EXPANDING STEM TALENT
through Upward Transfer

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Predicting Transfer into STEM Fields of Study Using Statewide Longitudinal Data: The Case of Ohio

Xueli Wang, Yen Lee, and Kelly Wickersham
University of Wisconsin-Madison

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http://stemtransfer.wceruw.org
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Introduction

- Community colleges expand and diversify STEM
- Lots of policy spotlight but limited empirical work, esp. on:
  - Courses and pathways leading to successful transfer in STEM
  - Specific types of course-taking patterns contributing to transfer in STEM and the actual timing of transfer

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Research Question

What course-taking patterns predict transfer into STEM fields as well as the timing of transfer?

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Literature and Conceptual Framework

- Research on upward transfer
  - Academic preparation for STEM (e.g., Hagedorn & DuBray, 2010)
  - Role of advising (e.g., Packard & Jeffers, 2013; Packard, Tuladhar, & Lee, 2013)
  - Students' experiences in STEM before and after transfer (e.g., Allen & Zhang, 2016; Jackson, 2013; Jackson & Laanan, 2015; Jackson, Starobin, & Lannan, 2013; Laanan, Starobin, & Eggleston, 2010)
- Course-taking patterns in STEM
  - Student pathways in transferrable STEM courses (e.g., Bahr, Jackson, McNaughtan, Gross, & Oster, 2015)
  - Course-taking patterns that lead to transfer in STEM (e.g., Wang, 2015)
- Wang's (2015) concept of STEM momentum
  - Current study extending from early STEM momentum to momentum embedded in longitudinal patterns

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Data and Sample

- Ohio Department of Higher Education's - Higher Education Information system (ODHE-HEI)
- First-time students beginning at any of the 23 community colleges in Ohio during the 2003-2004 academic year
  - No postsecondary records in any community colleges or universities in Ohio within five years preceding 2003-2004 enrollment
  - Enrolled only at community colleges when starting in 2003-2004
  - Enrolled as undergraduate students
- Retained 36,618 students and followed their academic records over an 8-year window

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Measures

- Course-taking patterns
  - STEM, non-STEM, and remedial; non-remedial courses coded general and other
  - CIP codes to classify whether course was in STEM field
- Independent variables
  - Course-taking clusters
- Dependent variable
  - In-state upward transfer from two- to four-year institutions over 8-year window
  - Major fields of study: STEM, non-STEM, and no declared major
  - Timing of transfer: early (Spring 2005 and earlier), middle (after Spring 2005 through Spring 2007), and late (after Spring 2007)
- Control variables
  - Demographic/background (e.g., gender, race/ethnicity, transfer intent)

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Analytical Approaches and Limitations

- Longitudinal, multidimensional k-means cluster analysis for course-taking patterns
- Clusters as key independent variables in multinomial logistic regression model predicting transfer
- Limitations
  - Does not include out-of-state transfer
  - Data longitudinal, but observational
  - Not all relevant student-level variables included in data

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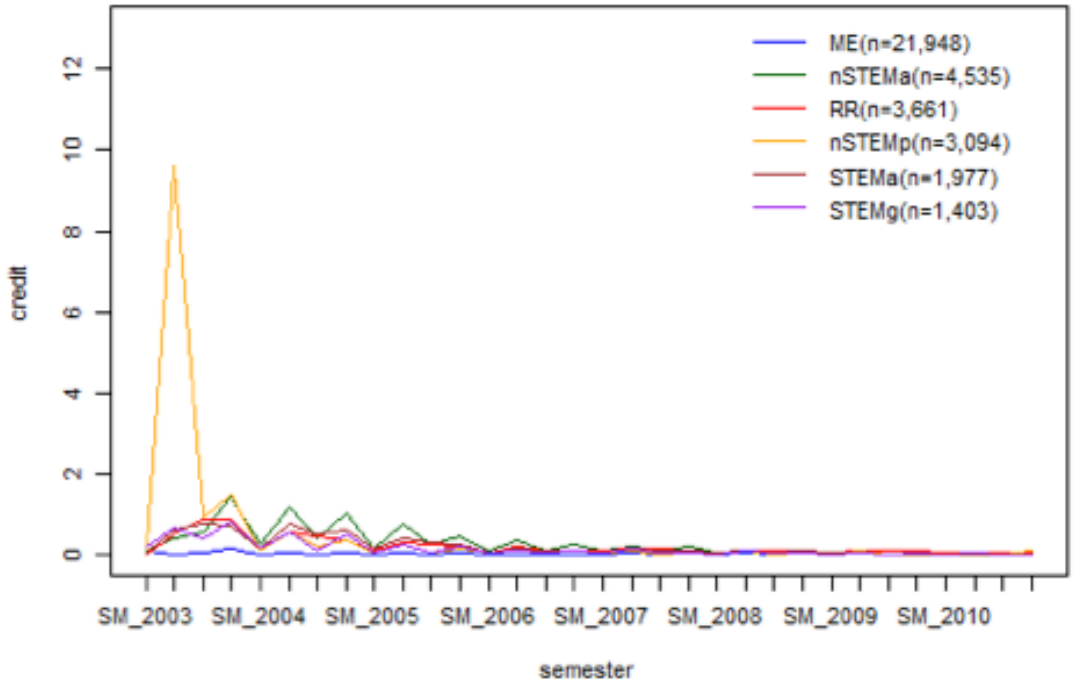
Results: Generating Clusters

