EXPANDING STEM CAREER PATHWAYS THROUGH ONLINE EDUCATION

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CREATING THE NEXT®

Georgia Tech

Improving Education through Accessibility and Affordability

Georgia Tech – A Potentially New Model

- GA Tech's Online MSCS launched in 2013
  - Fully version of well regarded on-campus M.S. (MSCS)
  - Open to all with relevant B.A. and GPA of 3.0+
  - Developed with Udacity, subsidized with $4 million from AT&T.

- Classes are "asynchronous," so no fixed time commitments.
  - 10 courses for degree, part time over 6-7 terms.
  - similar grading standards as in-person program.

The OMSCS Motto

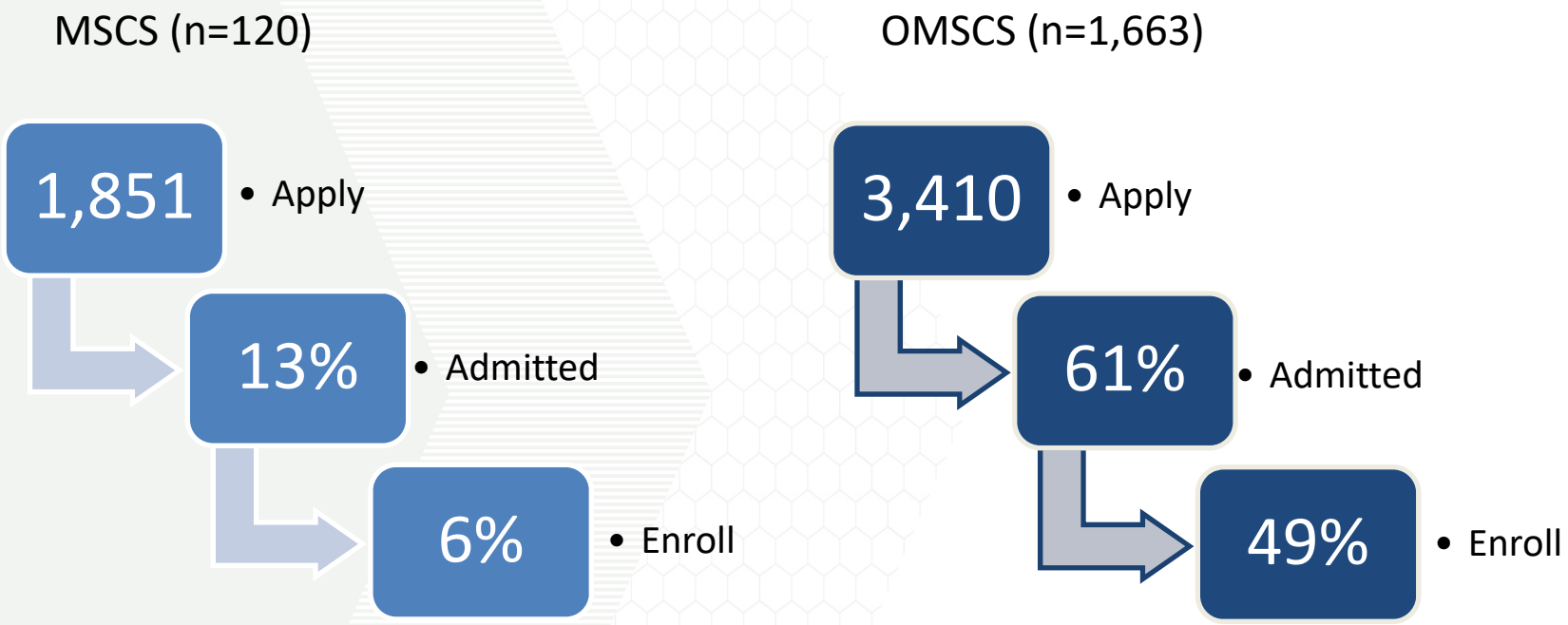
Georgia Tech

Accessibility through *Affordability* and *Technology*

- OMSCS total degree cost: ~$6,600
- Typical MS CS (public university, out-of-state) ~$40,000
- Typical MS CS (private university) ~$70,000

Improving Education through Accessibility and Affordability

Comparing On-Site to On-Line Raw numbers (annualized)



- 14 times larger than on-campus program, three times larger than largest on-campus program (Carnegie Mellon ~600 per year).
- Important: Fewer than 0.2% of applicants apply to both programs.

