What can we learn from studying how we talk in the classroom?

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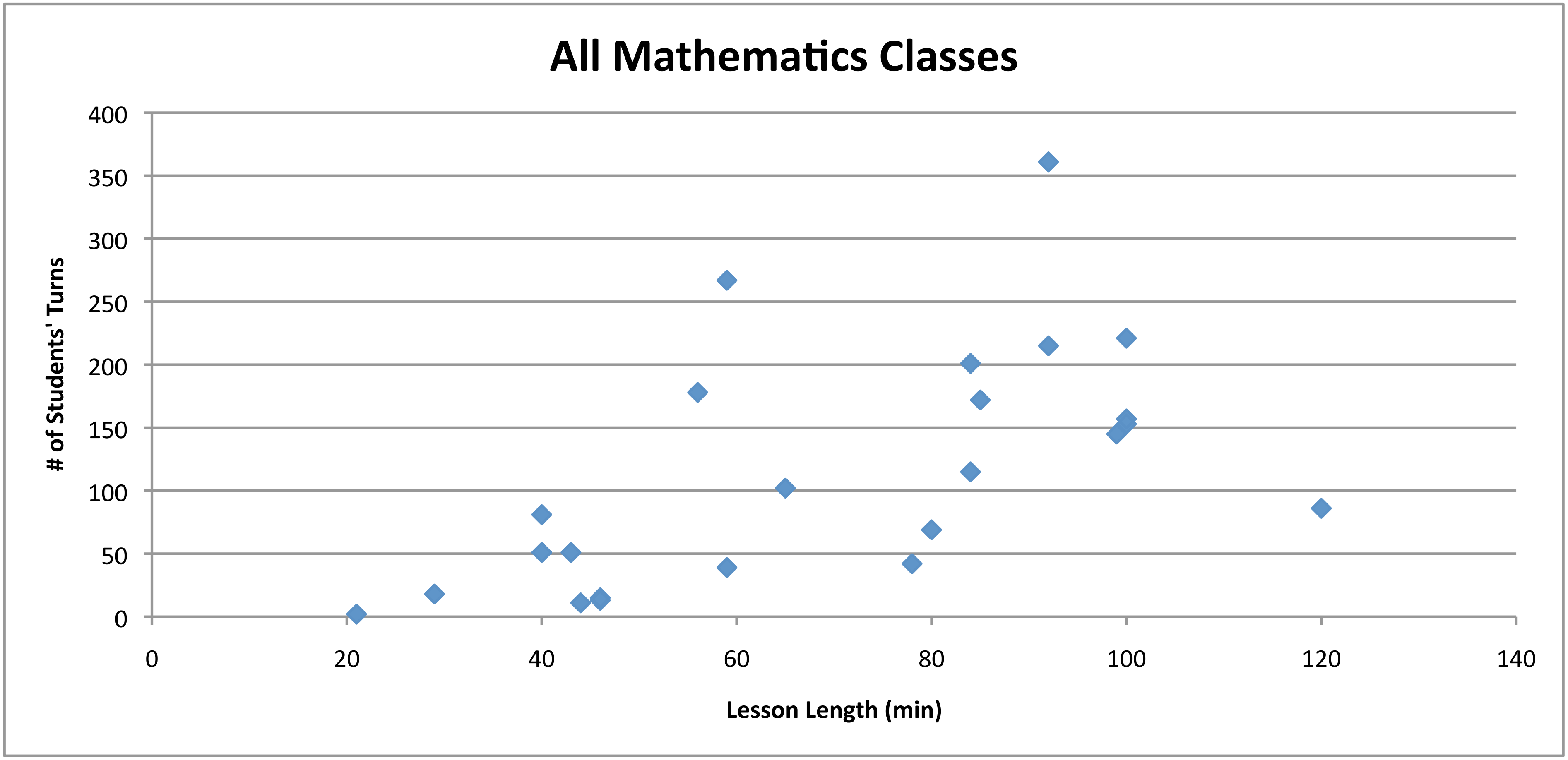
Main Point

