IMPROVING COLLEGE READINESS IN MATHEMATICS AT ECHS

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EARLY COLLEGE RESEARCH CENTER AT UNC-GREENSBORO

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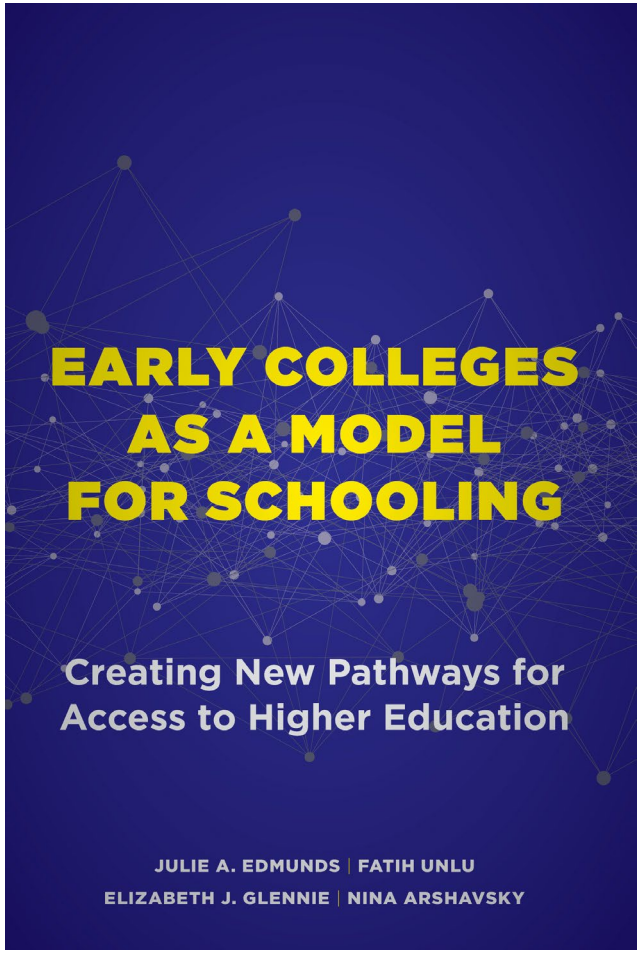
WHO ARE WE?

- ***The Early College Research Center*** conducts, synthesizes and disseminates research on early college and related topics, such as dual enrollment and the transition to college.
- Research we have conducted includes:
  - A 20-year experimental study of the impact of early colleges in NC.
  - Studies of seven large-scale efforts to implement early college strategies in comprehensive high schools (CO, CT, IN, MI, NC, OH, TX)
  - Five-year study of the impact, implementation, and cost of NC's statewide dual enrollment program
  - National Rural Center's study of dual enrollment in 3 states: AL, TN, NC



SESSION OUTLINE

Research findings: What are the impacts of the Early College on performance in mathematics for students with on-grade and below-grade academic preparedness?

How did instruction look like in these classrooms?

Discuss: How do early colleges help underprepared students succeed in their math outcomes?

WHO IS IN THE ROOM?

Stand up if you…

EXPERIMENTAL STUDY OF THE MODEL'S IMPACT

- 20-year experimental study comparing students who applied to and were randomly assigned into the ECHS with students who applied for and were randomly not assigned through lottery
- Students who applied to 19 early colleges for the fall of 2005 through 2009
  - Administrative data collected by NCDPI
  - Mathematics Classroom Observations
  - Interviews with Math Teachers

Treatment:

1,434

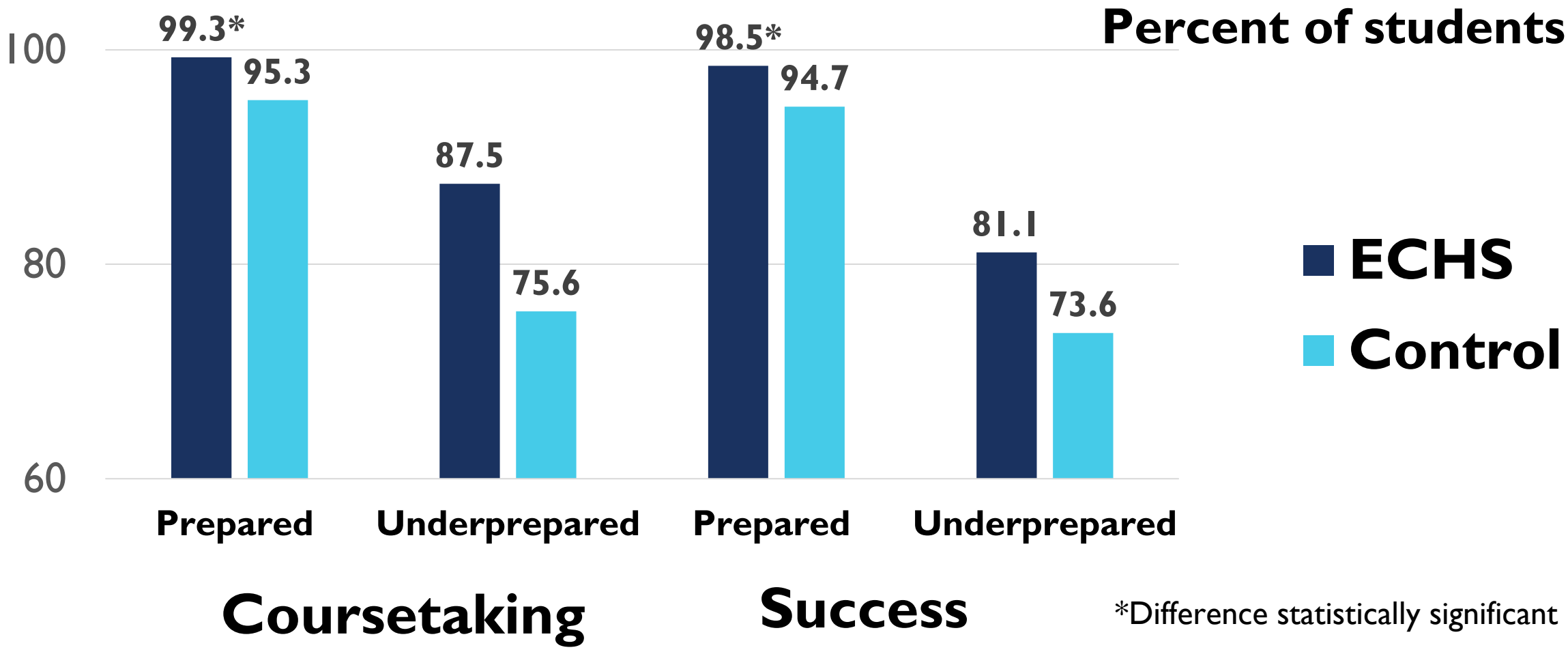
Control:

995

EARLY COLLEGES

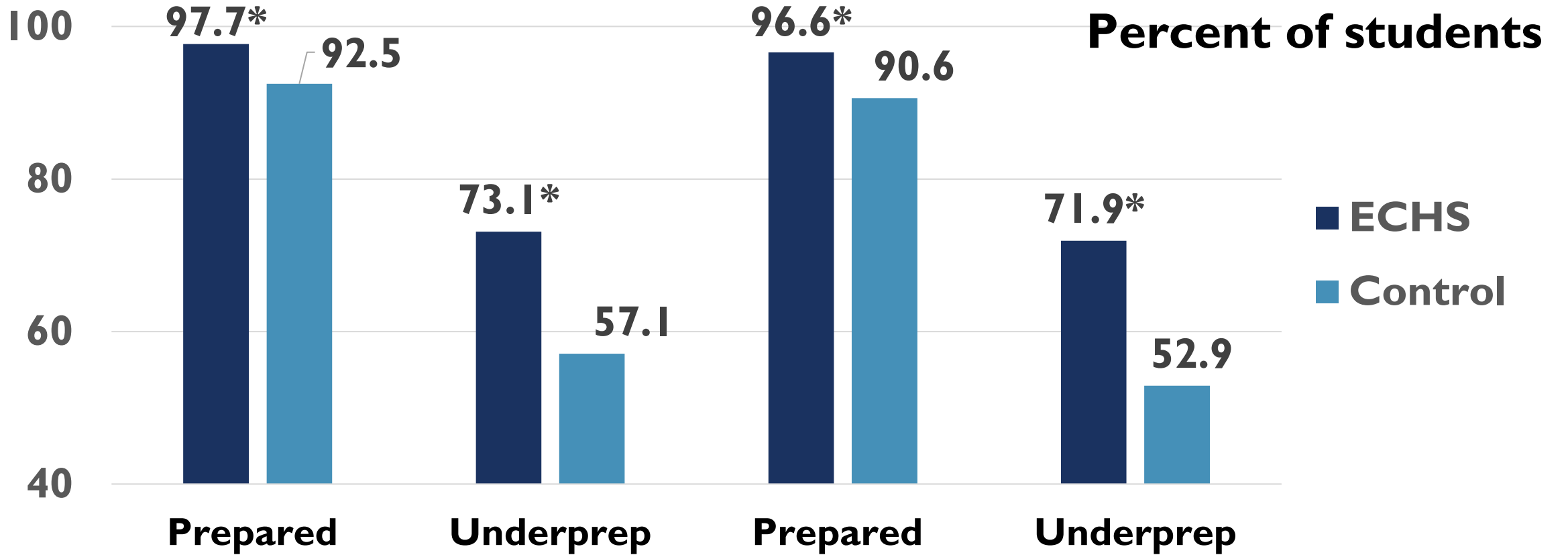
- Small high schools that blur the line between high school and college
- Mostly located on college campuses
- Serve students in grades 9-12 or 9-13
- Targeted students who are underrepresented in college
  - First-generation; low-income; minority