Attracting Different Types of Students:

- Average on-campus applicant: 24-year old Indian recent college grad
- Average online applicant : 34-year old employed American

- OMSCS attracts:
  - large numbers of applicants
  - mid-career workers of various ages in the U.S. (>70% US)
  - students similar to MSCS applicants in terms of race and gender
  - high-yield-- nearly all who are accepted ultimately enroll

- ***Strong evidence of unmet need for mid-career training that's flexible, relatively low cost, and of serious quality (particularly in technical disciplines)***

To what extent are we reaching a new market?

- **Can we provide rigorous evidence that this is a new educational "product" for which close substitutes do not currently exist?**
  - If not for OMSCS, would applicants enroll elsewhere?

Goodman J, Melkers J, Pallais A. ***Can Online Delivery Increase Access to Education?*** Journal of Labor Economics. www.journals.uchicago.edu *Forthcoming January 2019.*
https://www.journals.uchicago.edu/doi/abs/10.1086/698895

What did we learn about demand?

- **High demand** for the first low cost, high quality MOOC degree in computer science.
  - BUT – demand is DIFFERENT (comes largely from mid-career Americans)
- Online version **increases access** for
  - Older/employed students (time flexibility offers appeal?)
  - American students (no need for physical access to U.S. networks and labor markets?)

Descriptive Evidence

- New form of formal ed has **no close substitutes** in current market (formal or informal)
- Existence of OMSCS thus **increases educational attainment and overall training hours**

Causal Evidence

Implications?

- **OMSCS should increase annual production of U.S. master's degree holders in computer science by at least 7%.**
  - 11,000 Americans earn CS master's annually
  - At least 62% of OMSCS-ers persist after two years (possibly 90%)
  - Averaging 1,170 US enrollees per year so far (*0.62 ~= 725)

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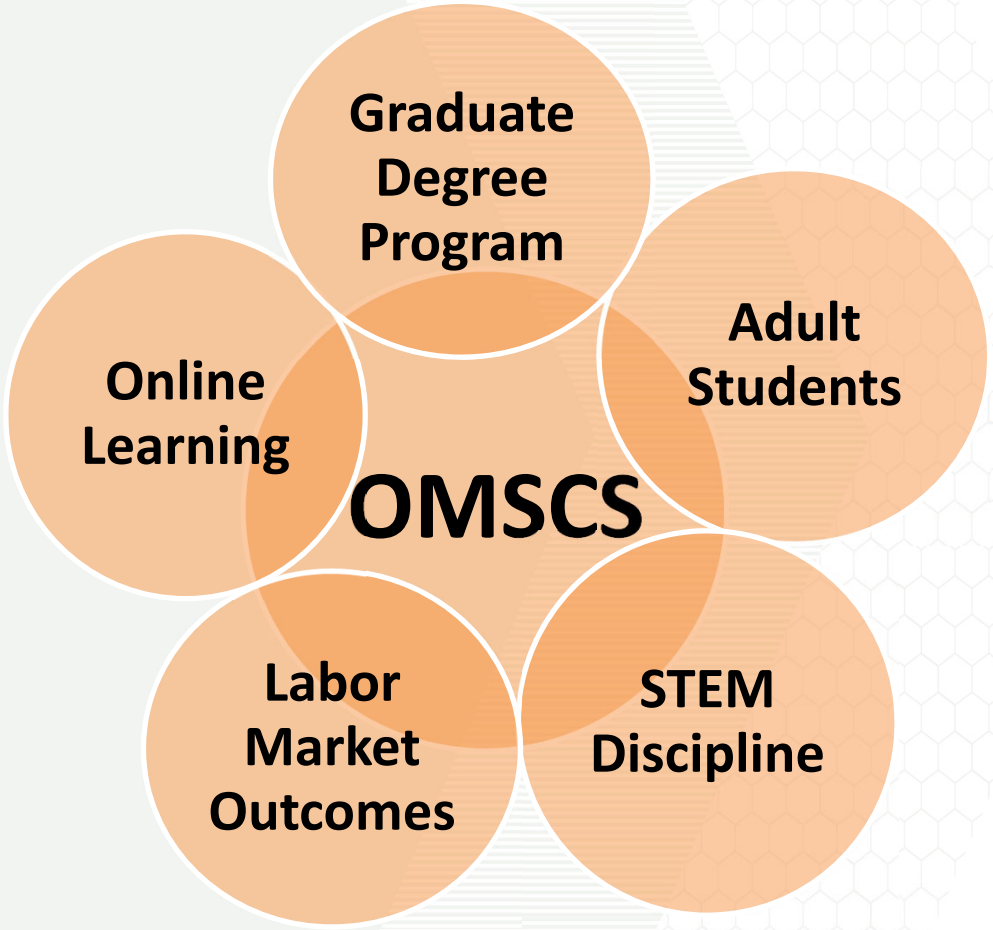
- **What are the characteristics of student pursuing this new-market degree relevant to persistence and completion?**
  - **Particularly for students under-represented in CS, and/or transitioning to the IT workforce?**

