Pre-STEM Pathways: Establishing a route for success for four-year STEM degrees

Barbara Kramer, Ph.D. (Chemistry)
Jason Miller, Ph.D. (Mathematics)
Timothy Walston, Ph.D. (Biology)

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Objective

- Missouri trends in training of undergraduates in STEM, and
- report on NSF-funded efforts at Truman to expand the talent pool
- lessons
- proposal: pre-STEM pathways

Context

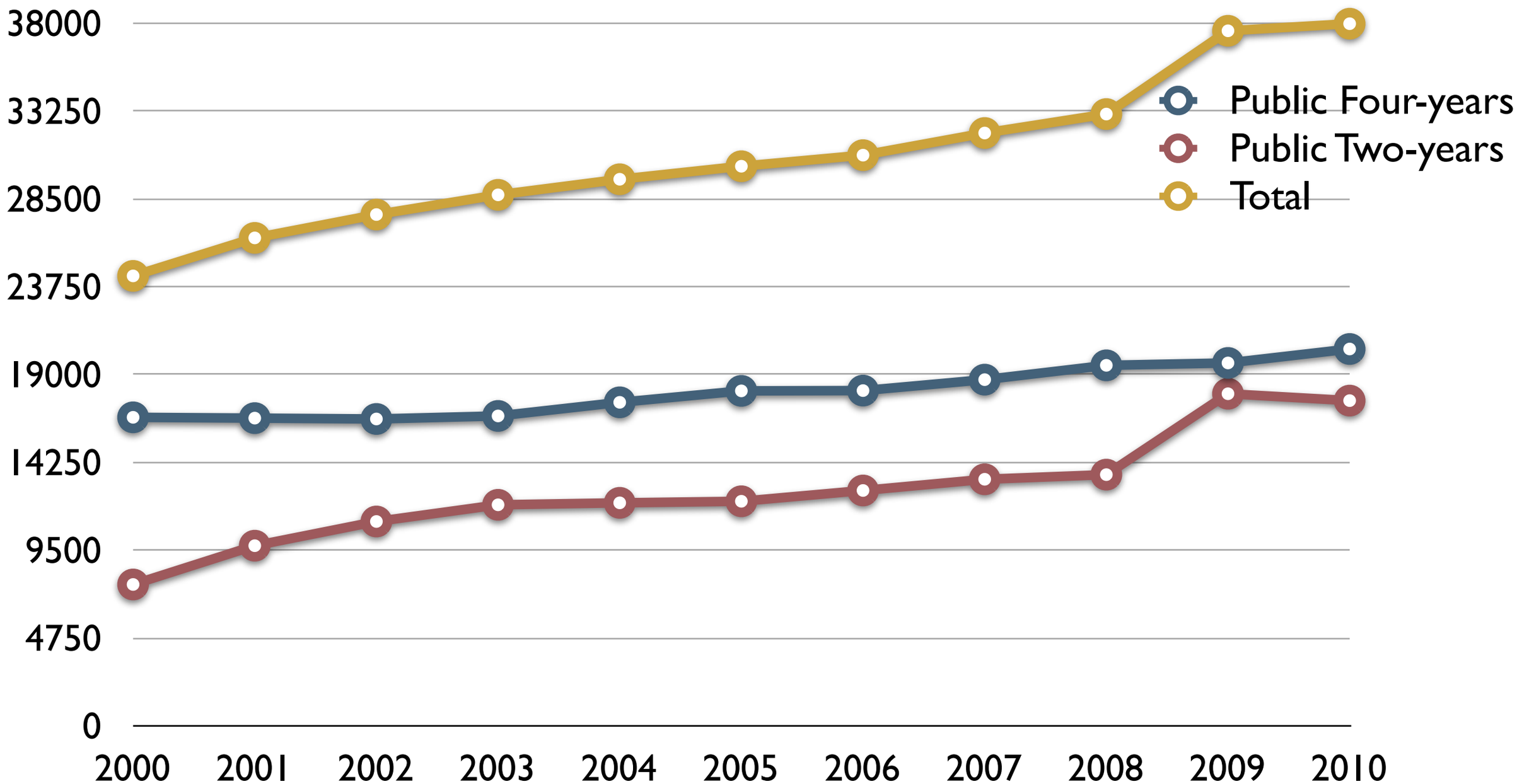
- During 2002-2007, national STEM degree production was increasing by about 15% and AA production was decreasing by 25%
- in Missouri STEM, baccalaureate degrees decreased by 13% and AA degree production decreased by 48%