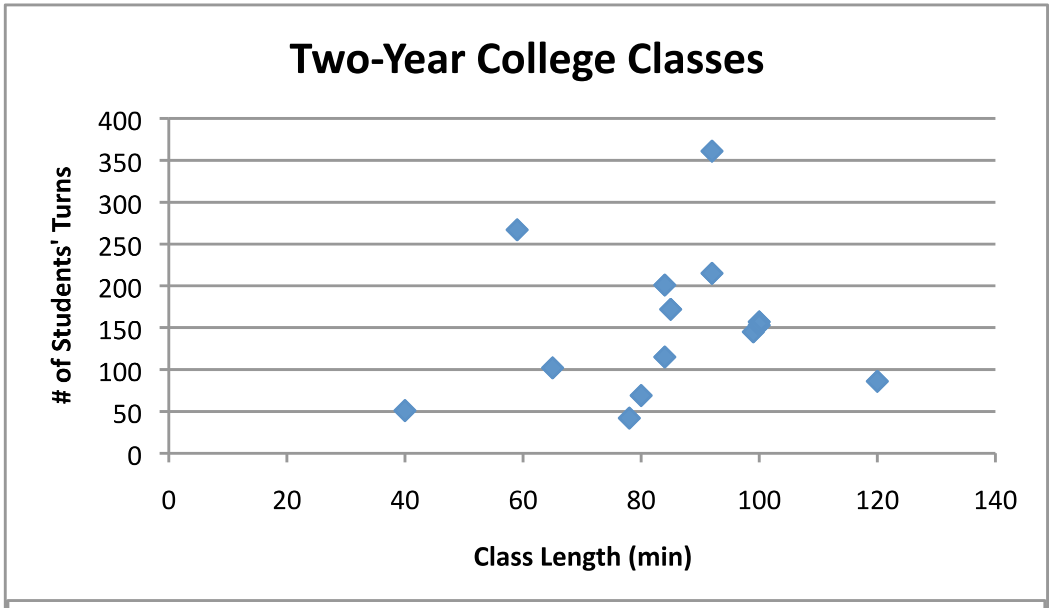
- Closely investigating the interaction that occurs in the classroom can move us closer towards “student-centered” approaches to teaching and learning mathematics

