

Instructional Change in Undergraduate STEM

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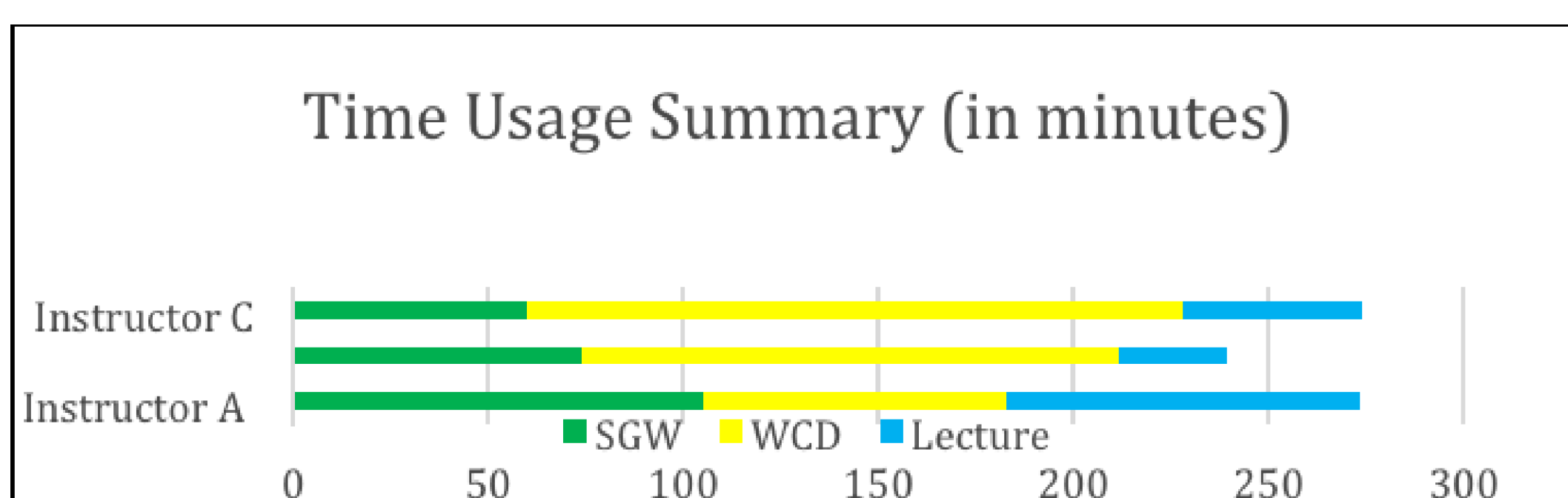
- Research Question: How do undergraduate mathematics instructors implement student-centered instructional materials?
- Data Sources:
 - video recordings of 3 instructors at 3 tertiary institutions teaching a 4-day, student-centered instructional unit on span and linear (in)dependence in introductory linear algebra, two years in a row
 - Audio recordings of interviews with these instructors before, during, and after the unit
- Methods of Analysis:
 - Coded video data for use of instructional time according to small group work, whole class discussion, and lecture
 - Coded whole class discussions for ways in which instructors elicited and built on student thinking in whole class discussion
- Findings: Challenges
 - Year 1: Instructors reported focusing much of their time and attention on pacing, alignment of student-centered instructional materials with course texts, and grouping students and getting them to talk in class
 - Year 2: Instructors’ talk focused much more on the ways in which students were thinking about the mathematics

- Findings: Year 1 Implementation
 - Total time spent on the instructional sequence was similar across instructors; allocation of time varied across instructors
 - Four structures for eliciting and building on student thinking in whole class discussion identified:
 1. Getting students to talk
 2. Getting students to explain their thinking
 3. Using student ideas as a basis for instructor explanation or formalization
 4. Using student ideas as the basis for a new mathematical question or task
- Preliminary Year 2 Findings
 - Observed increase in eliciting and building on student thinking (structures 2-4)

| Instructor | Approx # of student groups | # of student approaches represented publicly | # of student approaches explained by students in WCD | Discussion structures observed |
|------------|----------------------------|--|--|--------------------------------|
| C- 2013 | 14 | 14 | 0 | 1 |
| C- 2014 | 10 | 10 | 4 | 2,3,4 |
| B-2013 | 2 | 2 | 2 | 2,4 |
| B-2014 | 5 | 5 | 4 | 2,3,4 |
| A-2013 | 8 | 8 | 4 | 2,3 |
| A-2014 | 8 | 8 | 1 | 2,3 |

- Implications:
 - Informs appropriate trajectories for instructors learning to implement student-centered instruction

Andrews-Larson (FSU), Johnson (Virginia Tech), and Keene (North Carolina State University) applied for and received a three-year collaborative NSF grant to support the next stage of this work beginning August, 2014. The grant is entitled *Teaching Inquiry-Oriented Mathematics: Establishing Supports (TIMES)*.



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