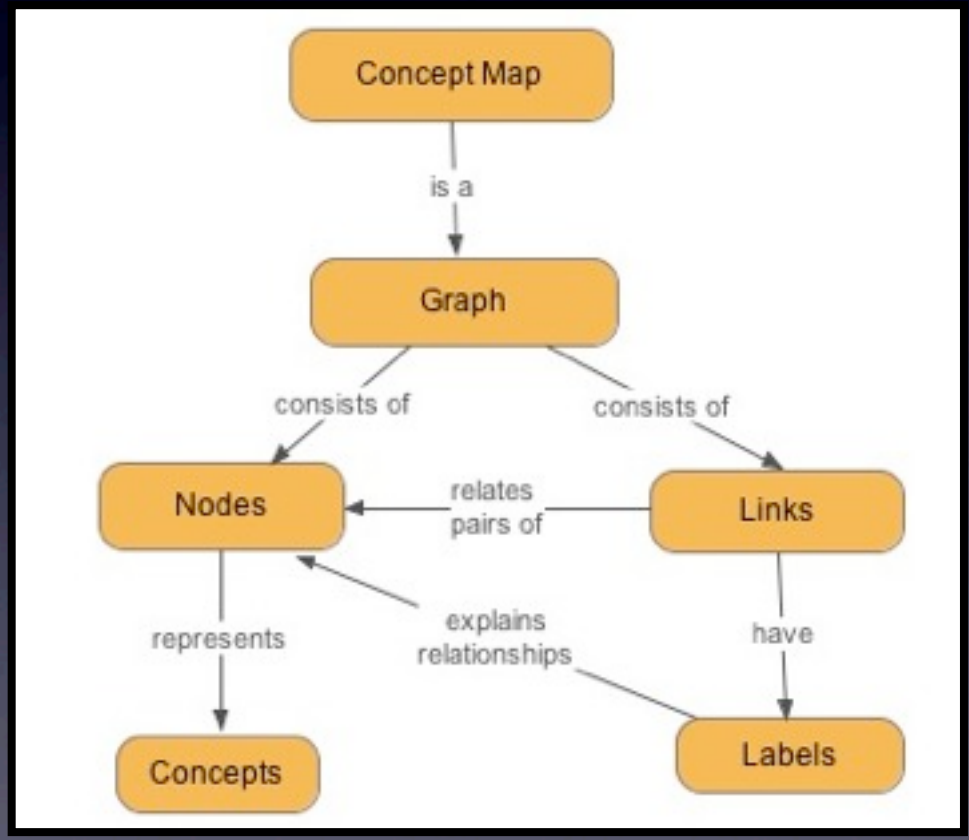
What are Concept Maps?

Visual representation or diagram that organizes relationships among concepts/ideas/things (Novak @ Cornell)

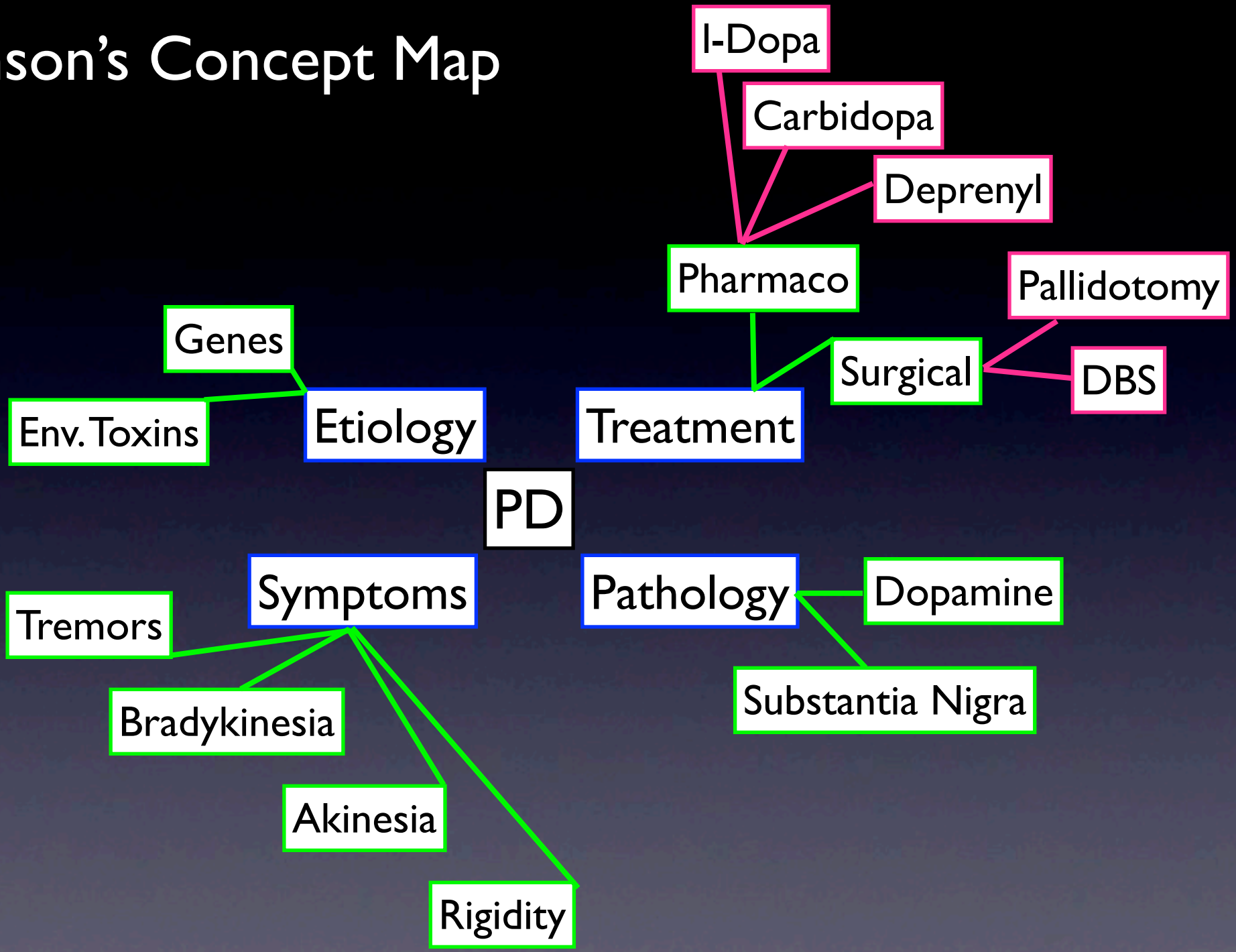
“cognitive closet organizer”