- *Missouri Department of Higher Education. Imperatives for Change Baseline Report, 2009.*
- *National Science Board. Science and Engineering Indicators 2010. National Science Foundation, 2010.*

Degrees Awarded

Number of METS Degrees Awarded and as Percentage of All Degrees, AY2007-08	Certificate	Associate's	Bachelor's	Graduate	Total Degrees
Missouri	**590**	**1,513**	**8,608**	**3,121**	**13,832**
US Average	822	1,712	7,496	2,755	12,785
Contiguous States Average	895	1,187	5,703	1,961	9,746
Missouri (AY2002-03)	**1,389**	**2,843**	**8,786**	**2,971**	**15,989**
MO Growth since AY2002-03	-58%	-47%	-2%	5%	-13%
US Growth since AY2002-03	-22%	-20%	9%	19%	3%
METS Degrees as a Percentage of All Degrees					
US Average	8%	11%	23%	17%	17%
Missouri	**9%**	**10%**	**23%**	**13%**	**17%**
Missouri Rank	**22**	**31**	**22**	**42**	**30**
Contiguous States Average	8%	10%	21%	15%	15%
High Funding States	10%	12%	24%	19%	18%
Top Ten States	15%	18%	28%	23%	21%
High State	Maine 20%	Kentucky 19%	Wisconsin 33%	Montana 28%	Montana 26%
Low State	W. Virginia 2%	Delaware 6%	Alaska 19%	Arizona 6%	Arizona 11%

Enrollment of First-time, Full-time freshmen in Missouri



Data from MDHE *Statistical Summaries*, available online.

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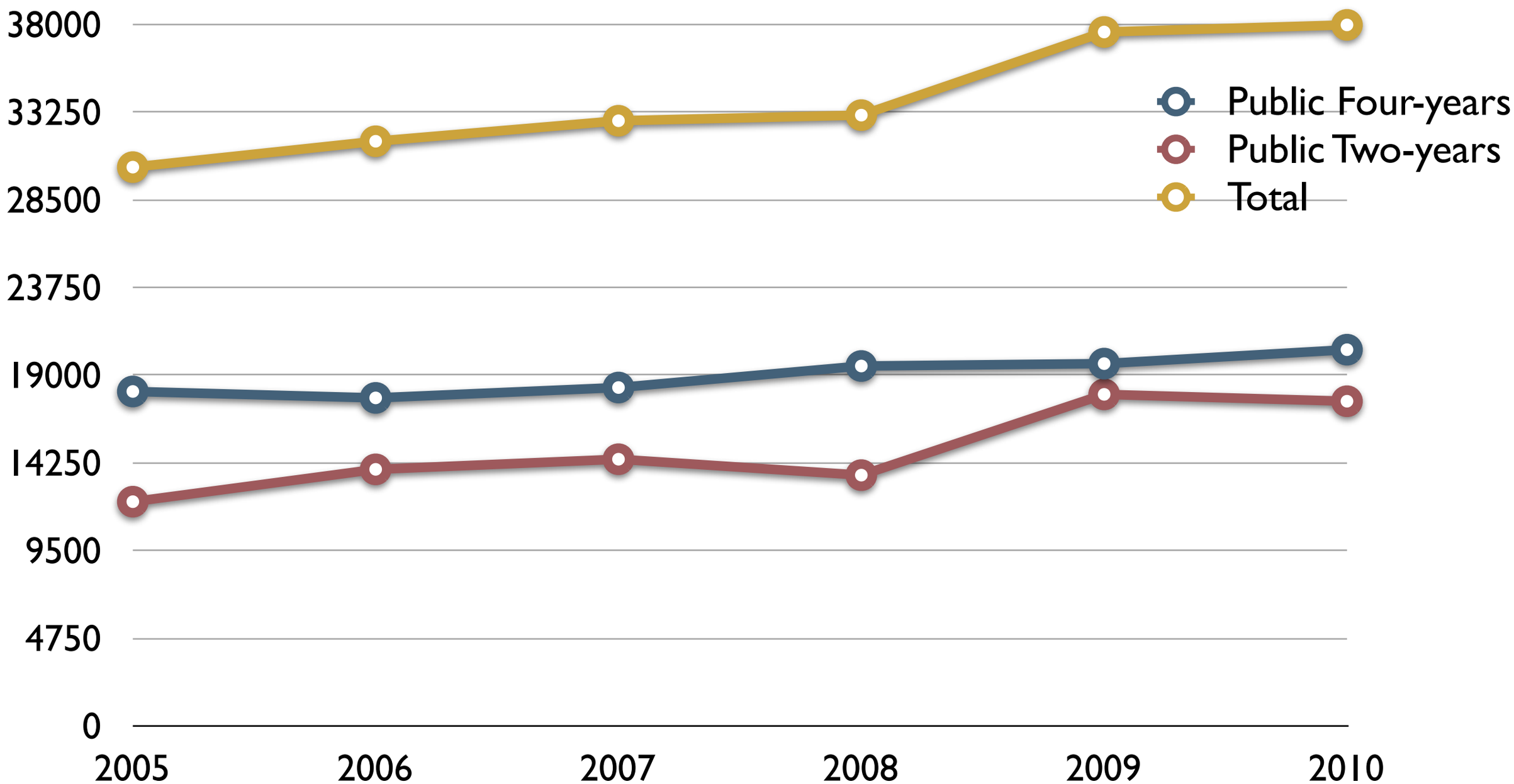

