



Cognitive Tasks Required in Undergraduate Courses: A Comparison of Agriculture and Other Students

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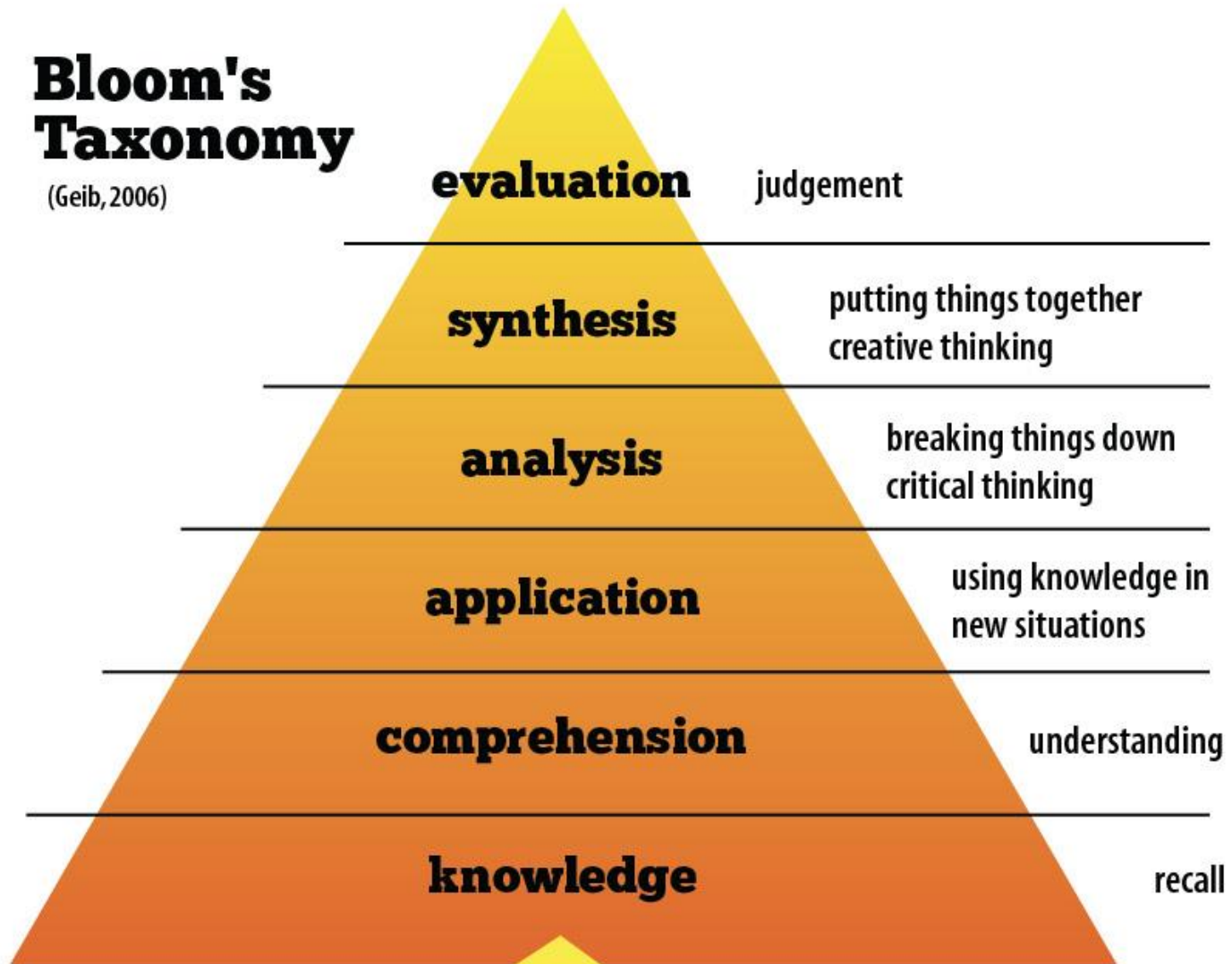
Cognition

- The mental processes by which “sensory input is transformed, reduced, elaborated, stored, recovered, and used.”
 - Neisser, 1967