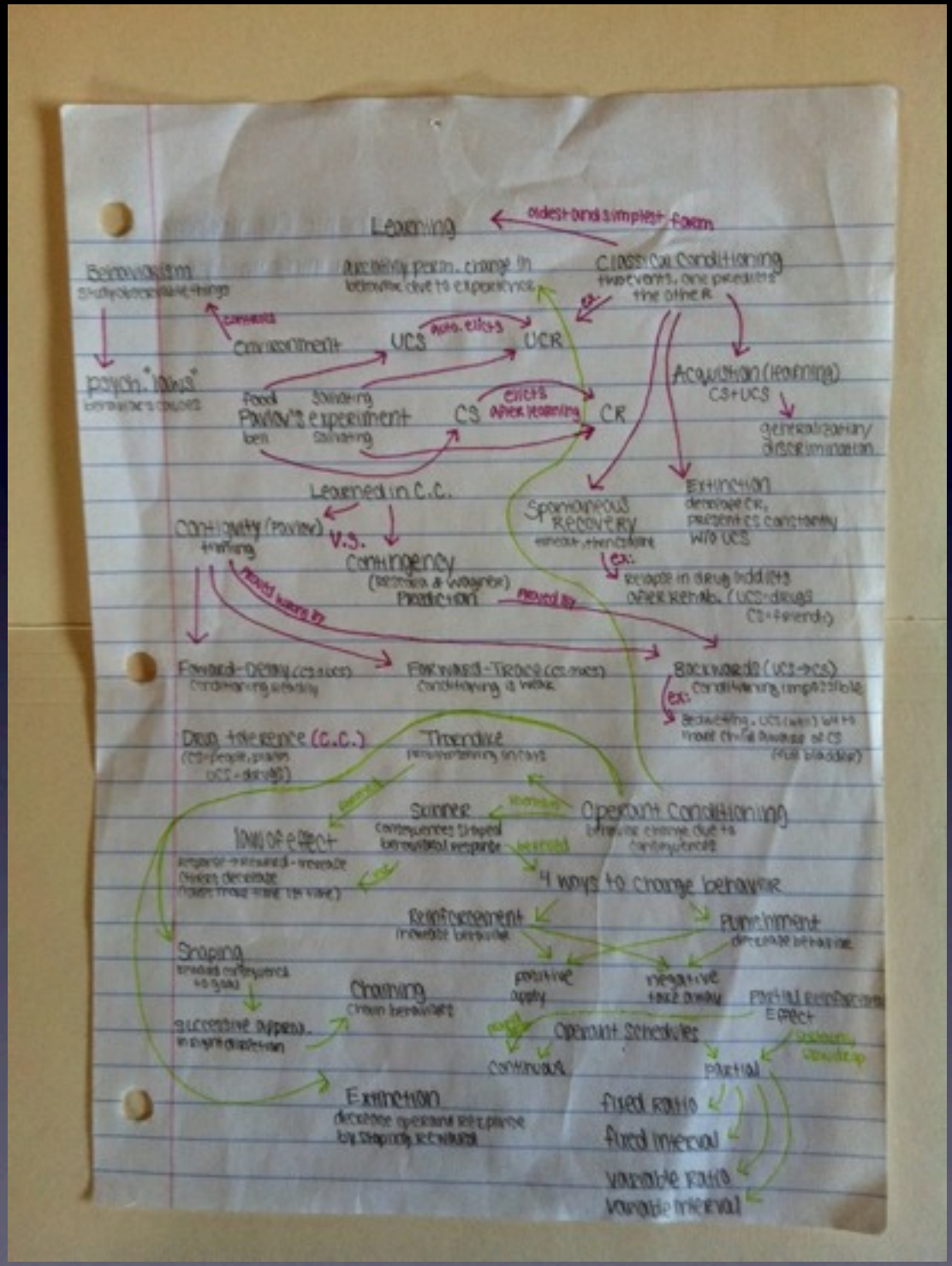
Building Concept Maps

- Parking Lot Technique
  - list key terms then sort/organize and toss left-overs
- Focus Question/Statement
  - e.g., organize your knowledge of Parkinson's Disease around 1) etiology, 2) symptoms, 3) pathology & 4) treatment