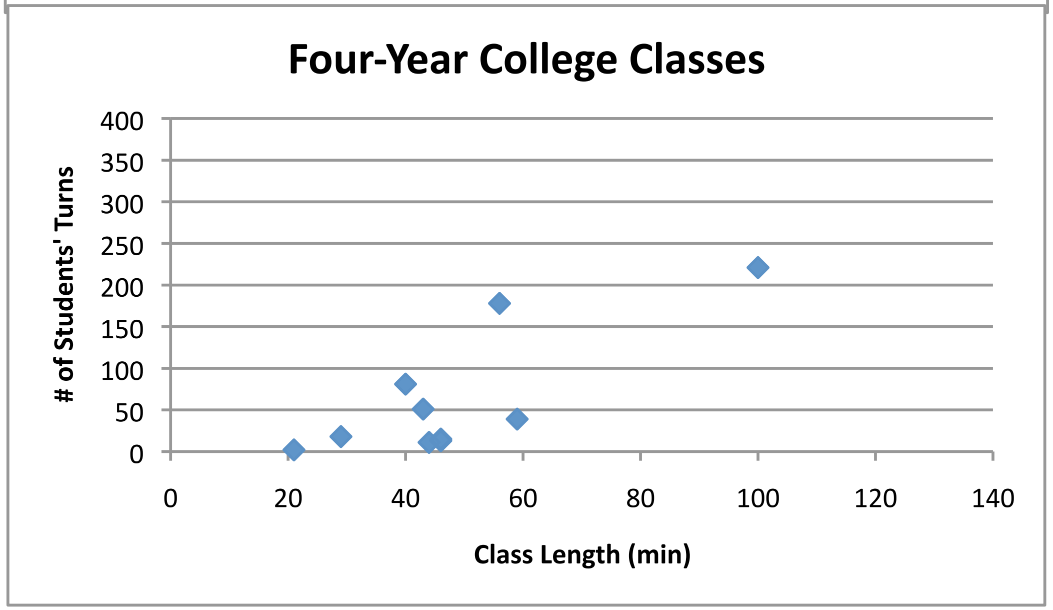
Background

- Paradigm shift from ‘teacher centered instruction’ to ‘student centered instruction’
  - What these classrooms look like?
  - How can this teaching be sustained?
  - Under what conditions is student centered instruction feasible?
- The literature points to
  - increasing student participation
  - using engaging, authentic, content

Student Participation, guess that course!




Two-Year College Classes
# of Students' Turns
400
350
300
250
200
150
100
50
0
0
20
40
60
80
100
120
140
Class Length (min)


Four-Year College Classes
# of Students' Turns
400
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200
150
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20
40
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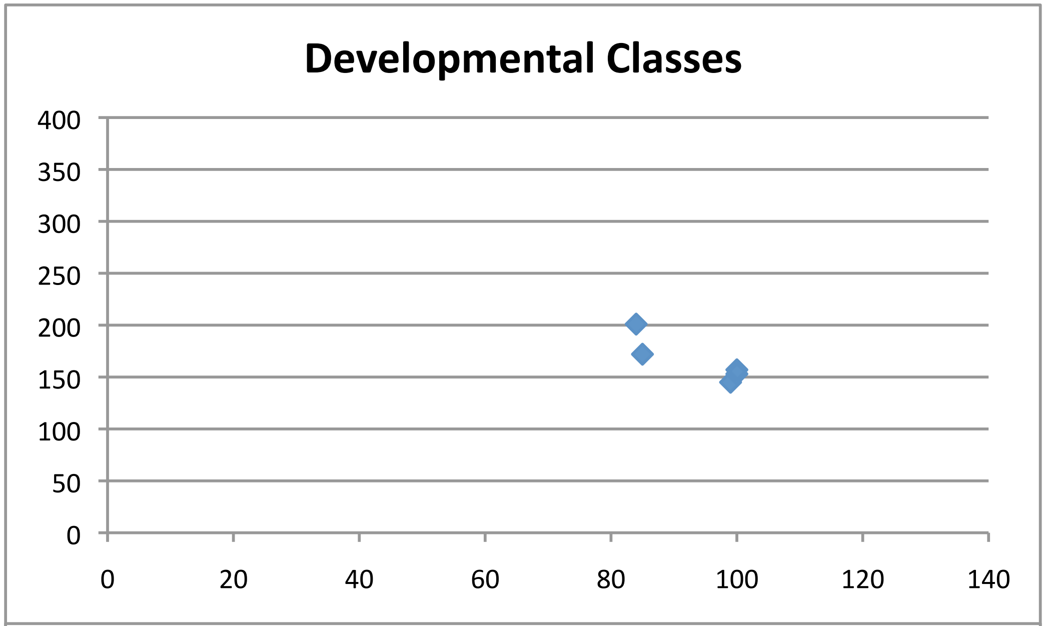
80
100
120
140
Class Length (min)