Bloom's Taxonomy

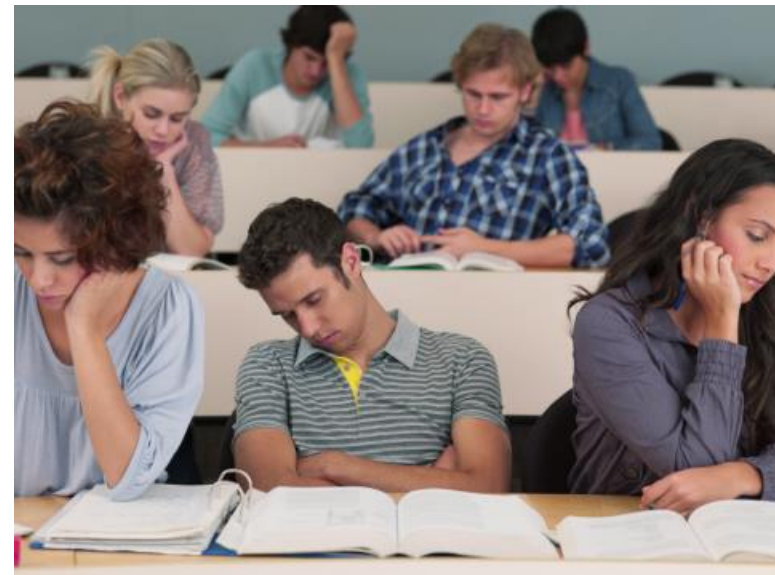
(Geib, 2006)



Knowledge Retention
Foundation for higher order thinking

Previous Research

- Ewing and Whittington (2009)
 - 21 university agriculture class sessions (12 instructors)
 - 62% of all professor discourse at knowledge or comprehension levels
 - 52.3% of courses had NO professor discourse at synthesis or evaluation levels of cognition
 - 60% of student thought was non-course related
 - 62% of course-related thought was at the knowledge or comprehension level



Results are consistent with those of numerous researchers

Previous Research

Cognitive Levels by Teaching Method among Five Professors Recognized for Teaching Excellence*

Teaching Method	Percent of Class Time (16.1 hrs. total)	Modal Cognitive Level	Highest Cognitive Level Achieved
Lecture	45.6	Knowledge (56%)	Synthesis
Cooperative Learning	26.7	Application (78%)	Application
Questioning	20.9	Knowledge (34%)	Analysis
Discussion	5.1	Comprehension (44%)	Analysis
Individualized Application	1.6	Bimodal (Comprehension, 50%: Application, 50%)	Application

*Authors' summary of data reported by Estep, Stripling, Conner, Giorgi, & Roberts (2013)

Problem Statement and Research Question

- Teaching/learning in agriculture focused on lower levels of cognition
- Little if any comparative cross-college research
 - Related research suggests a small negative difference for agriculture majors relative to other majors
- Do the cognitive tasks required of agriculture and non-agriculture students differ?

Objectives

1. Describe and compare the cognitive tasks required in courses as perceived by freshman and senior agriculture and non-agriculture students
2. Determine if perceptions of cognitive tasks differ between freshmen and seniors within majors (agriculture and non-agriculture)

Methods

- Data: 2005, 2007, 2010, & 2013 National Survey of Student Engagement (NSSE) administered at U of A
 - Data provided by Office of Institutional Research
 - IRB approval
- NSSE collects data from college freshmen and seniors about their level of participation in learning and personal development activities
 - Administered at 1,574 institutions since 2000
 - Approximately 4.5 million students have completed the survey since 2000
 - Extensive validation and reliability studies have been conducted

UA Respondents and Response Rates

	Agriculture		Non-Agriculture		Response Rate	
	Freshmen	Seniors	Freshmen	Seniors	Freshmen	Seniors
Year	<i>n</i>	<i>n</i>	<i>n</i>	<i>n</i>	%	%
2005	38	32	386	254	34.9	25.5
2007	48	51	558	421	23.0	20.2
2010	53	74	562	631	18.1	24.1
2013	79	144	1071	1056	26.1	33.5
Total	218	301	2577	2362	24.0	25.2

- Response rates were typical for RU/VH institutions
- “Few meaningful differences exist between respondents and non-respondents in terms of their academic engagement” (Kuh, 2003, p. 13)
- “Non-response effects are minimal” (Chen et al., 2009, p. 37)