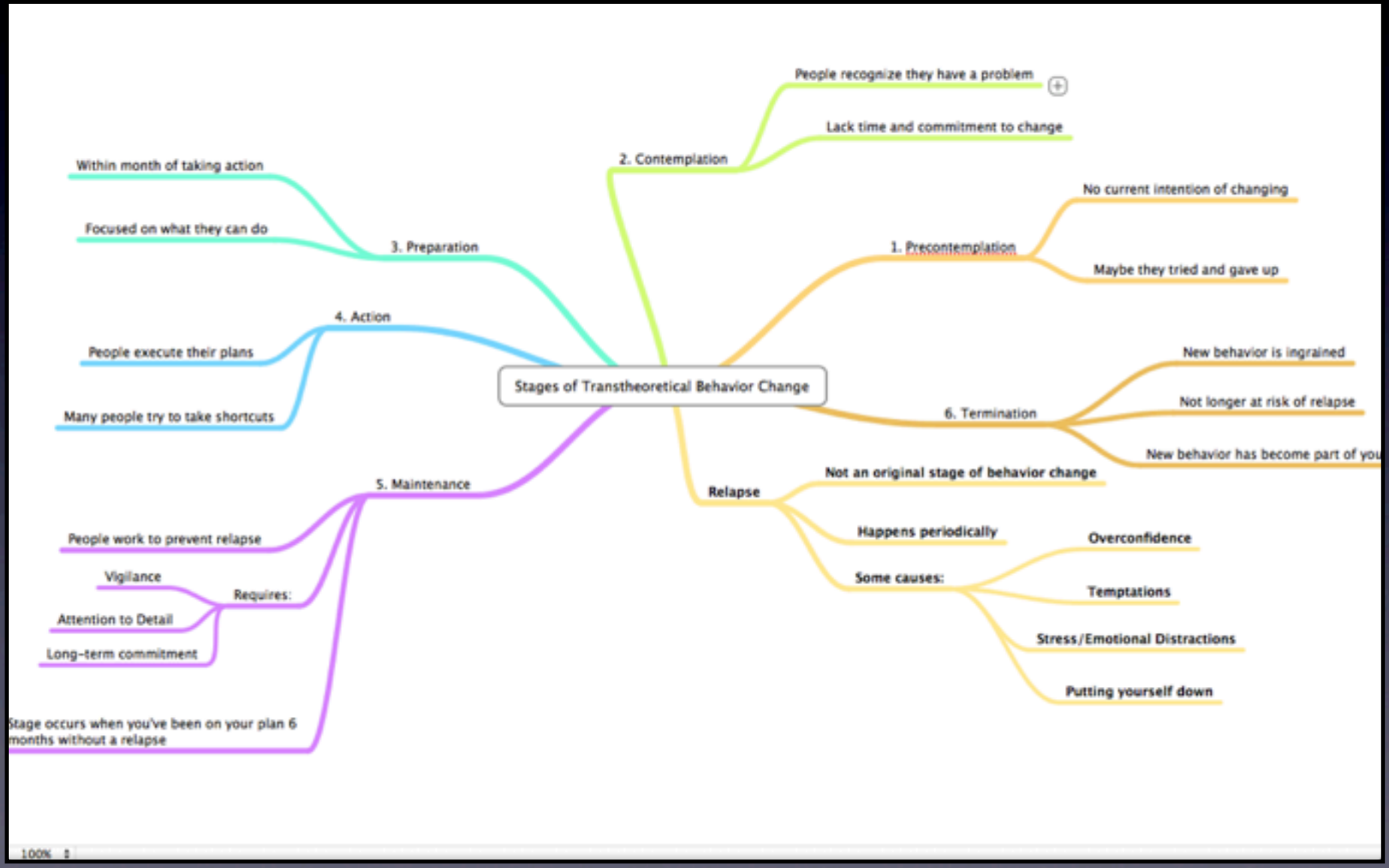
Parkinson's Concept Map

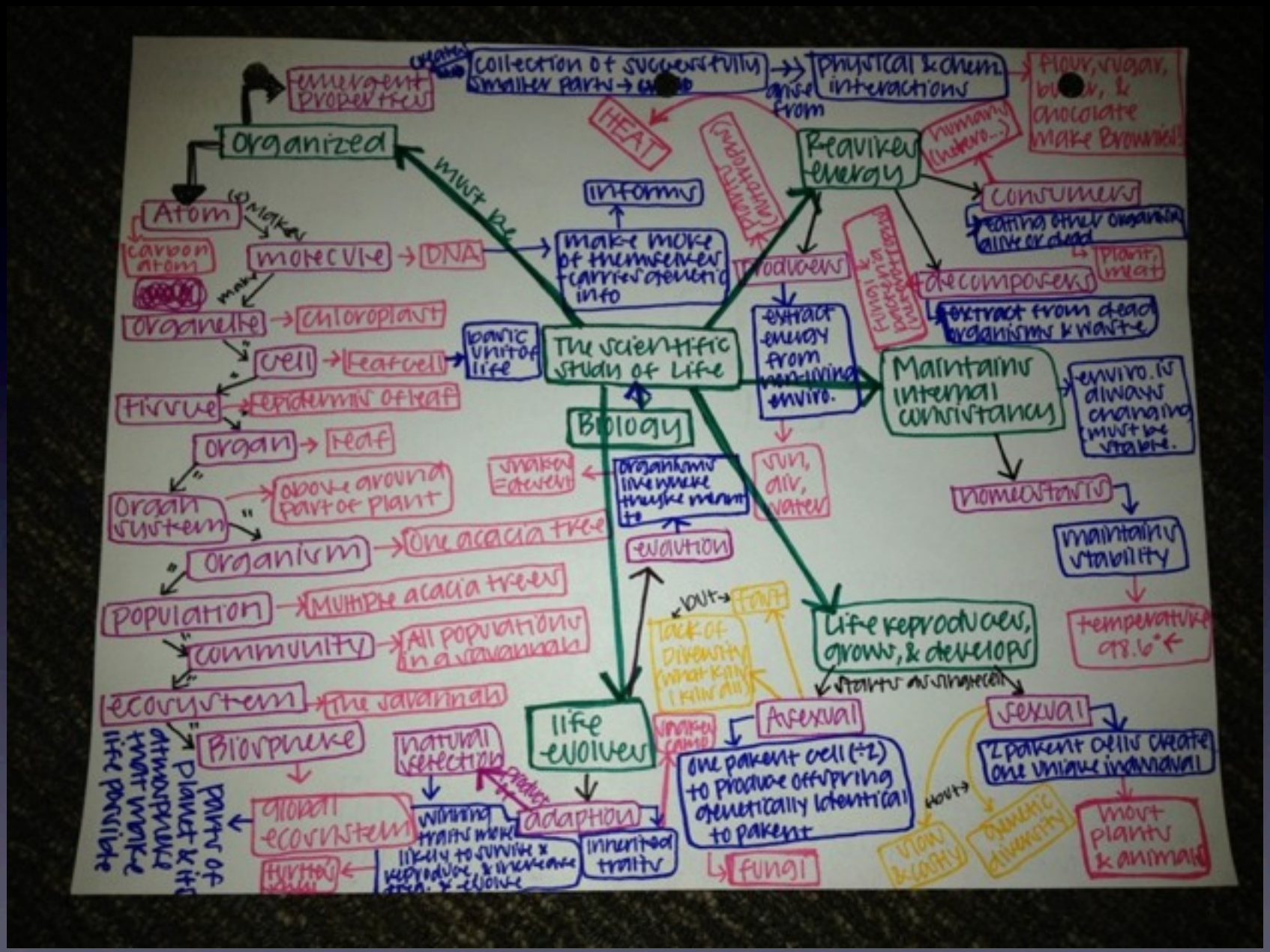


Stephanie Cunningham
Psychology 201
Summer II, 2011



Joshua Hopper
St. Ambrose University
Fall 2012





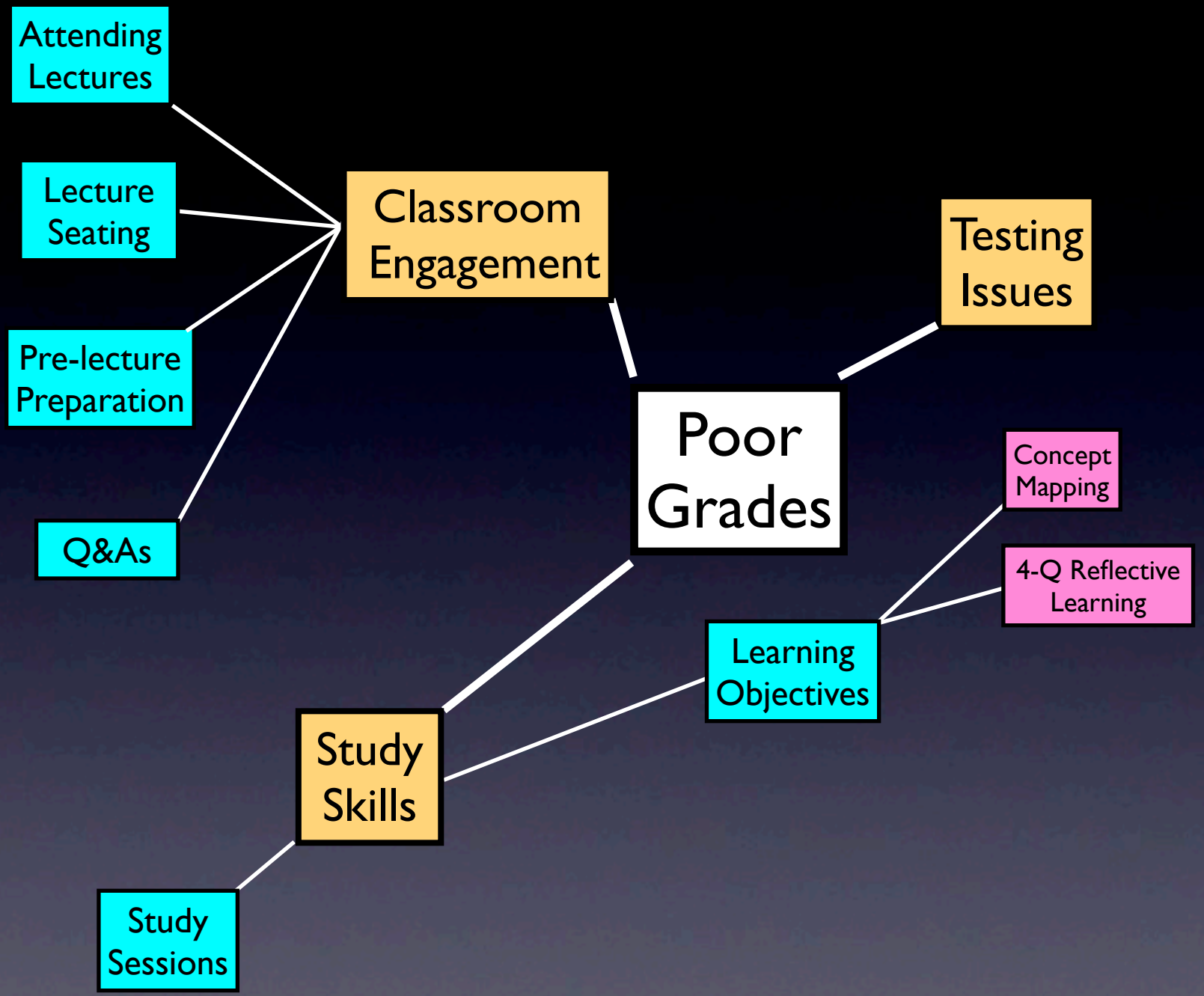
The scientific study of Life
Organized
emergent properties
collection of successfully smaller parts
physical & chem. interactions
flour, sugar, butter, & chocolate make Brownies!
HEAT
Requires energy
consumers
eating other organisms alive or dead
plant, meat
decomposers
extract from dead organisms & waste
producers
extract energy from non-living enviro.
sun, air, water
Maintains internal consistancy
enviro. is always changing must be stable.
homeostasis
maintains stability
temperature 98.6°
Biology
organisms live where they're meant to
evolution
life evolves
adaption
innerited traits
natural selection
winning traits more likely to survive & reproduce, & increase freq. & evolve
global ecosystem
Biosphere
parts of planet & its atmosphere that make life possible
Atom
carbon atom
molecule
DNA
organelle
chloroplast
cell
leaf cell
basic unit of life
tissue
epidermis of leaf
organ
leaf
organ system
above ground part of plant
organism
one acacia tree
population
Multiple acacia trees
community
All populations in a savannah
ecosystem
The savannah
must be
informs
make more of themselves carries genetic info
Life reproduces, grows, & develops
starts as single cell
Asexual
one parent cell (÷2) to produce offspring genetically identical to parent
fungi
sexual
2 parent cells create one unique individual
most plants & animals
genetic diversity
slow & costly
but
fast
lack of diversity (what kills 1 kills all)
snakes = desert

- Concept Mapping
  - Novak & Canas (2008) The theory underlying concept maps and how to construct and to use them. Technical Report IHMC Cmap Tools.
  - Nesbit & Adescope (2006) Learning with concept and knowledge maps: A meta-analysis. Review of Educational Leadership, 76, 413-448.
  - Berry & Chew (2008) Improving learning through interventions of student generated questions and concept maps. Teaching of Psychology, 35, 305-312.
    - 50 Ps in Gen Psych class; admin 2 exams
    - b/4 3rd unit cover C-Maps for ExCr
      - 28 Ps submitted maps (≥ 30 nodes; mean 47.5)
      - Give Final Exam