Developmental Classes
400
350
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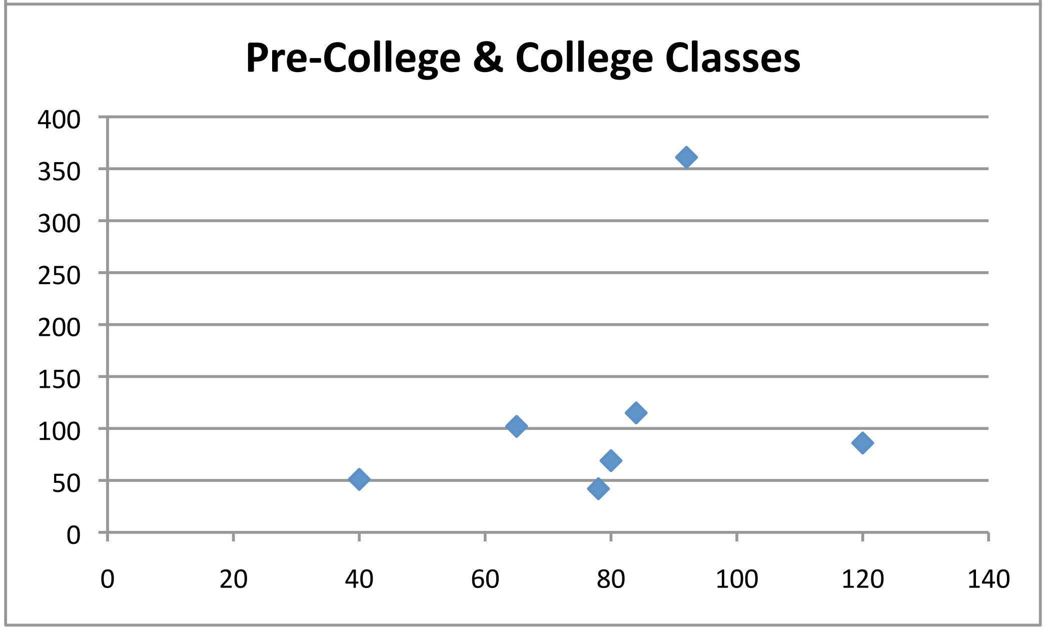
20
40
60
80
100
120
140