Progressing in Non-STEM



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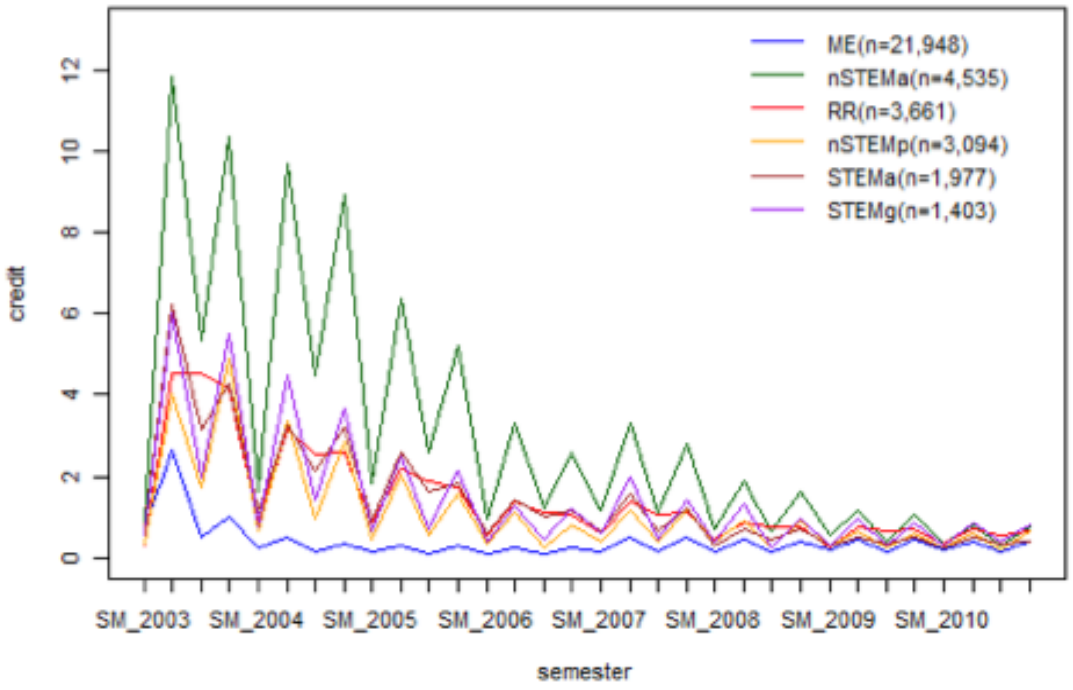
Results: Generating Clusters