Concept Mapping

	Mean % Correct		Standardized Scores	
Exam	Maps Group	No Maps Group	Maps Group	No Maps Group
1	81.3	77.4	0.15	-0.13
2	80.7	75.3	0.17	-0.14
3	**83.7** **r = 0.42**	81.2	**0.34** **ps < 0.01**	**-0.36** **p < 0.01**

Berry JW & Chew SL (2008) Improving learning through interventions of student generated questions and concept maps. Teaching of Psychology, 35, 305-312.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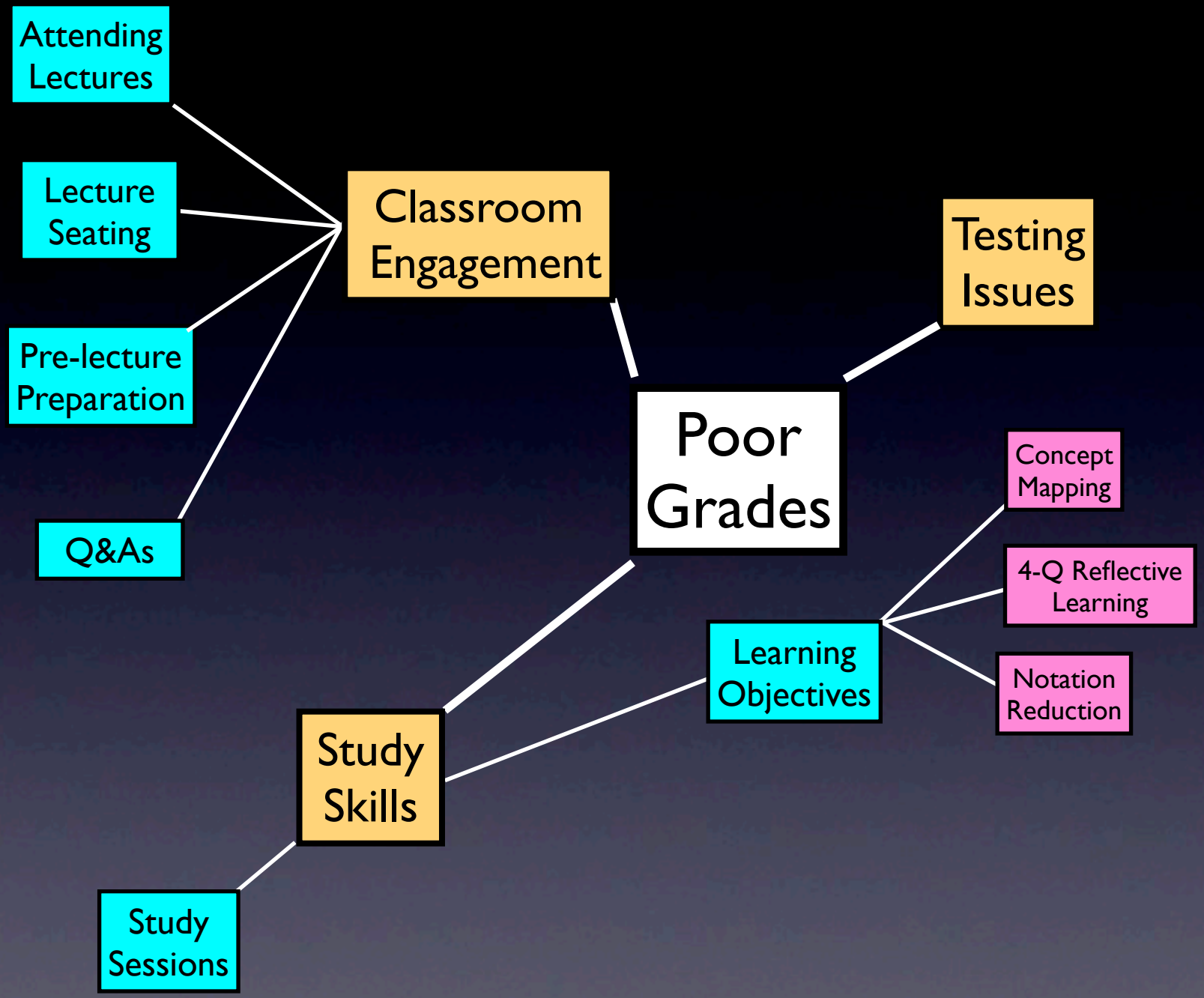
4-Q Reflective Learning
Learning Objectives
Study Skills
Study Sessions

- Elaborative Learning through Questions
  - Berry & Chew (2008) Improving learning through interventions of student generated questions and concept maps. Teaching of Psychology, 35, 305-312.
  - Dietz-Uhler & Lanter (2009) Using the four-question technique to enhance learning. Teaching of Psychology, 36, 38-41.
    - 4Qs promote: analyzing, reflecting, relating and generating
      - 4Q b/4 vs after exam yielded means of 74% vs 59%, respectively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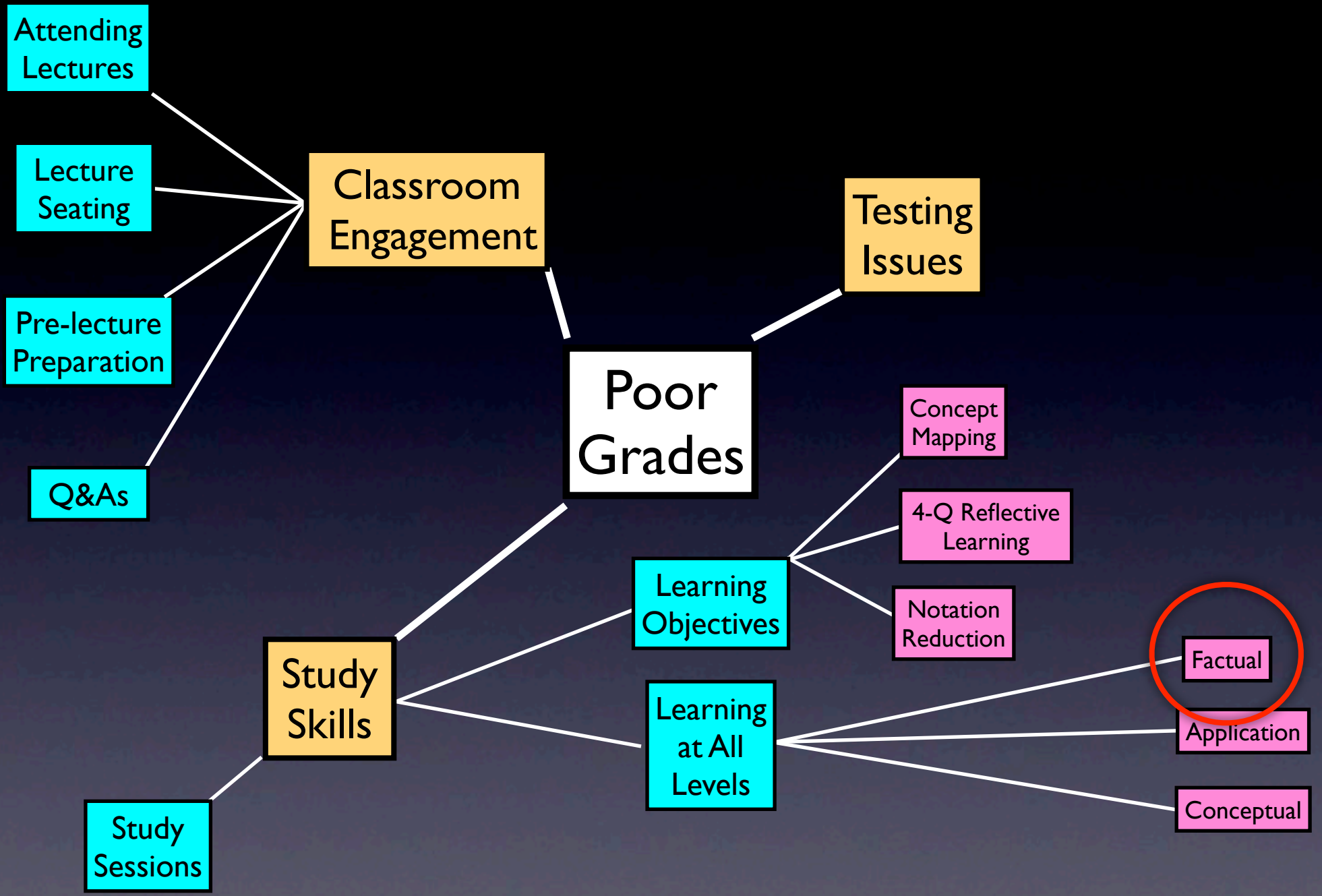
Psy 101