9TH GRADE MATH OUTCOMES



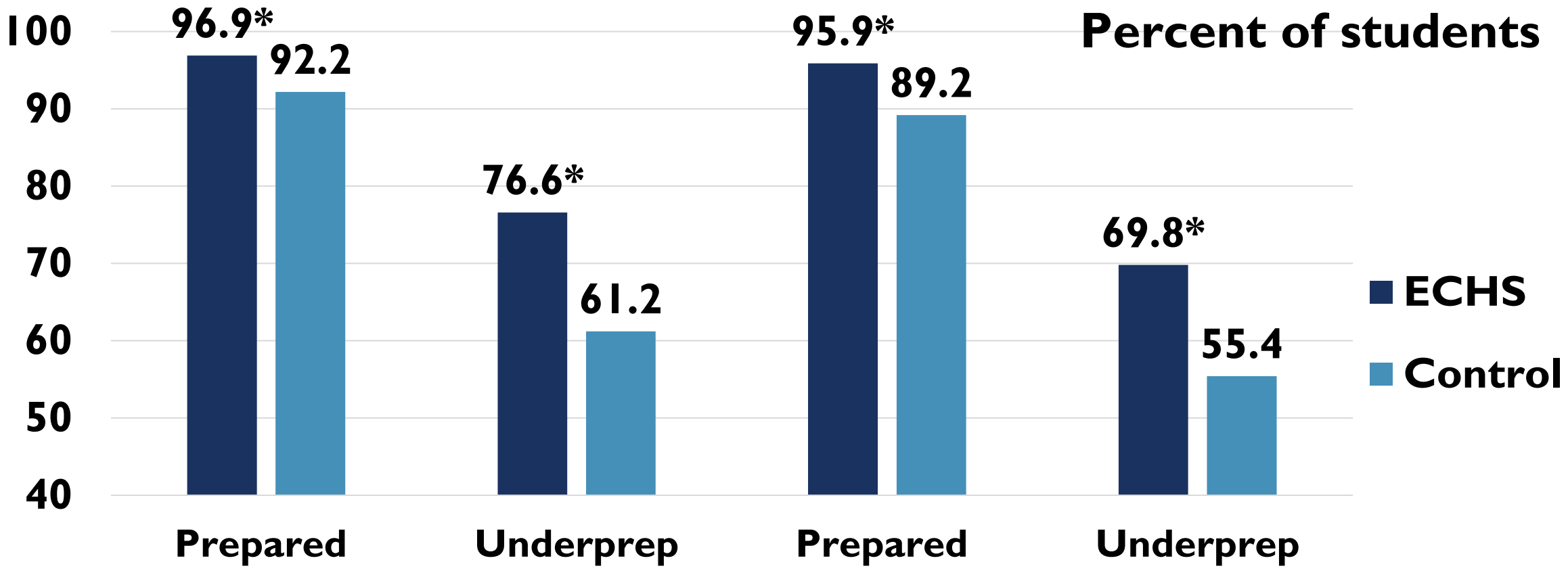
*Difference statistically significant

10TH GRADE MATH OUTCOMES



*Difference statistically significant

11 TH GRADE MATH OUTCOMES



*Difference statistically significant

KEY TAKEAWAYS

- **ECHS students outperformed control students in both math coursetaking and success in completing courses.**
- **Underprepared students benefited from ECHS more than prepared students in math outcomes.**
- **The gaps with control and benefits for underprepared students grew from the 9th to 10th and 11th grades.**

DISCUSSION

Question: How do early colleges help underprepared students succeed in their math outcomes?

- Take a couple of minutes to jot down and discuss this question with your neighbor.
- Let's share out

DESIGN PRINCIPLE II: INNOVATIVE INSTRUCTIONAL PRACTICE

How does innovative instructional practice help to build student academic readiness? How is it related to the rigor of instruction?

EC Exhibits teaching for learning through innovative instructional practice that **builds student self-efficacy** through active collaboration

- Intentional planning to scaffold **student collaboration, voice and choice**; aligned instructional strategies
- Individualized student support
- Reflective practice to encourage staff collaboration and professionalism to make practice public

COMMON INSTRUCTIONAL FRAMEWORK

Every student reads, writes, thinks and talks in every classroom every day

- Collaborative Group Work
- Questioning
- Scaffolding
- Classroom Talk
- Writing to Learn
- Literacy Groups

These are six student-centered instructional practices. What does it mean? Do they make instruction rigorous?

IN INTERVIEWS, TEACHERS DESCRIBED MOST FREQUENTLY

- teacher as a facilitator (56%)
- group work (69%)
- classroom talk (56%)

So between the group working the assignments, there is usually … hopefully no more than 15 or 20 minutes with me up in front talking, demonstrating, and I just try to facilitate whatever the goal for the unit, or the day, or the remediation is…

We're constantly working on them [students] explaining their thinking, and learning how to communicate with each other, and doing a lot of group work. I have kept my tables in groups the entire semester so far.

students were "…on task considerably more than when I was standing at the board, explaining the problem they didn't know how to do."

CLASSROOM OBSERVATIONS

- 17 mathematics classrooms in 17 schools
- Algebra 1 – 1
- Geometry – 7
- Algebra 2 – 6
- Core Plus (integrated) - 3

- Lesson goals
- Cognitive demand of student work
- Conceptual vs procedural focus
- Reasoning
- Collaboration
- Communication
- Collecting evidence of student learning

EXAMPLES OF GOALS

- **Conceptual goal:** "what is/defines a function in tables, graphs, symbols, and words?"
- **Procedural goal** in the form of a question: "How do you solve inequalities algebraically?"
- **Agenda:** Solve problems involving exponential growth & decay; solve problems using the Pythagorean Theorem
- **Topic:** Logarithmic Equations & Properties of Logs

RIGOROUS INSTRUCTION: COGNITIVE DEMAND, REASONING, AND CONCEPTUAL FOCUS

- Conceptual – 35%, Procedural – 65%
- 5 obs. –cognitive demand, low or reduced
- 7 obs. (41%) –reasoning

Examples:

- Peer teaching, asking each other questions
- Teacher asks a whole class to create a generalization or a rule from a set of numeric problems
- Students are asked to justify their answers and prove geometric relationships or conjectures: "How do you know, what's your reason?"