Advanced Non-STEM



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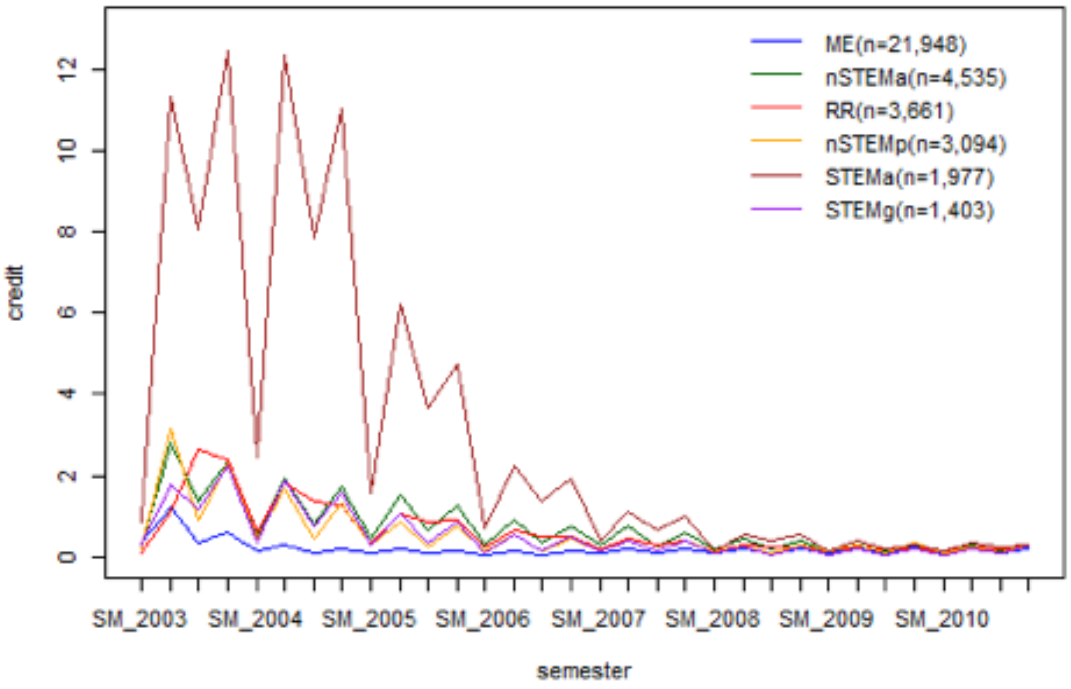
Results: Generating Clusters

Advancing in STEM



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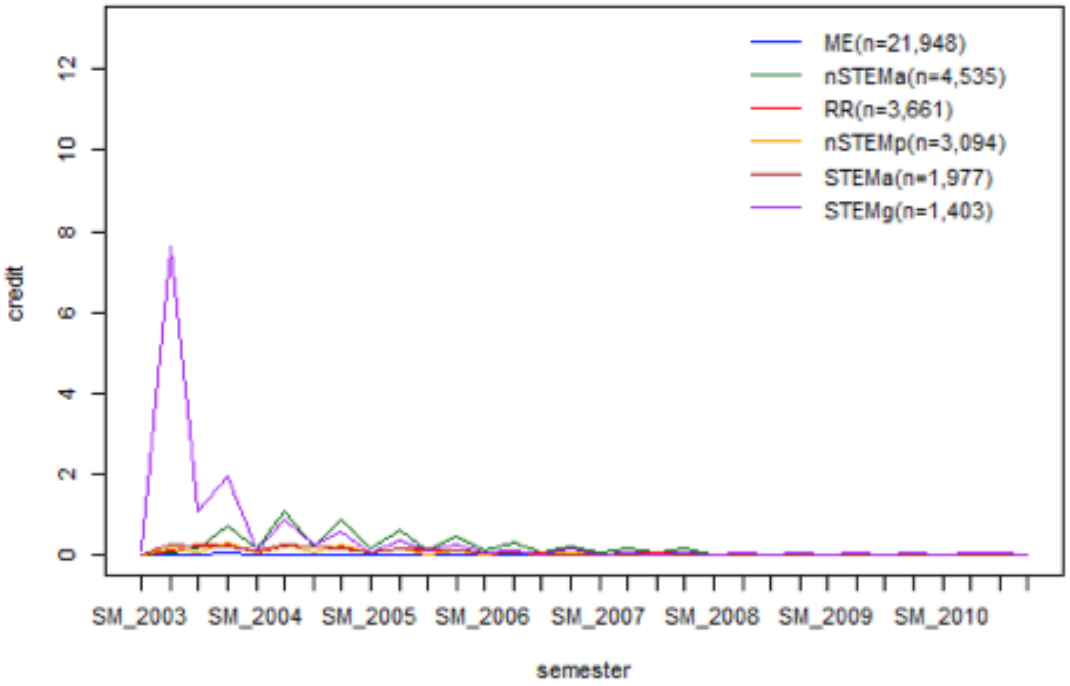
Results: Generating Clusters