Lecture Notes
Unit 1

8.5 x 11
Cheat
Sheet

5 x 8
Card

3 x 5
Card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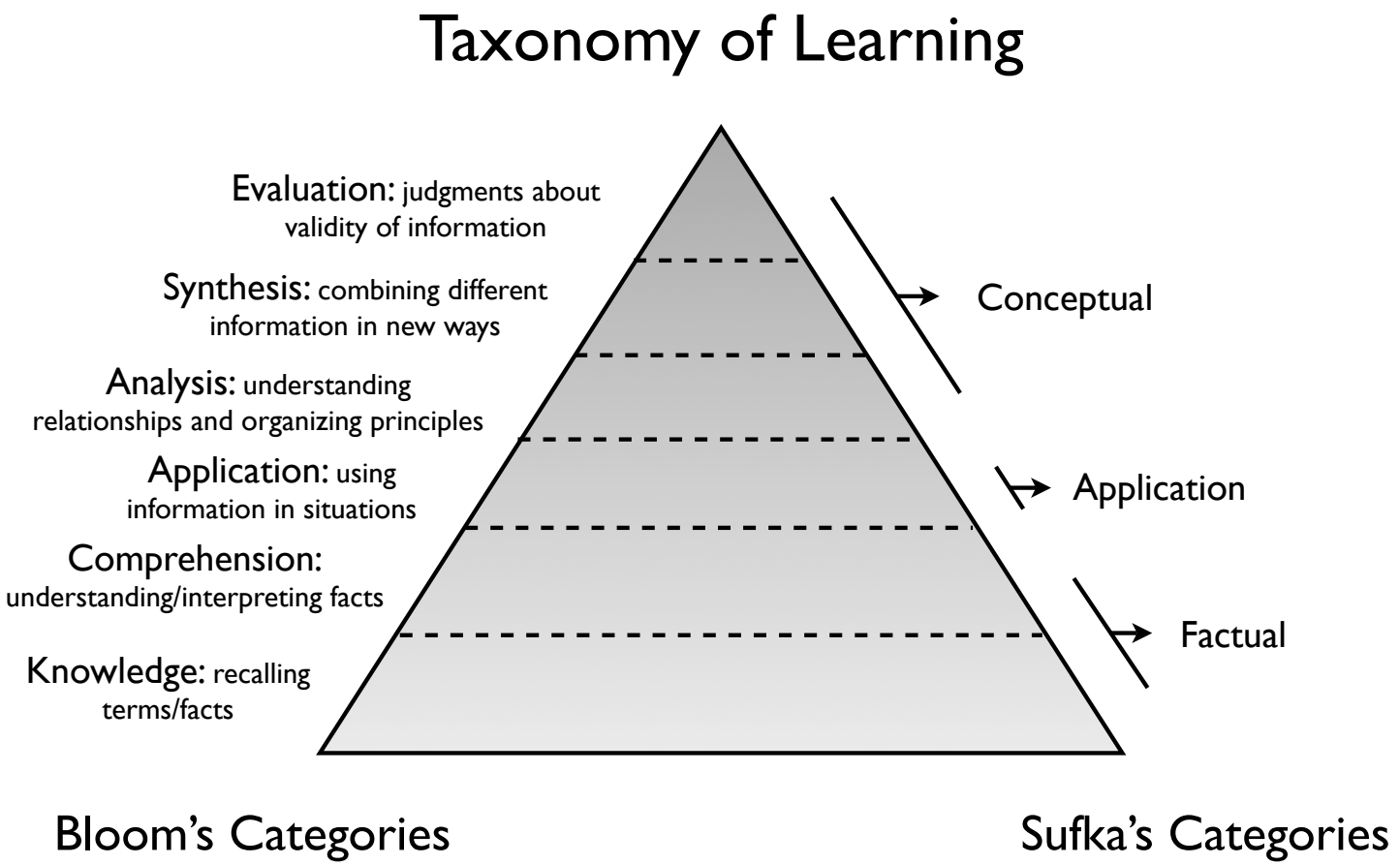
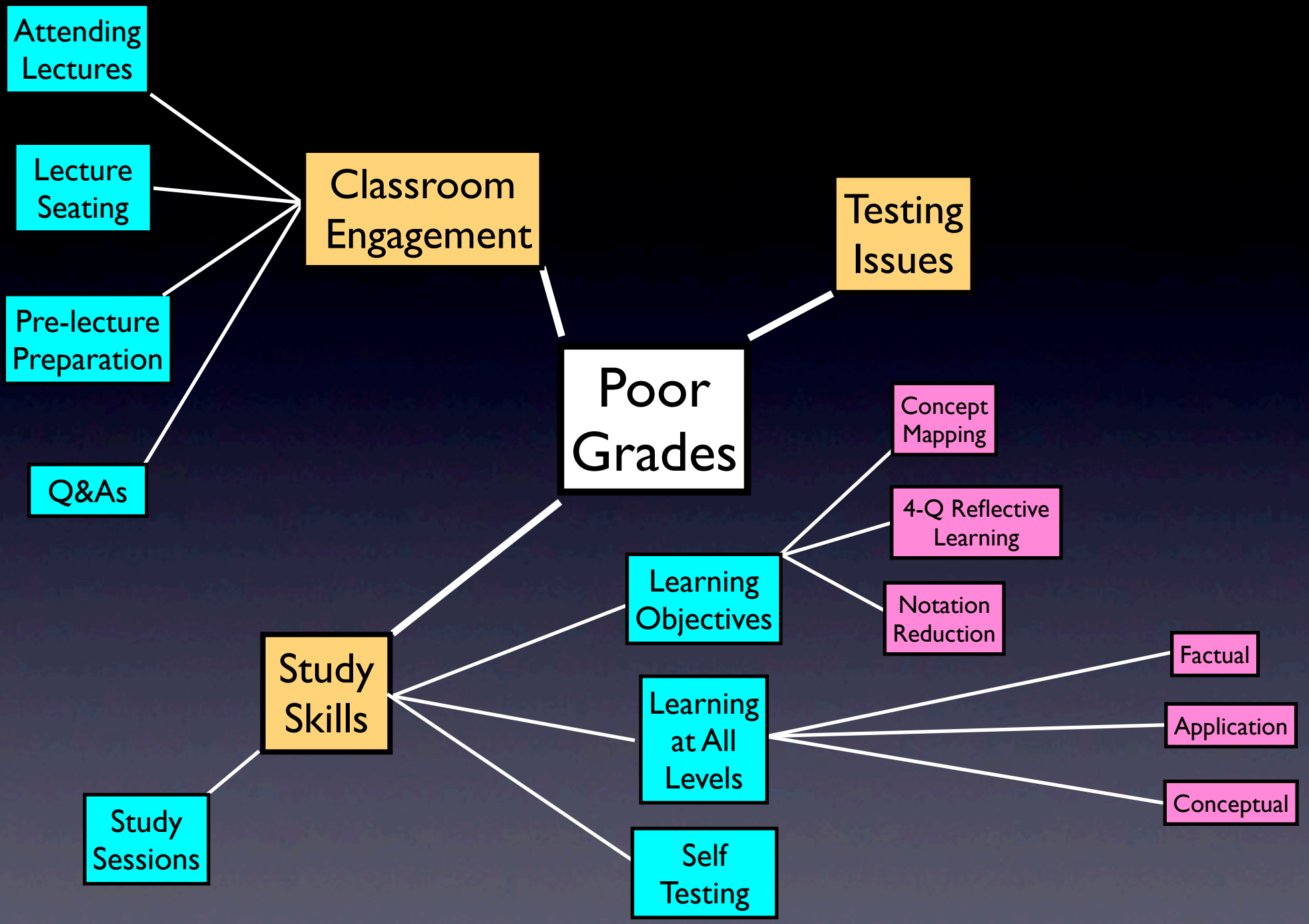
Learning at All Levels
Factual
Application
Conceptual
Study Sessions

Figure 3


Taxonomy of Learning
Evaluation: judgments about validity of information
Synthesis: combining different information in new ways
Analysis: understanding relationships and organizing principles
Application: using information in situations
Comprehension: understanding/interpreting facts
Knowledge: recalling terms/facts
Conceptual
Application
Factual
Bloom's Categories
Sufka's Categories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Self Testing

- On Self Testing
  - Chan, McDermott & Roediger (2006) Retrievel-induced facilitation: Initially nontested material can benefit from prior testing of related material. Journal of Experimental Psychology: General, 135, 533-571.
  - Karpicke & Roediger III (2008) The critical importance of retrieval learning. Science, 319, 966-968.
  - Karpicke & Blunt (2011) Retrieval practice produces more learning than elaborative studying with concept mapping. Science, 331, 772-775.