Pre-College & College Classes
400
350
300
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200
150
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20
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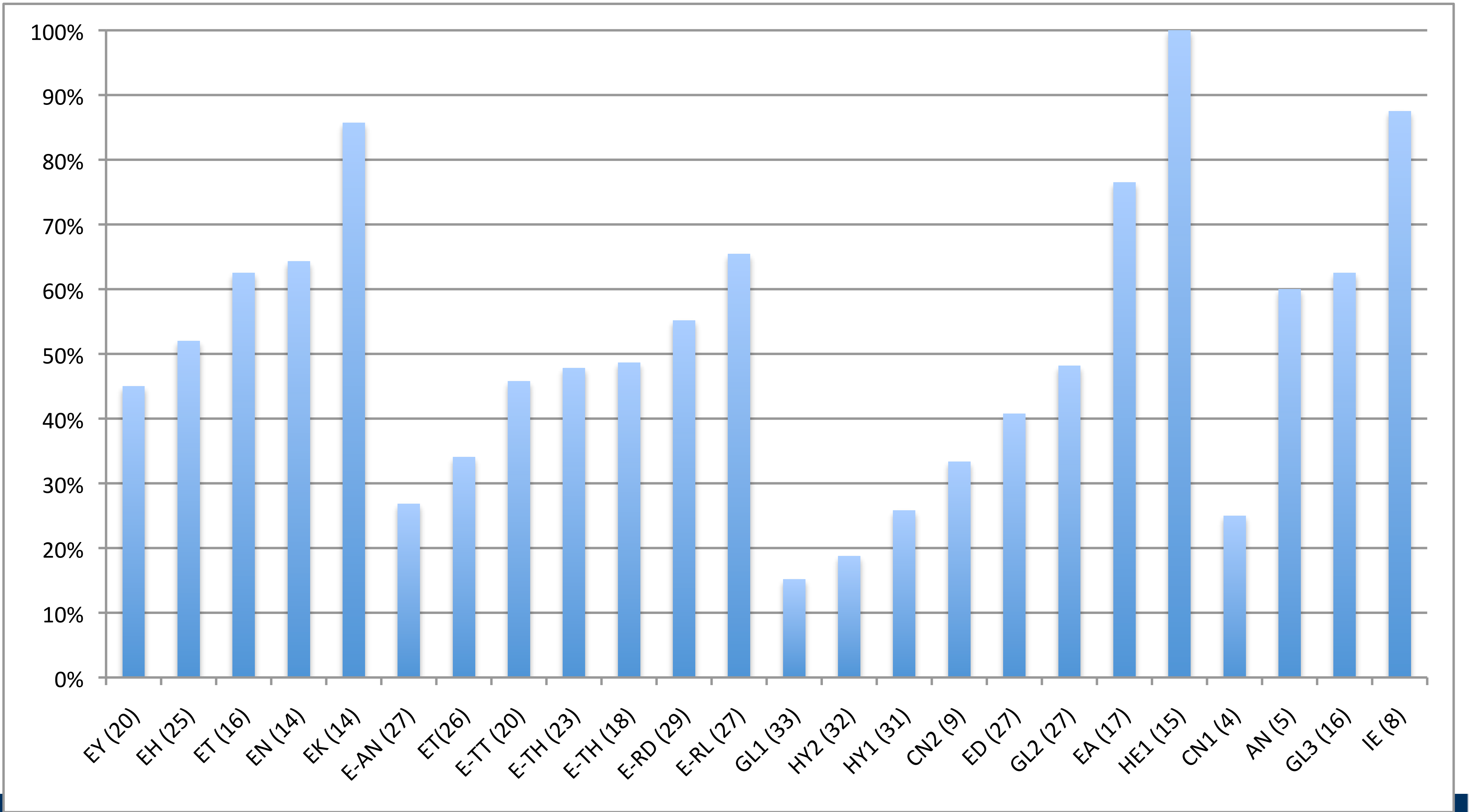
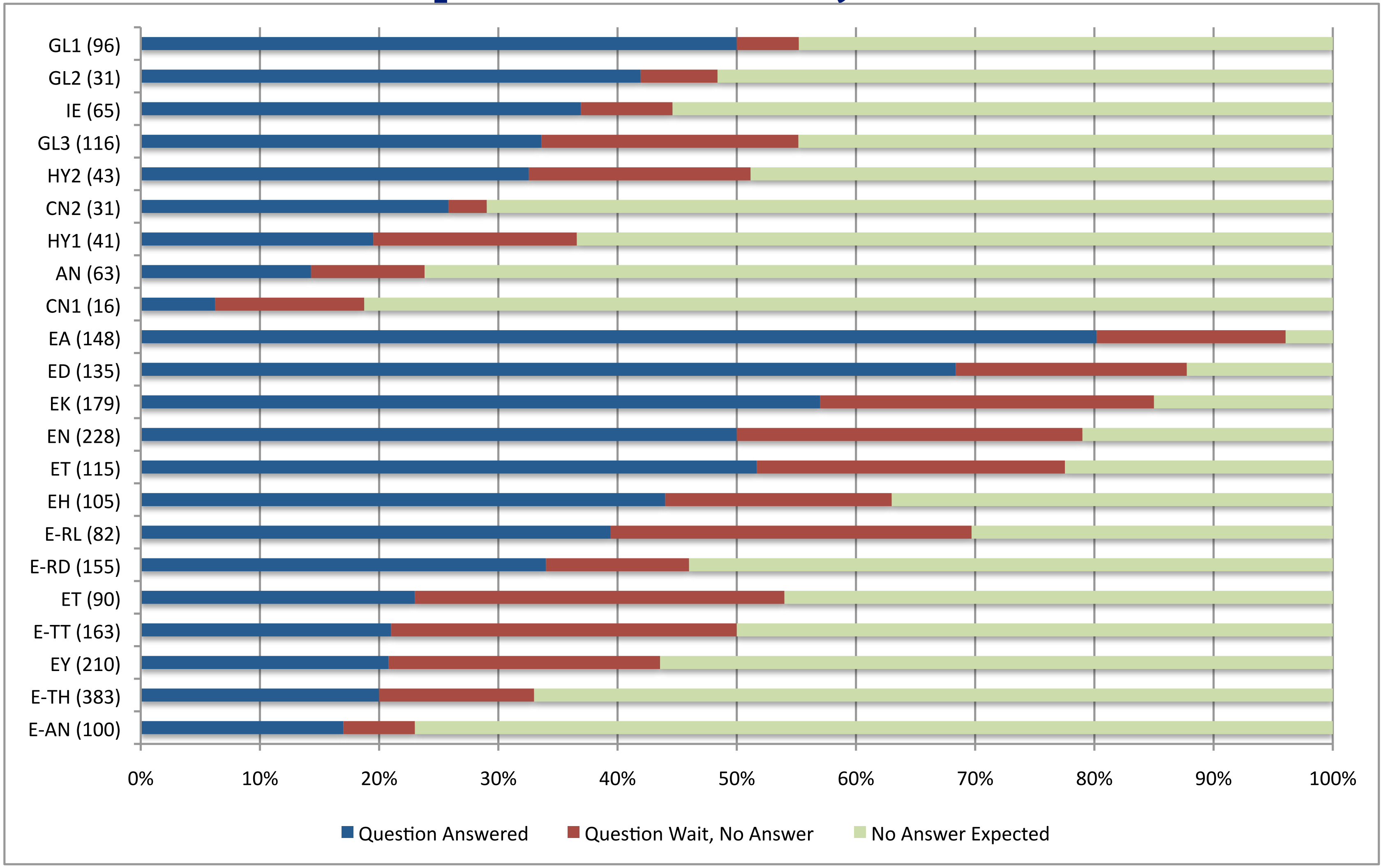
80
100
120
140