Gatekeeping STEM



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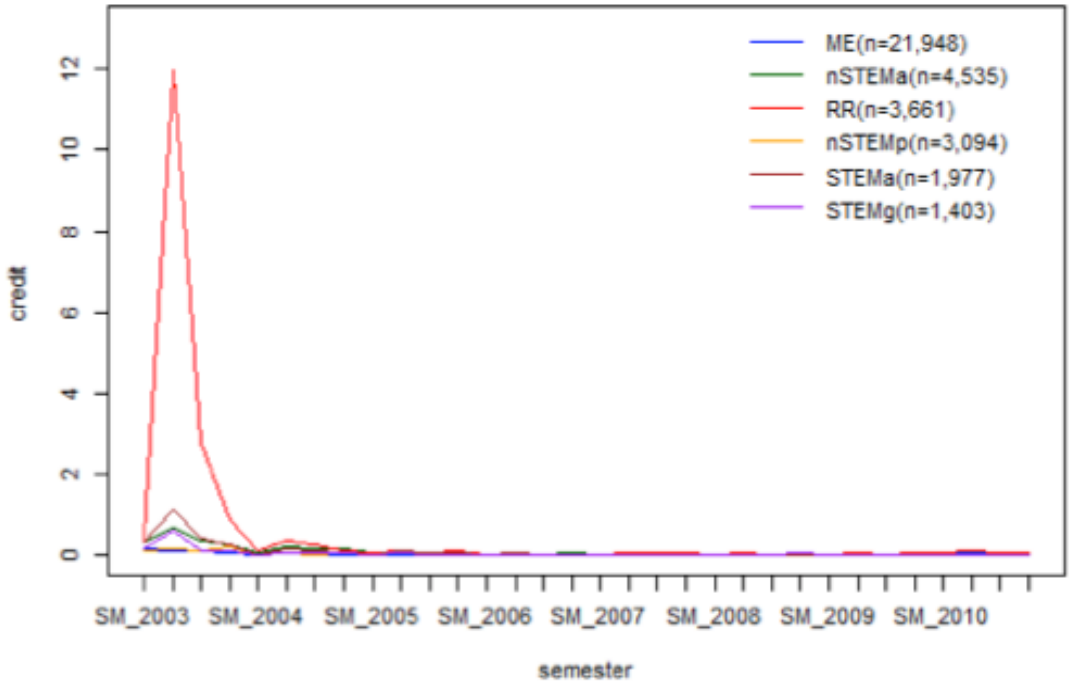
Results: Generating Clusters

Remedial Required



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Results: Multinomial Logistic Regression

	nSTEMa	Remedial	nSTEMp	STEMa	STEMg
Early non-STEM transfer (n=1,094)	1.21***	-0.02	0.92***	1.52***	0.78***
Early non-declared transfer (n=204)	0.03	-0.74*	0.35	1.04***	0.10
Early STEM transfer (n=163)	0.74**	-1.35*	0.80**	1.97***	1.43***
Middle non-STEM transfer (n=1,446)	1.70***	0.36***	0.91***	1.30***	1.40***
Middle non-declared transfer (n=205)	0.80***	-1.14**	0.64**	1.06***	1.12***
Middle STEM transfer (n=228)	1.22***	0.04	0.68*	2.51***	1.75***
Late non-STEM transfer (n=1446)	1.26***	0.30***	0.57***	0.81***	0.70***
Late non-declared transfer (n=155)	0.66**	-0.18**	0.23	0.00	0.60
Late STEM transfer (n=197)	0.82***	-0.08***	0.67*	2.18***	1.13***

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Discussion

- General and advanced as two main patterns
- Advanced STEM course-taking stronger transfer pathway
- General and advanced STEM course-taking benefit middle transfer in STEM to a greater extent

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Implications for Policy, Practice, and Research

- Two- and four-years help chart academic trajectories in STEM
  - Develop and examine articulation policies
- Support and guide students in need of remediation or otherwise
- K-means and multinomial logistic regression useful and robust approach
- Course-taking in STEM new empirical frontier

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