Study Variables

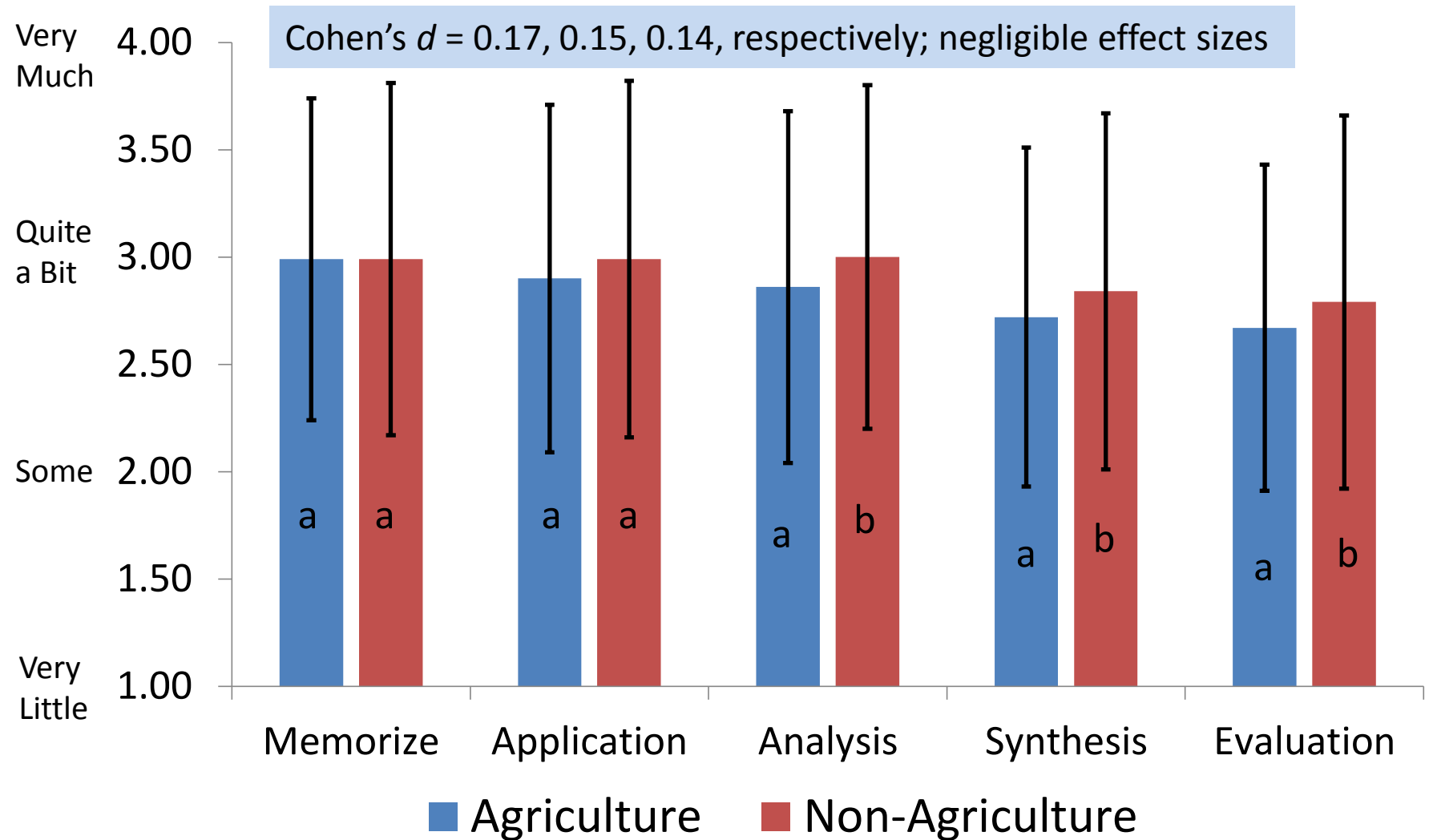
- During the current school year, how much has your coursework emphasized the following?
 - **Memorizing** course materials [Knowledge]
 - **Applying** facts, theories, or methods to practical problems or new situations [Application]
 - **Analyzing** an idea, experience, or line of reasoning in depth by examining its parts [Analysis]
 - **Forming** a new idea or understanding from various pieces of information [Synthesis]
 - **Evaluating** a point of view, decision, or information source [Evaluation]
- Response options:
 - Very little [1]
 - Some [2]
 - Quite a bit [3]
 - Very much [4]
- Class Rank and College matched by UA IR