Evidence of Effectiveness

- Karpicke & Roedeger (2008)
  - College students learn 40 word pairs (Swahili-English) in 4 trials
  - 4 experimental conditions once pair correctly ID:
    - Study & Test entire list; Test only non-recalled; Study only non-recalled; Neither
    - Recall test administered 1 week later.

Karpicke & Roediger III (2008) The critical importance of retrieval learning. Science, 319, 966-968

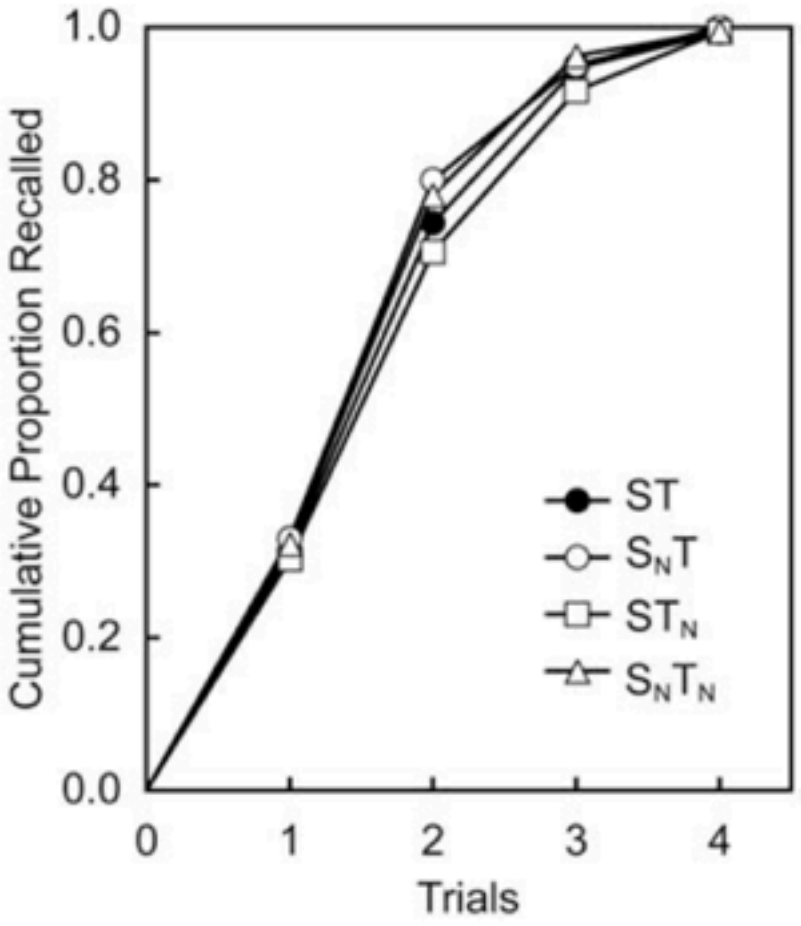


Fig. 1. Cumulative performance during the learning phase.

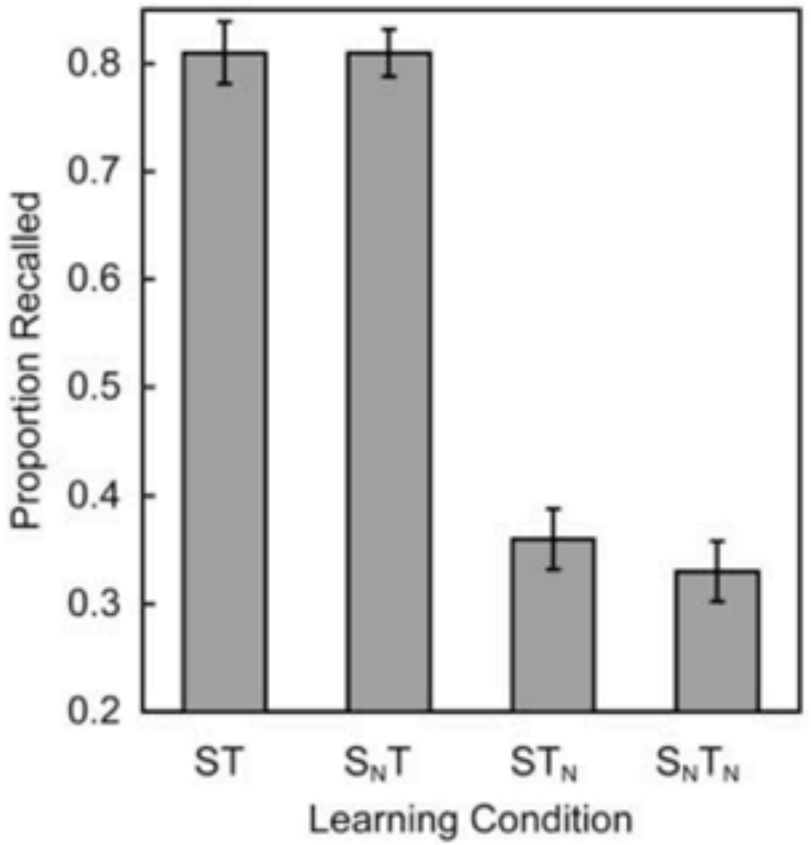


Fig. 2. Proportion recalled on the final test 1 week after learning. Error bars represent standard errors of the mean.

Evidence of Effectiveness

- Karpicke & Blunt (2011)
  - College students read then studied science text passage
  - 4 experimental conditions matched on study total time
    - Study once; Repeated Study (in 4 sessions); Study & Concept Map; Study & Retrieval Practice
    - Recall test administered 1 week later

Karpicke & Blunt (2011) Retrieval practice produces more learning than elaborative studying with concept mapping. Science, 331, 772-775.

