P20W STEM Research Post-Session

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Today's focus

• Researchers from Saint Louis University, UMKC and the University of Missouri-Columbia are conducting research on the STEM program Project Lead the Way
• Today we'll...
  • Present data on the STEM pipeline in Missouri
  • Present data on how PLTW is impacting students' progress in the STEM pipeline
  • Both presentations show the value of using linked data from state agencies collected over long periods of time
STEM Pipeline in Missouri
Defining STEM majors and degrees

• Followed Department of Homeland Security Definitions (DHS), providing CIP codes for STEM primary and related fields

• 4 primary Fields:
  • Engineering(14);
  • Biological/Biomedical Sciences (26);
  • Mathematics & Statistics(27);
  • Physical Sciences(40)

• 14 related fields:
  • In general, they include “fields involving research, innovation, or development of new technologies, using engineering, mathematics, computer sciences, or national sciences”
Part 1 overview: STEM Pipeline in Missouri

1) Of all first-time 9th-grade students
   • What % graduate from High school, Enter College, Major in STEM, Complete College, and Earn a STEM degree?

2) Of those who enter college
   • What % declare a STEM major?
   • What % complete a STEM degree, other degree, or leave without a degree?
   • What is the highest degree completed?

3) Do 8th-grade MAP scores predict college enrollment, completion, or STEM degree completion and how does this pattern differ by race and gender?
1) STEM Pipeline in Missouri

All First-Time Freshman: 80.4%

HS Graduation: 80.0%
1) STEM Pipeline in Missouri

- All First-Time Freshman: 100.0%
- HS Graduation: 80.4%
- Enrolled in College: 53.8%

STEM: 3.3%
1) STEM Pipeline in Missouri

- All First-Time Freshman: 80.4%
- HS Graduation: 53.8%
- Enrolled in College: 26.1%
- Earned a Degree: 19.9%
- Earned 4-Yr Degree: 3.3%
2) Major Declaration among College Enrollees

- Non-STEM, 76.5%
- STEM in Yr1, 10.3%
- STEM Later, 13.2%
2) Major Declaration among College Enrollees

**Non-STEM Majors**
- Non-STEM, 76.5%
- STEM in Yr1, 10.3%
- STEM Later, 13.2%

**STEM Majors**
- STEM, 23.6%
- No-Degree, 41.8%
- Other, 34.6%

**Degree Completion**
- No-Degree, 65.4%
- Other, 34.6%
2) Highest Degree Completed among College Enrollees

- No Degree: 55.1%
- Certificate: 1.4%
- Two-Year Degree: 10.1%
- Four-Year Degree: 33.4%
2) Highest Degree Completed among College Enrollees

STEM Degree Earned among College Graduates

- No Degree: 55.1%
- Certificate: 10.1%
- Two-Year Degree: 33.4%
- Four-Year Degree: 1.4%
- Other: 87.4%

STEM: 12.6%
3) 8th-grade MAP Scores predict college enrollment and degree completion.
3) 8th-grade MAP Scores predict STEM major declaration in college and STEM degree completion.

Graph 1: Percent Majoring in STEM Area by Math MAP Proficiency Levels and Sex

Graph 2: Percent Earning STEM Degree by Math MAP Proficiency Levels and Sex
3) STEM major declaration for White Male and Female

STEM degree completion
3) STEM major declaration for White and Hispanic Male and Female

STEM degree completion
3) STEM major declaration for White, Hispanic, and Black Male and Female

STEM degree completion

- Race-Sex Group
  - White Male
  - White Female
  - Hispanic Male
  - Hispanic Female
  - Black Male
  - Black Female

Graphs showing percent majoring in STEM area and percent earning STEM degree across different proficiency levels for select race-sex groups.
Research on Project Lead the Way
PLTW curriculum

**PLTW LAUNCH**
- PreK-5
- 42 modules
- "12-14 hours each
- Focus areas:
  - Life Science, Physical Science,
  - Earth & Space Science,
  - Biomedical Science, Computer Science, Engineering

**PLTW GATEWAY**
- 6-8
- 10 units
- "36-45 hours each
- Focus areas:
  - Biomedical Science, Computer Science, Engineering

**PLTW COMPUTER SCIENCE**
- 9-12
- 4 year-long high school courses

**PLTW ENGINEERING**
- 9-12
- 10 year-long high school courses

**PLTW BIOMEDICAL SCIENCE**
- 9-12
- 4 year-long high school courses
PLTW Rollout in Missouri

The number of participating districts and schools has grown steadily since 2005.
The number of participating districts and schools has grown steadily since 2005.

The number of courses offered in all 3 high school Pathways has also grown steadily.
Types of Missouri high schools offering PLTW
Types of Missouri high schools offering PLTW

17% of MO high schools have offered PLTW courses
Types of Missouri high schools offering PLTW

17% of MO high schools have offered PLTW courses

PLTW schools are larger
Types of Missouri high schools offering PLTW

17% of MO high schools have offered PLTW courses

PLTW schools are larger

Suburban schools are more likely to offer PLTW, rural schools are less likely
In schools offering PLTW, who participates more?
In schools offering PLTW, who participates more?

Asian, Hispanic, Other race students

- Asian: 38%
- Hispanic: 28%
- Other: 27%
- White: 24%
- Black: 23%

Average: 25%
In schools offering PLTW, who participates more?

Asian, Hispanic, Other race students

Students receiving free/reduced lunch participate less
In schools offering PLTW, who participates more?