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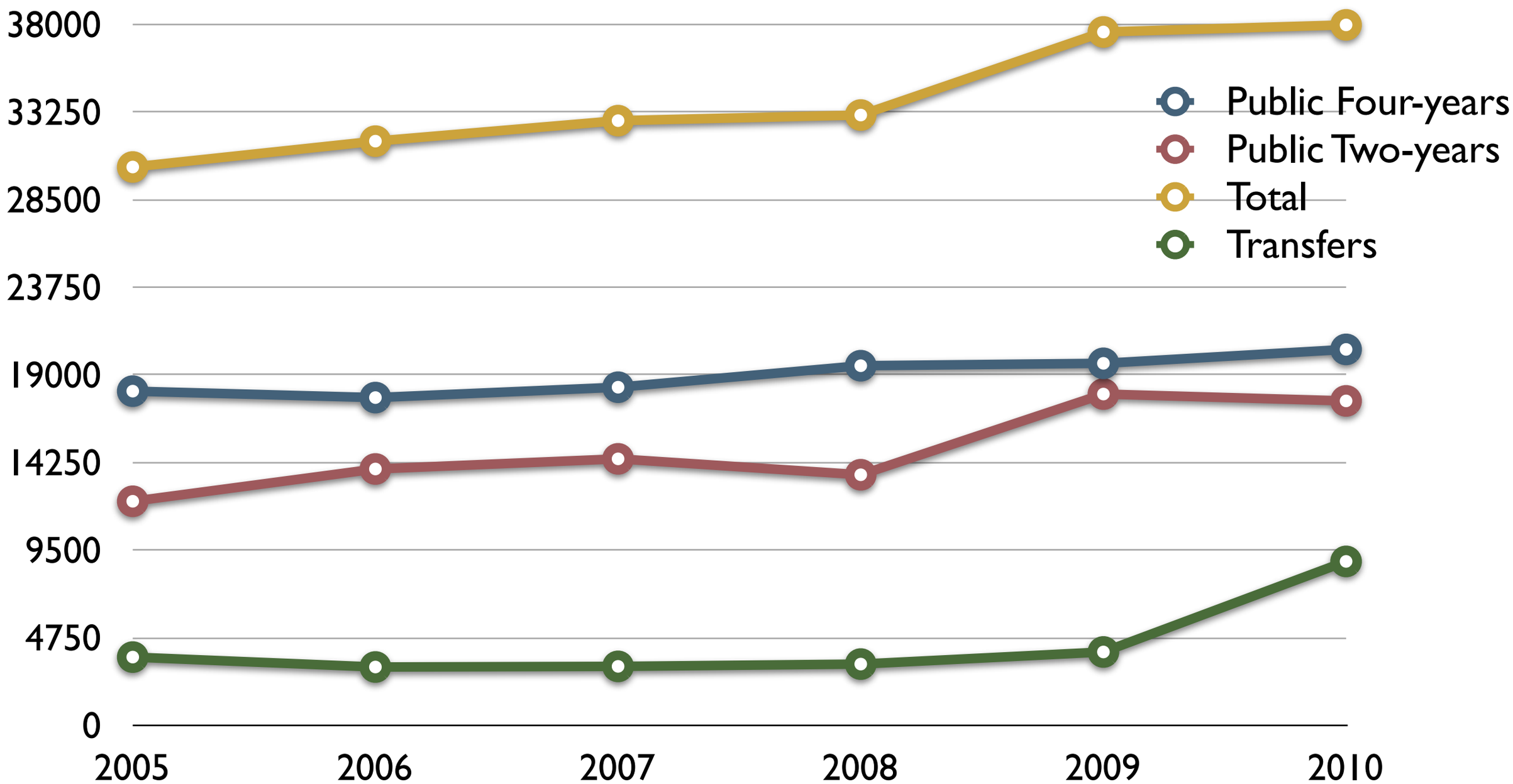