What Challenges Exist Given This Student Base?

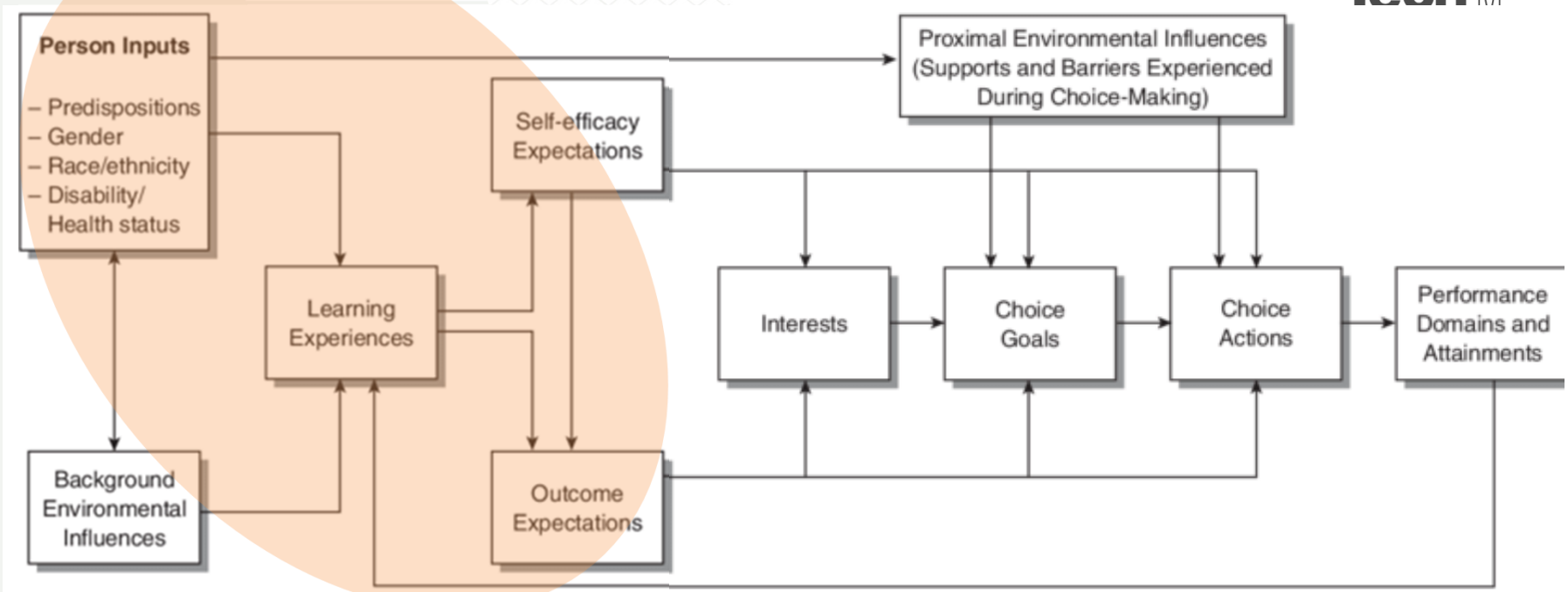


- **Advancing education**
  one of a kind in US Higher Education
- **Bridging fields**
  bringing theoretical and empirical foundational knowledge to this new setting

Research Agenda:

- **Filling Gaps**
  exploratory, novel research that breaks new ground in social and economic sciences
- **Providing feedback**
  provide feedback that will help OMSCS