Asian, Hispanic, Other race students

<table>
<thead>
<tr>
<th>Race</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>23%</td>
</tr>
<tr>
<td>White</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>27%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>28%</td>
</tr>
<tr>
<td>Asian</td>
<td>36%</td>
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Students receiving free/reduced lunch participate less

<table>
<thead>
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<th>Lunch Status</th>
<th>Participation</th>
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<tbody>
<tr>
<td>Free/reduced</td>
<td>22%</td>
</tr>
<tr>
<td>Unsubsidized</td>
<td>26%</td>
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Males

Female: 17%
Male: 33%
In schools offering PLTW, who participates more?

Asian, Hispanic, Other race students

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Males

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<td>Female</td>
<td>17%</td>
</tr>
<tr>
<td>Male</td>
<td>33%</td>
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Students with higher 8th grade achievement

<table>
<thead>
<tr>
<th>Academic Track</th>
<th>Participation</th>
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<tbody>
<tr>
<td>Sci-Not prof</td>
<td>18%</td>
</tr>
<tr>
<td>Math-Not prof</td>
<td>21%</td>
</tr>
<tr>
<td>Math-Prof/adv</td>
<td>27%</td>
</tr>
<tr>
<td>Sci-Prof/adv</td>
<td>29%</td>
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PLTW impact
Impact of PLTW on STEM Major Enrollment

- Students in schools never offering PLTW

<table>
<thead>
<tr>
<th>Year</th>
<th>% STEM Major Enrollment</th>
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<tbody>
<tr>
<td>2010</td>
<td>6.4%</td>
</tr>
<tr>
<td>2011</td>
<td>7.8%</td>
</tr>
<tr>
<td>2012</td>
<td>8.5%</td>
</tr>
<tr>
<td>2013</td>
<td>8.5%</td>
</tr>
<tr>
<td>2014</td>
<td>8.5%</td>
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</tbody>
</table>
Impact of PLTW on **STEM Major Enrollment**

- **PLTW Takers**
- **PLTW Non-Takers**

- **Students in schools never offering PLTW**

Construct groups that are similar to PLTW takers and non-takers

<table>
<thead>
<tr>
<th>Year</th>
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<th>PLTW Non-Takers</th>
<th>Students in schools never offering PLTW</th>
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<tbody>
<tr>
<td>2010</td>
<td>6.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>10.9%</td>
<td></td>
<td></td>
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<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>12.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>12.8%</td>
<td></td>
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Schools offered PLTW for 2013/2014 Cohorts

- **2011**
  - Students in schools never offering PLTW: 8.5%
  - PLTW Takers: 23.5%
  - PLTW Non-Takers: 12.8%

- **2014**
  - Students in schools never offering PLTW: 9.6%
  - PLTW Takers: 27.5%
  - PLTW Non-Takers: 12.8%
Impact of PLTW on STEM Major Enrollment

- **PLTW Takers**
- **PLTW Non-Takers**

Students in schools never offering PLTW

**Construct groups that are similar to PLTW takers and non-takers**

- 2010: 6.4%
- 2011: 10.7%
- 2012: 13.0%
- 2013: 12.1%
- 2014: 12.8%

Schools offered PLTW for 2013/2014 Cohorts

- 2010: 13.0%
- 2011: 10.7%
- 2012: 15.1%
- 2013: 14.4%
- 2014: 23.5%

What would be the STEM enrollment had PLTW takers not taken PLTW?

- 2010: 6.4%
- 2011: 7.8%
- 2012: 8.5%
- 2013: 12.1%
- 2014: 27.5%
Impact of PLTW on STEM Major Enrollment

- PLTW Takers
- PLTW Non-Takers
- Students in schools never offering PLTW

PLTW impact: 12.4%
PLTW impact: 9.1%
Impact of PLTW on STEM Degree Completion or Still Enrolled in STEM in the 5th year of College

- **PLTW Takers**: Students who took PLTW.
- **PLTW Non-Takers**: Students who did not take PLTW.
- **Students in schools never offering PLTW**: Students in schools that never offered PLTW.

### Schools offered PLTW for 2013/2014 Cohorts
- 2010: 4.6%
- 2011: 9.6%
- 2012: 6.4%
- 2013: 15.6%
- 2014: 9.6%

**PLTW Impact:** 6.0%

**Impact of PLTW on STEM Degree Completion or Still Enrolled in STEM in the 5th year of College**
**Impact of PLTW on STEM Degree Completion by the 5th year of College**

- **PLTW Takers**
- **PLTW Non-Takers**
- **Students in schools never offering PLTW**

<table>
<thead>
<tr>
<th>Year</th>
<th>PLTW Takers</th>
<th>PLTW Non-Takers</th>
<th>Students in schools never offering PLTW</th>
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<tbody>
<tr>
<td>2010</td>
<td>2.6%</td>
<td>3.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2011</td>
<td>5.9%</td>
<td>3.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2012</td>
<td>3.5%</td>
<td>3.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2013</td>
<td>5.9%</td>
<td>3.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2014</td>
<td>9.3%</td>
<td>3.5%</td>
<td>2.6%</td>
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**PLTW Impact:** 3.4%
Going forward

• This presentation demonstrates the value of P20W longitudinal data
  • Tracking students from K-12 to post-secondary and beyond
  • Having multiple cohorts to understand trends over time
• Adding workforce data (DOLIR) and linking to DHEWD records will allow us to understand:
  • Post-secondary experience (e.g., barriers or where/when students struggle the most while in college) and how high school factors are related to it.
  • Labor market participation patterns among broader MO student populations (not just college graduates)
  • The progress we are making over time
  • How policies/programs improve students' long-run outcomes
• Data like these can bring greater transparency regarding the workforce development system in Missouri.