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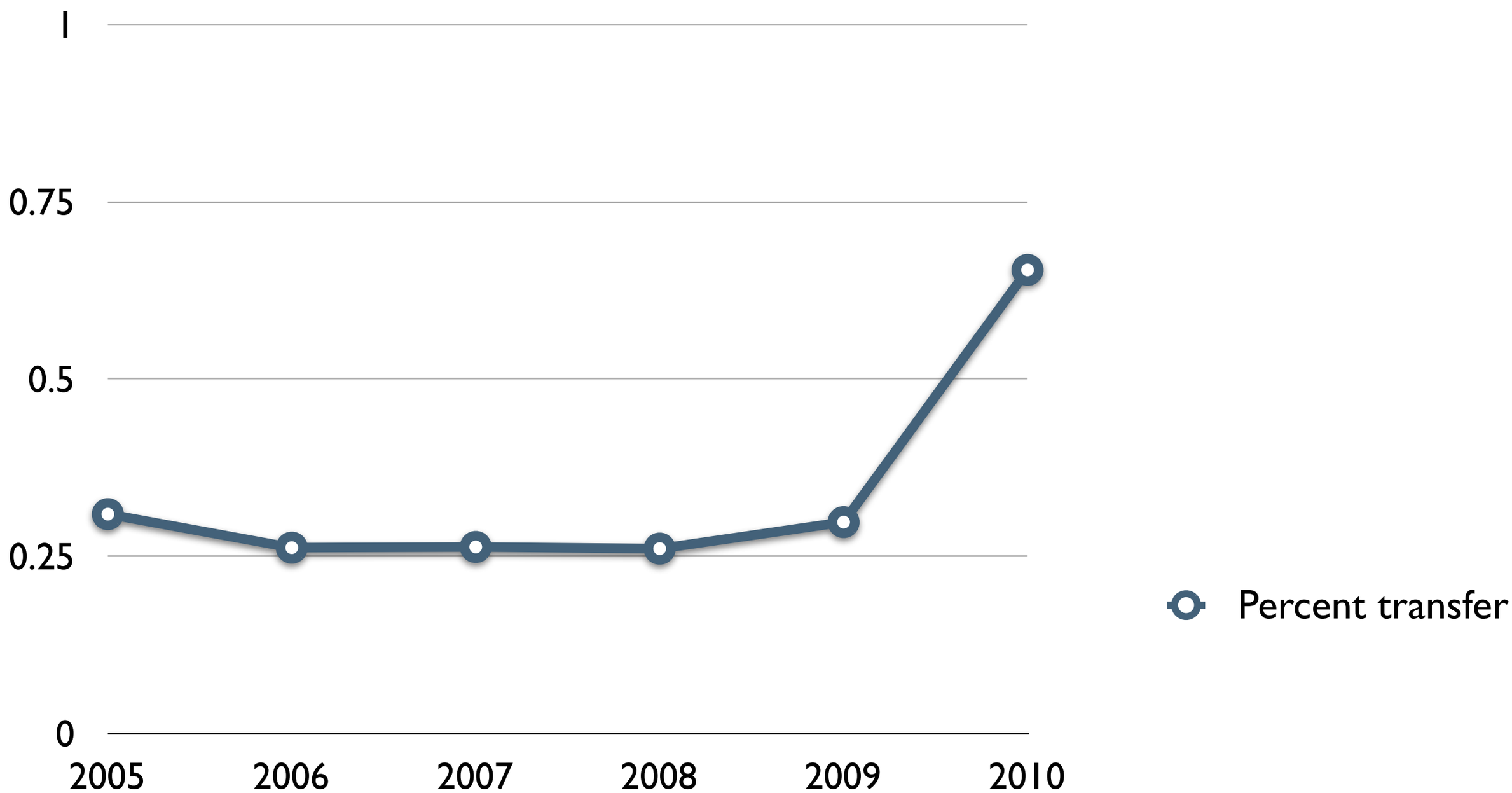
Proportion of Students Starting at Two-years schools that Transfer to Four-year programs