Student Participation, II



Teacher questions, I



Teacher questions, II

Study the excerpts of the four different classes

What do you notice?

What is similar?

What is different?

How are students being involved in the conversation?

Type of Knowledge & Cognitive Processes

N = 463	Remember	Understand	Apply	Analyze	Evaluate	Create	Total
Factual Knowledge	17%	8%	6%	0%	1%	0%	31%
Conceptual Knowledge	2%	8%	3%	0%	0%	0%	13%
Procedural Knowledge	13%	11%	24%	0%	1%	0%	49%
Metacognitive Knowledge	2%	2%	3%	0%	0%	0%	7%
Total	33%	29%	36%	1%	1%	0%	100%

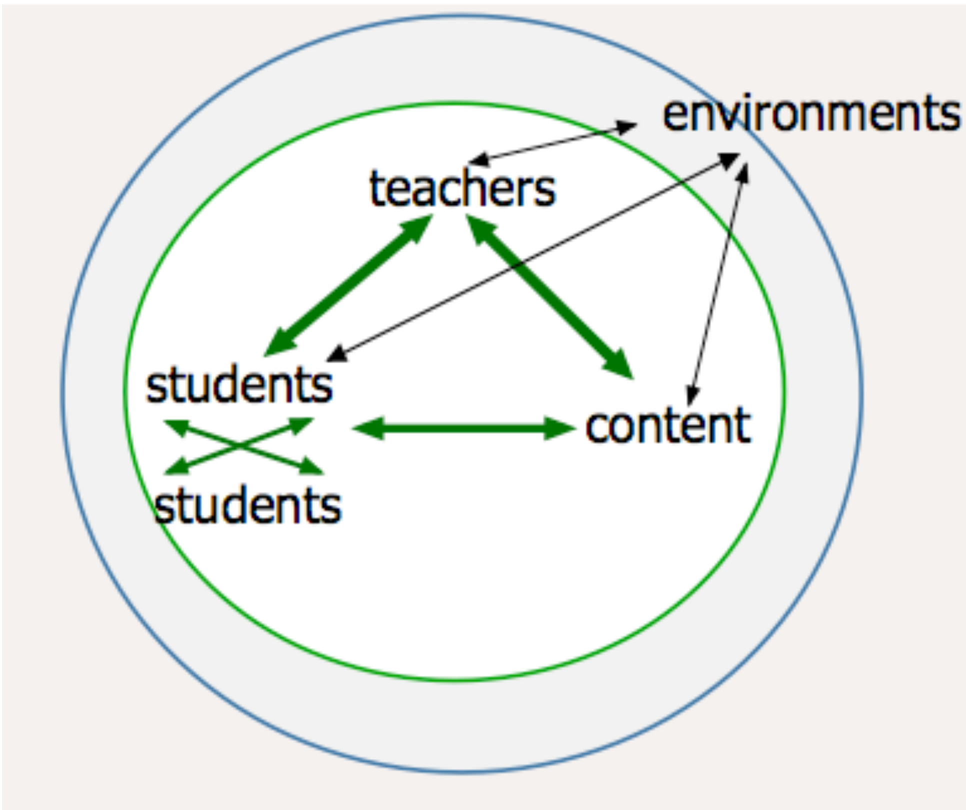
Next Steps…

What does ‘student-centered instruction’ mean?

Different layers:

Curriculum → Instruction → Assessment

Conception of Teaching



(Source: Ball, 2009)

- Multiple interactions
- Not just "what teachers do"
- Students learn anyway
- Teachers have a special role in shaping the dynamic to increase the probability that students learn what we want them to learn

Thanks

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Sample Questioning Strategies

Source: King, A. (1992). Facilitating elaborative learning through guided student-generated questioning. *Educational Psychologist, 27*, 111-126

1. What is a new example of…
2. How would you use … to …
3. What would happen if …
4. What are the strengths and weaknesses of …
5. What do we already know about…
6. How does … tie in with what we learned before
7. Explain why
8. Explain how
9. How does … affect …
10. What is the meaning of…
11. Why is … important
12. What is the difference between… and …
13. How are … and … similar
14. What is the best … and why
15. What are some possible solutions for the problem of…
16. Compare… and … with regard to….
17. How does … affect/change/influence …
18. What do you think causes…
19. Do you agree or disagree with <this statement, this solution, your partner’s answer>
20. Support your answer
21. How do you know that the answer is right?
22. How can you tell that this is the solution to the problem?
23. How do you justify…
24. …

Definitions of the categories of the cognitive-complexity coding scheme

Knowledge Dimension	Cognitive Processes Dimension
Factual Knowledge—Basic elements students must know to be acquainted with a discipline or solve problems in it, including knowledge of terminology and of specific details. ***Conceptual Knowledge***—Interrelationships among the basic elements within a larger structure that enable them to function together. It involves knowledge of classifications and categories, of principles and generalizations, and of theories, models, and structures. ***Procedural Knowledge***—How to do something, method of inquiry, and criteria for using skills, algorithms, techniques, and methods. It includes knowledge of subject-specific skills and algorithms, of specific techniques and methods, and of criteria for determining when to use appropriate procedures. ***Metacognitive Knowledge***—Knowledge of cognition in general as well as awareness of one's own cognition. It includes strategic knowledge, knowledge about cognitive tasks (including appropriate contextual and conditional knowledge), and self-knowledge.	***Remember***: Retrieve relevant knowledge from long-term memory, including recognizing and recalling. ***Understand***: Construct meaning from instructional messages, including oral, written, and graphic communication. It involves interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining. ***Apply***: Use a procedure in a given situation. It involves executing and implementing. ***Analyze***: Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose. It involves differentiating, organizing, and attributing. ***Evaluate***: Make judgments based on criteria and standards. It involves checking and critiquing. ***Create***: Put elements together to form a coherent or functional whole and reorganize elements into a new pattern or structure. It involves hypothesizing, designing, and producing.

Source: Anderson, L. W., Krathwohl, D. R., Airasian, P. W., Cruikshank, K. A., Mayer, R. E., Pintrich, P. R., et al. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing*. New York: Longman.