Results

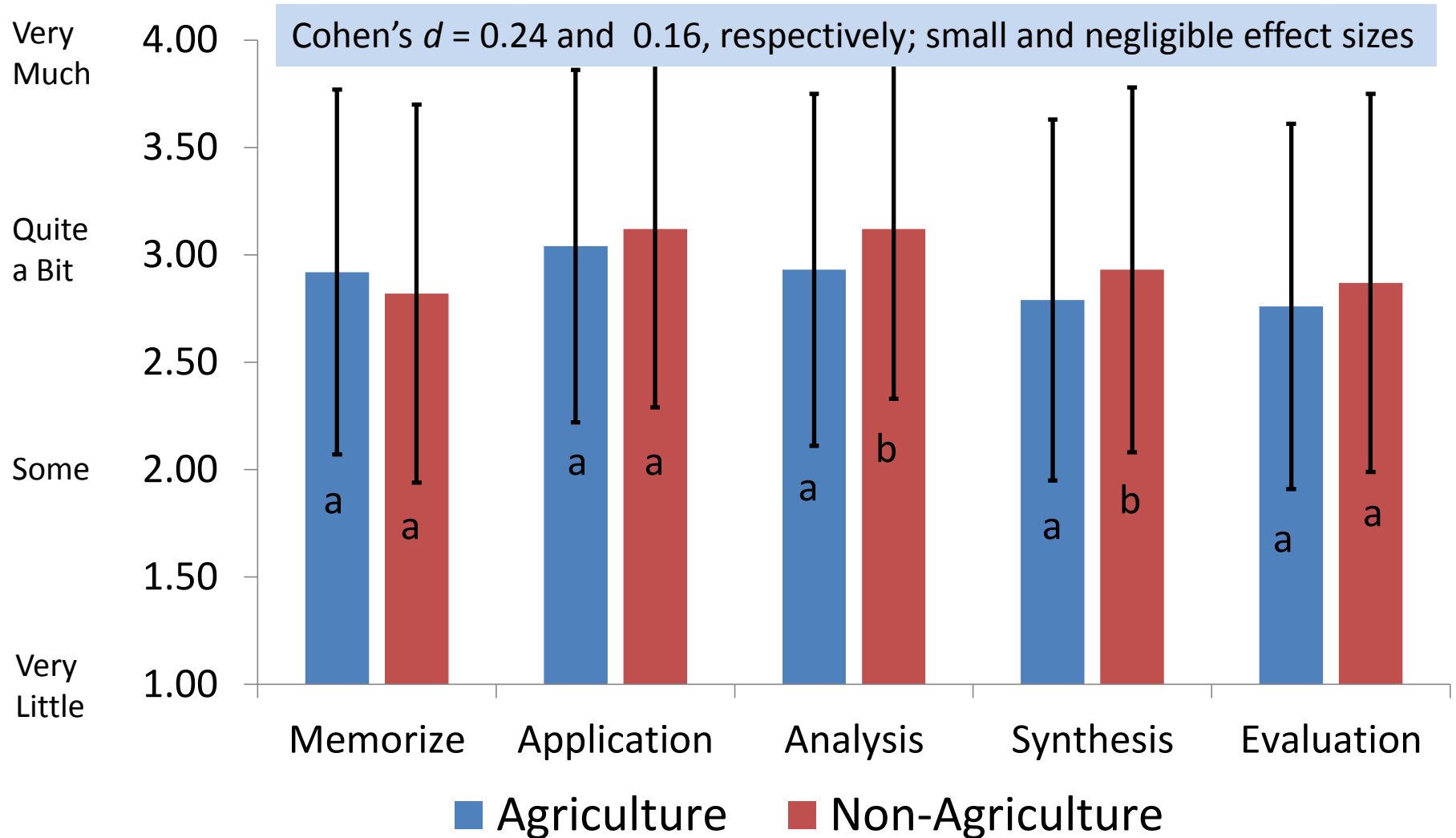
Testing for Major x Year Interaction

	ANOVA Results for Major x Year Interaction			
	Freshmen		Seniors	
Level of Cognition	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Memorize (Knowledge)	0.28	0.8383	0.43	0.7340
Application	0.33	0.8007	0.17	0.9195
Analysis	0.12	0.9489	0.55	0.6483
Synthesis	0.92	0.4281	0.10	0.9627
Evaluation	0.51	0.6754	0.47	0.7054