Based on data from MDHE *Statistical Summaries*, available online.

Degrees Awarded

Number and Percentage of First-Time Transfer Students Who Graduate from Public 4-Year Institutions with a METS Bachelor's, by Originating School Sector (AY2007)

Origin School Sector	2003 Cohort	2007 METS Bachelor's Graduates	2007 Graduation Rate
Independent 2-Year	46	7	15%
Independent 4-Year	670	58	9%
Public 2-Year	4,500	341	8%
Public 4-Year	1,306	162	12%
Out of State/Other	2,867	230	8%
TOTAL	9,389	799	9%

Source: Enhanced Missouri Student Achievement Study (EMSAS)
Only Missouri Public Institutional data available and represented

42 hour block

Skill Areas

1. Communicating
2. Higher Order Thinking
3. Managing Information
4. Valuing

Knowledge Areas

1. Social and Behavioral Sciences
2. Humanities and the Fine Arts
3. Mathematics
4. Life and Physical Sciences

http://www.dhe.mo.gov/policies/credit-transfer.php

42 hour block

1. Statewide Transfer Associates of Arts Degree

The associate of arts (AA) degree is designed as the statewide general studies transfer degree. This degree is structured for entry into the general range of baccalaureate degree programs offered by four-year colleges or universities...

http://www.dhe.mo.gov/policies/credit-transfer.php

42 hour block

2. Progam-to-Program Insitutionally Articulated Degrees