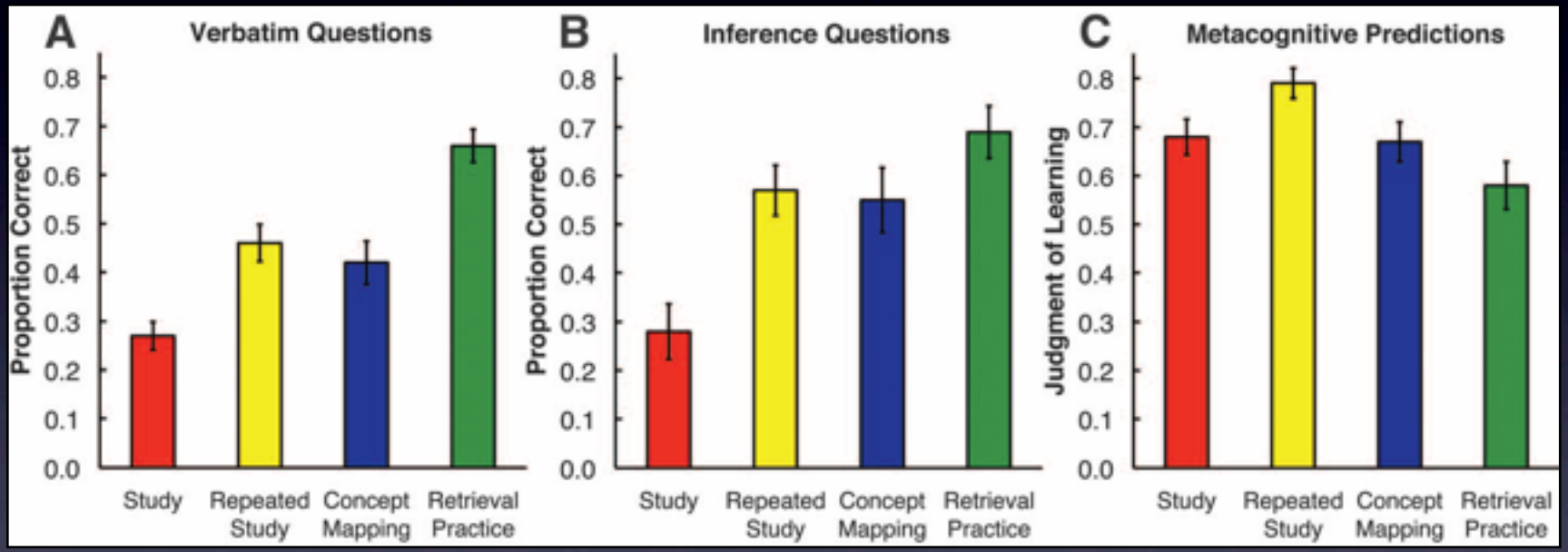
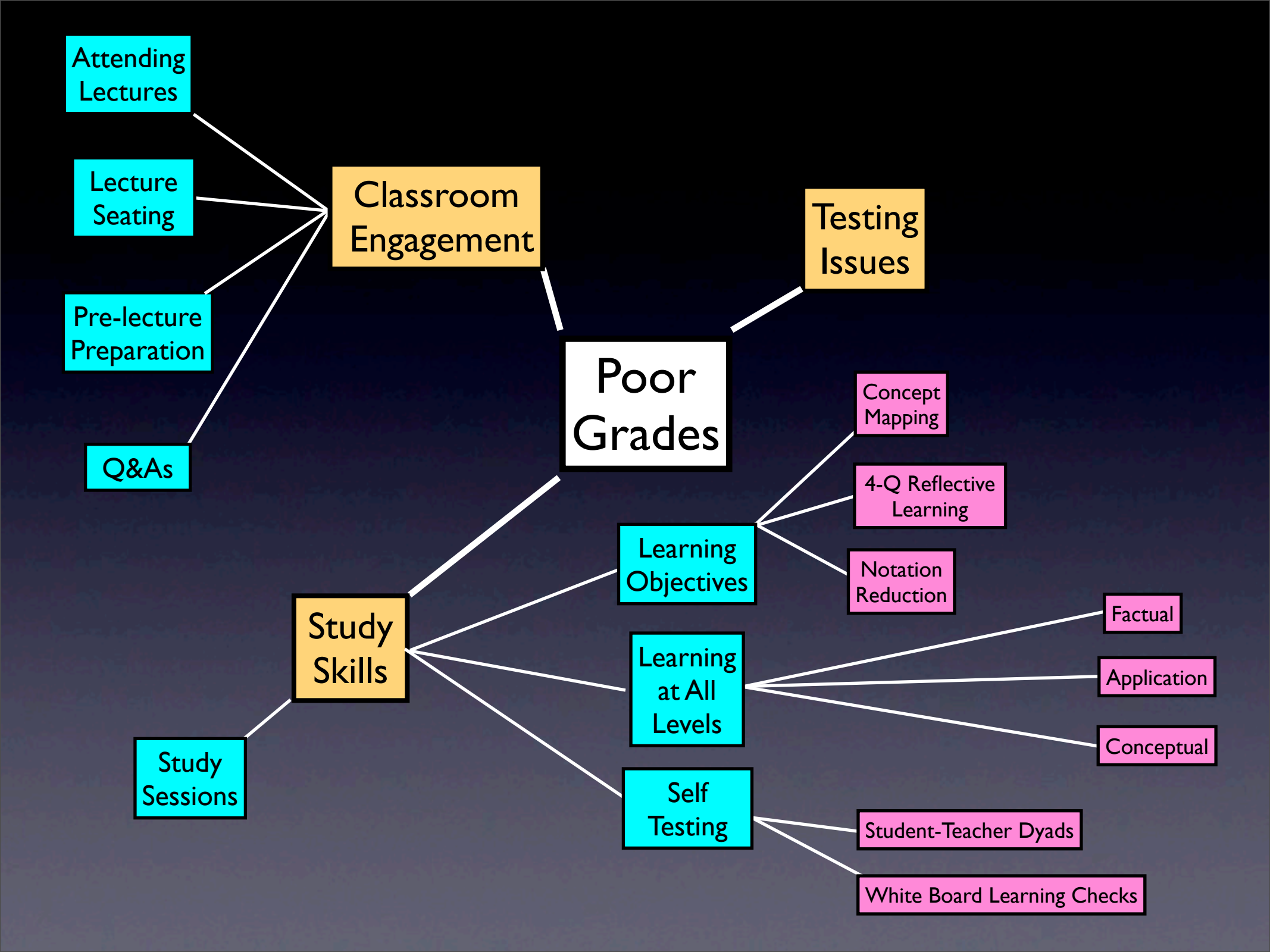


Fig. 1. Results of Experiment 1. (A and B) show the proportions correct on verbatim and inference shortanswer questions, respectively. (C) shows the proportion of information subjects predicted they would recall on the final test (their metacognitive judgments of learning). Error bars indicate SEM. On the final short-answer test, retrieval practice enhanced long-term learning above and beyond elaborative study with concept mapping by one and a half standard deviations (d = 1.50), yet students were largely unable to predict this benefit.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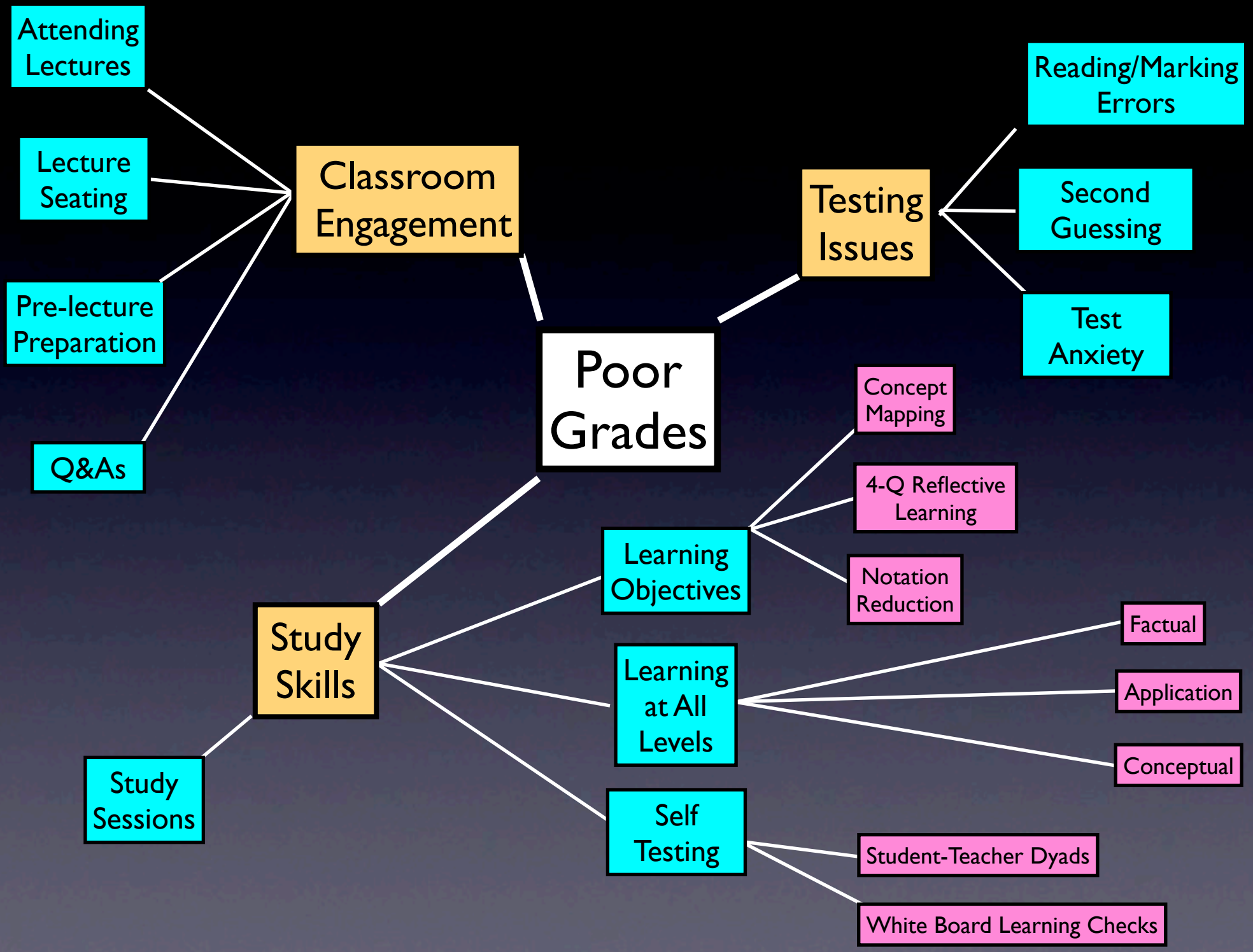
Student-Teacher Dyads
White Board Learning Checks