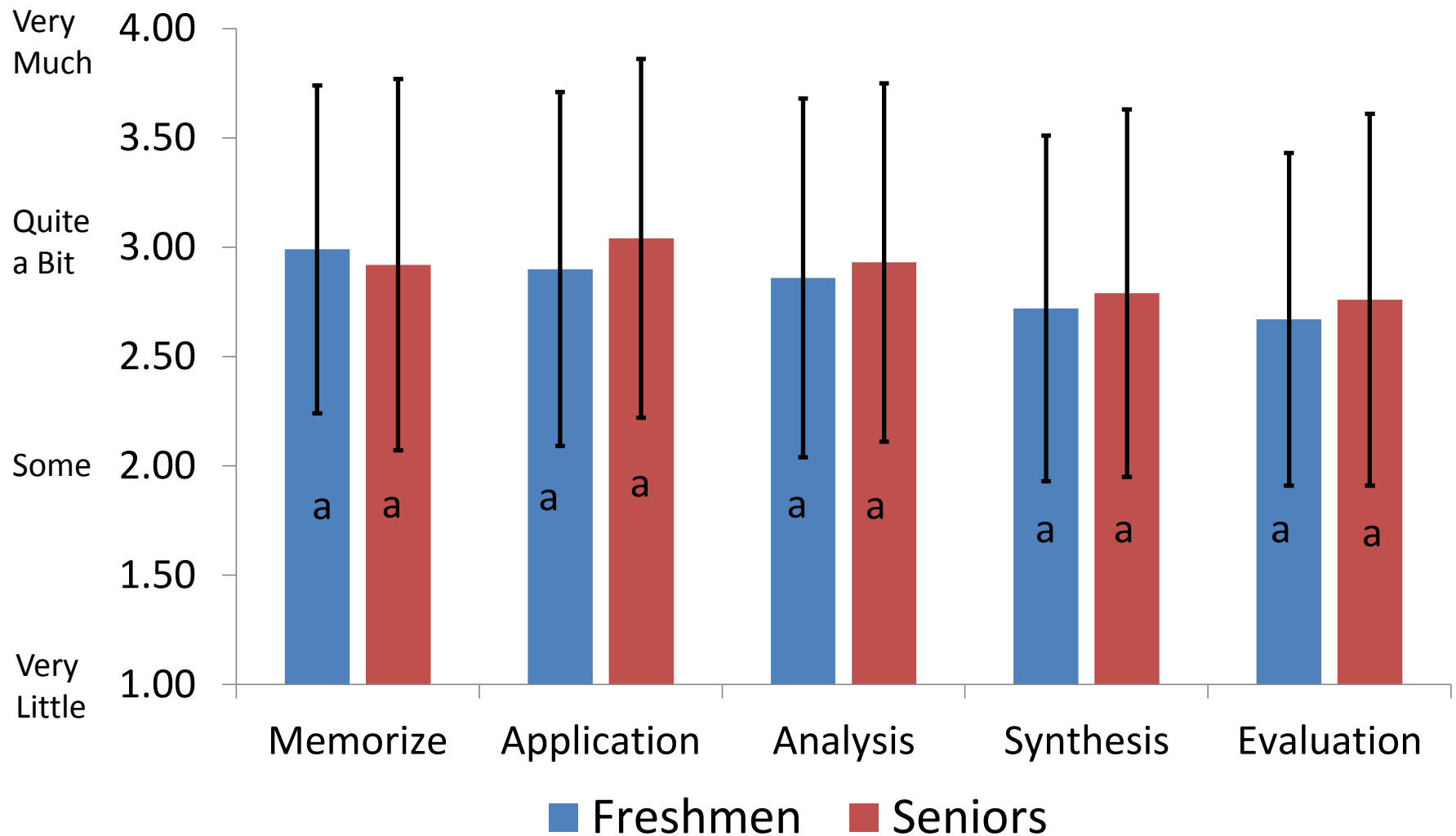
Freshmen: Mean (\pm 1 SD) extent to which coursework has required:



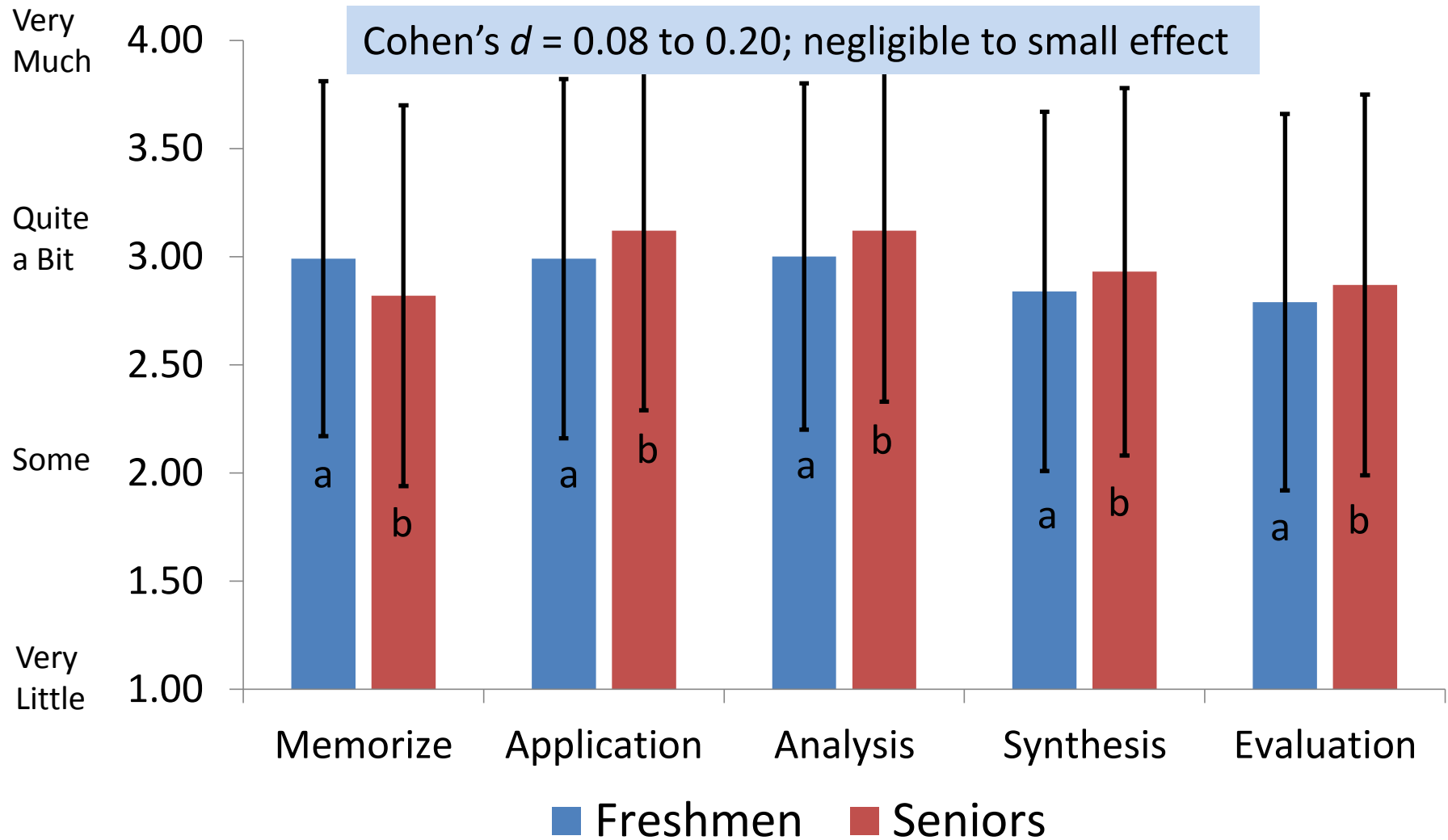
Seniors: Mean (\pm 1 SD) extent to which coursework has required:



Agriculture Freshmen and Seniors: Mean (± 1 SD) extent to which . . .



Non- Agriculture Freshmen and Seniors: Mean (± 1 SD) extent to which . . .



Conclusions and Questions

- Cognitive task levels were stable across years (2005, 2007, 2010, and 2013) for both agriculture and non-agriculture students
 - In an increasingly digital world, should use of higher-level cognitive skills also increase OR does the need to “know the basics” remain most(?) important?
- Agriculture students report less frequent use of cognitive tasks at the analysis, synthesis, and evaluation (freshmen only) levels
 - Differences are small – should we be concerned?
 - If so, what should we be doing differently?
- Agriculture students do not report more frequent use of application-level cognitive tasks
 - As an applied science, should this be the case?
 - What (if any) changes in instructional methods or approaches should be considered?

Conclusions and Questions

- Little if any difference in level of cognitive tasks required of freshmen and seniors
 - Shouldn't we expect seniors to use previously learned knowledge in working at higher cognitive levels (analysis, synthesis and evaluation)?
 - Should we encourage more widespread use of capstone courses, cooperative-learning, and problem-based learning?
- These results are consistent with previous research (Estepp et al., 2013; Ewing & Wittington, 2009; Rhoades et al., 2009)
 - Would the results be different at your university?

Thank you!