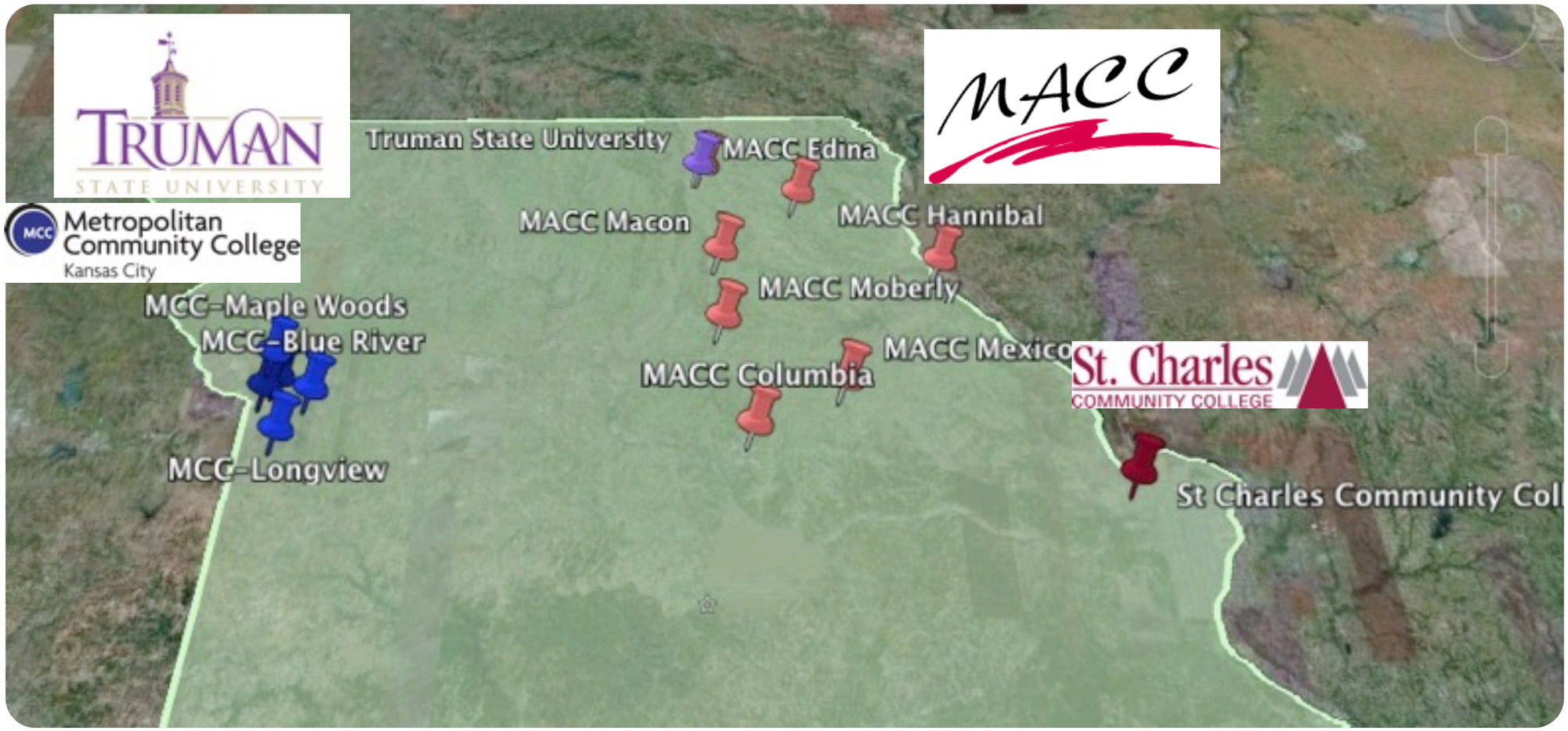
This policy encourages both two-year and four-year institutions to develop voluntary, supplemental articulation agreements for the AS and AAS degrees in addition to the AA state transfer degree....

http://www.dhe.mo.gov/policies/credit-transfer.php

Broadening Participation in STEM

Data from MDHE *Statistical Summaries*, available online.

STEM Talent Expansion Program



A **partnership** between four Missouri colleges (2004-present).

NSF-funded Efforts

- STEP program (2004-2010)
- SPECTRA program (2010-2015)
- S-STEM scholarship program (2012-2016)

NSF STEP Program

- STEP = STEM Talent Expansion Program
- **Objective**:
  - increase STEM degree production at Truman
  - boost student success in STEM
  - pursue opportunities to make STEM courses integrative and interdisciplinary

NSF STEP Program

Components

- 10 week residential Summer Research Community
- Bridge program for STEM transfers
- curriculum enrichment

NSF STEP Program

Results:

- increased STEM baccalaureate degree production at Truman by 10%
- increased STEM associate degree production at partner schools by 76%

Source: MDHE *Statistical Summaries*

NSF SPECTRA Program

Objective:

- increase STEM degree production at Truman
- increase STEM degree production at community college partners
- boost student success in STEM