COLLABORATION

12 observations (71%)

- Solving problems together, helping each other (8)
- Checking each other's homework or classwork (2)
- Hands-on activity (2)
- Identifying mistakes made in a solution to a problem
- Jigsaw: Becoming an expert in "Check your understanding" questions/concepts, and then sharing expertise and justifying it with others
- Doing a mathematical exploration and justifying their reasoning

STUDENT COMMUNICATION

15 observations (88%)

- Written Communication:
  - Reflect on hands-on activity in writing (Core-Plus)
  - Create a written presentation of the student-designed problem on the poster
- Small-group discussion among students, and teachers talking to small groups of students
- Small group presentation
- Single student presentations
- Whole-class discussion

COLLECTING EVIDENCE OF STUDENT LEARNING

15 observations (88%)

- Checking individual student's work and questioning groups of students as they do independent work; listening to their explanations
- Written exit tickets (2)
- Simultaneously collecting responses from the whole class (thumbs up or down; standing up for correct and sitting down for incorrect answers); asking individual students or groups to vote through the computer (on the net)
- Looking at student work as they publically solve problems
- Whole class questioning: asks to provide reasons/justification for conclusions; calling on students by name
- Checking HW

KEY TAKEAWAYS FROM OBSERVATIONS

- **Collaborative classrooms were as likely to be rigorous as not rigorous, while non-collaborative classrooms tended to be not rigorous.**
- **Classrooms with explicit instruction were less likely to be rigorous.**
- **Rigorous instruction was observed least frequently (in seven classrooms or 41%).**

EARLY COLLEGE VS CONTROL INSTRUCTION

Practice	Math
Homework includes writing	+
Homework includes reading (M: text problems)	+
Worked in groups	+
Describe explanations on tests	+
Discuss connections to other subjects	+
Homework includes research	+

QUOTES FROM STUDENTS

In our high school classes we're encouraged to speak up. We're encouraged to tell what we think about the topic, and what's going on.

Speeches are like second nature now. We give them on almost like every day.

Here you come and you work in groups, it's more hands-on. You learn it more with other people and it's easier.

we were able to essentially writing a paper every week, which were graded and handed back to us in a timely manner. I think we had four or five projects every two months.

The teachers push you, and they don't just give you answers. They help you to think for yourself.

And we had a lot of projects that related to what we were studying because with me, just seeing numbers will not help me at all. If you give me a real live process – like one of them was we had to make a blueprint of a house and find the different areas and the diameters of the different things that we were going to have in the house. And that helped me relate it to the real world, because I'm not as interested in things that I can't relate to my own life at all.

PERCEIVED IMPACTS OF CHANGES IN INSTRUCTION

- Increased student engagement
- Resistance to increased workload, writing
- Increased teacher enthusiasm

"I would say that the kids love the project-based stuff. They talk about it all the time." -- Teacher

"I think really it's bringing some life into some of our teachers and actually giving them some things to be a little bit more excitable about, and it's helping our students because when they're excited, and you'll see from the teachers, the kids are excited and then really learning; it is just awesome." -- Administrator

DISCUSSION AND CONCLUSIONS

- **Which practices in your school help underprepared students increase their success in math and other subjects?**

- **What are *your* 1 or 2 major takeaways from this session?**

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Resources you can find on our website:

- Infographics and briefs on impact and implementation of early college, dual enrollment, and postsecondary success strategies
- Links to our peer-reviewed articles

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