Rules for Student Success

5. Space Out Study Sessions
6. Develop Learning Objectives
7. Learn Material at All Levels
8. Use Learning Checks/Self Testing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Reading/Marking Errors
Second Guessing
Test Anxiety
Study Skills
Study Sessions
Learning Objectives
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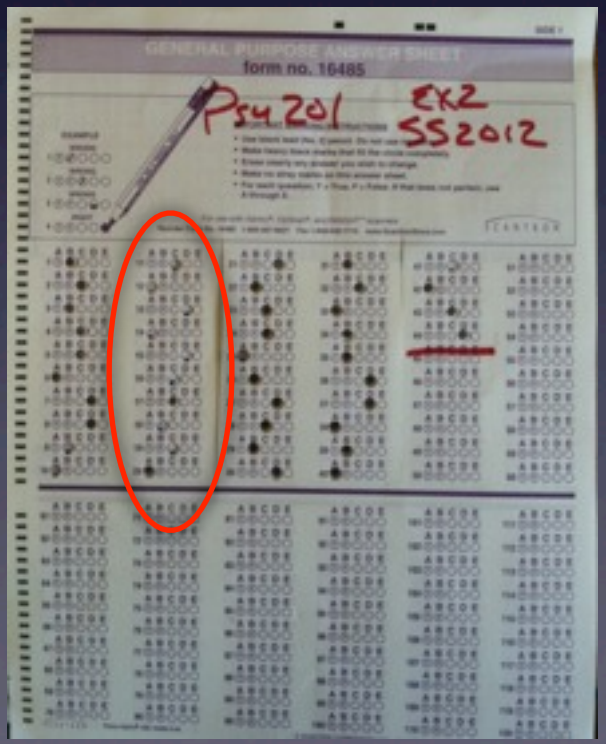
Testing Errors



- On Test Anxiety
  - Ramirez & Beilock (2011) Writing about testing worries boosts exam performance in the classroom. Science, 331, 211-213.

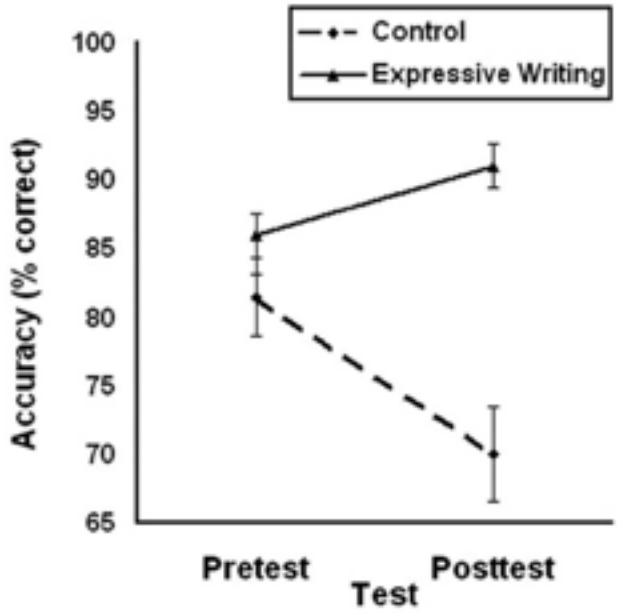


Fig. 1. Math accuracy in study 1. Error bars are SEM.

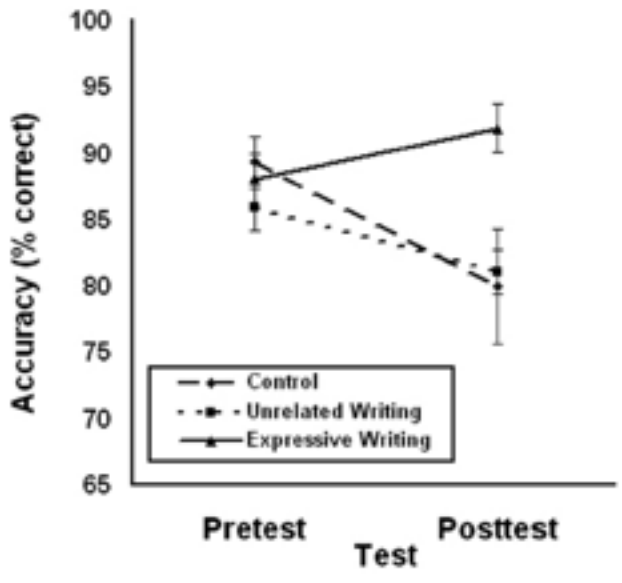
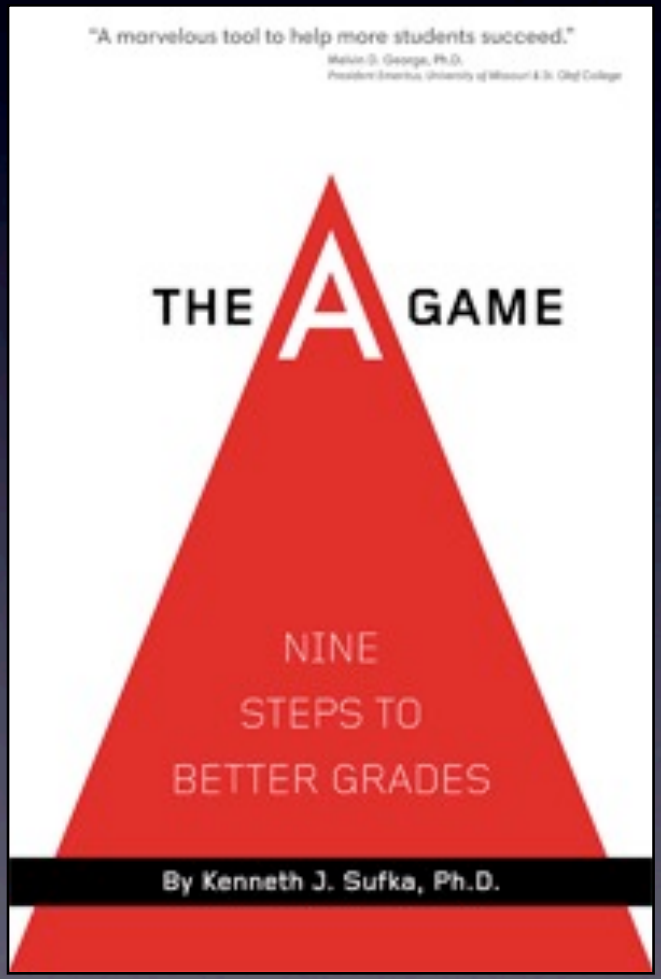


Fig. 2. Math accuracy in study 2. Error bars are SEM.

Sufka's Rules for Success



1. Go to Class-Always
2. Sit in the Sweet Spot
3. Come to Class Prepared
4. When Lost, Ask Questions
5. Get Spaced Out
6. Develop Learning Objectives
7. Learn Material at all Levels
8. Use Learning Checks/Self Test
9. Be Exam Savvy

"Do not expect instant perfection but strive for steady improvement"

Charles Brewer, Ph.D.
Professor of Psychology
Furman University