NSF SPECTRA Program

Components

- Pre-STEM Pathways Program
- Academic Year SPECTRA Scholars
- Summer SPECTRA Scholars

Mine STEM talent from 'new' courses
Study the impact of 'academic skills' on STEM success

Lessons

- excellence of STEM education at community college partners
- transfer pathway to STEM degree is broken in Missouri
  - AA degree: junior by hours, freshman by readiness in STEM
  - transfer shock: heavy STEM load, sequencing problems

Pre-STEM Pathways

- at 2-year school, student self-identifies as STEM majors
- get STEM-specific advising
  - more STEM courses
  - transfer before getting the degree
  - ‘reverse transfer’ to complete AA

Proposal

- Missouri needs a better STEM pathway from high school, through 2-year schools, to 4-year graduation
- specialized articulation agreements
- AS degrees for STEM
- reverse transfer to complete degree after transfer

Next: STEP Program II

Strengthening University and Community College Educational Environments for Degrees (SUCCEED) in STEM

Strengthening University and Community College Educational Environments for Degrees (SUCCEED) in STEM

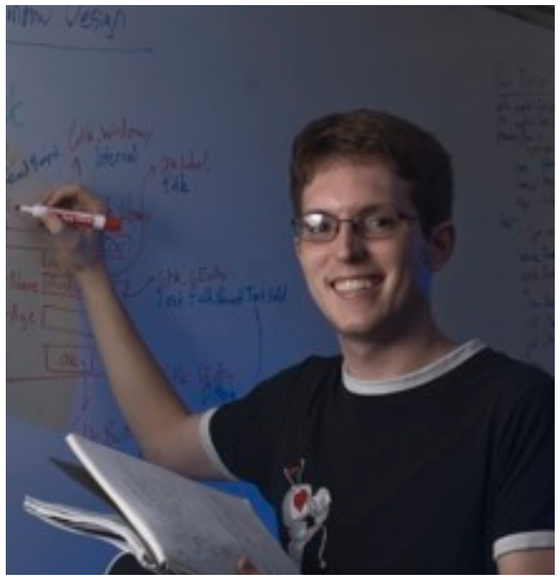
Initiatives that address three major challenges:

- readiness for college mathematics
- summer STEM course-based community for community college students
- preparing future STEM faculty

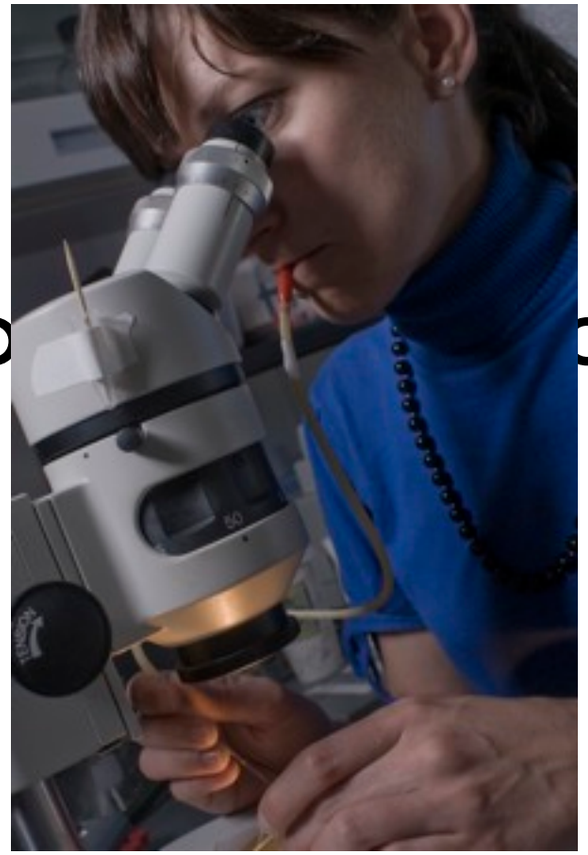
Expect to learn if funded in March or April.

Discussion





Web Portal: http://step.truman.edu
Email: step@truman.edu
Phone: 660.785.7252

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