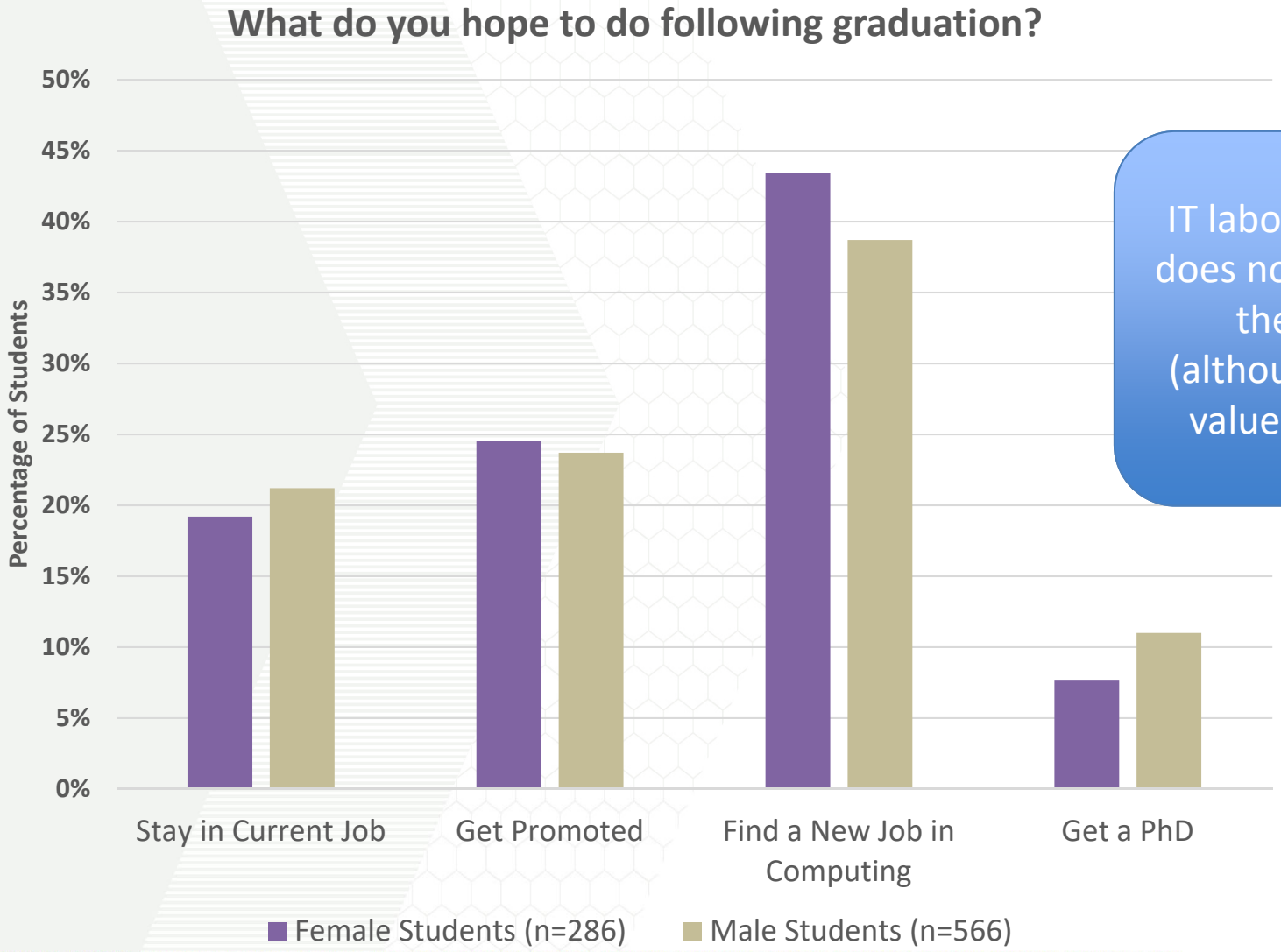
Social Cognitive Career Theory



SOURCE: Lent, R. W., Brown, S. D., & Hackett, G. (2002). *Social cognitive career theory*. *Career Choice and Development (4th Ed.).* Adapted from Lent, R. W., Brown, S. D. and Hackett, G. 1994. "Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice, and Performance" [Monograph]. *Journal of Vocational Behavior* 45:79-122.

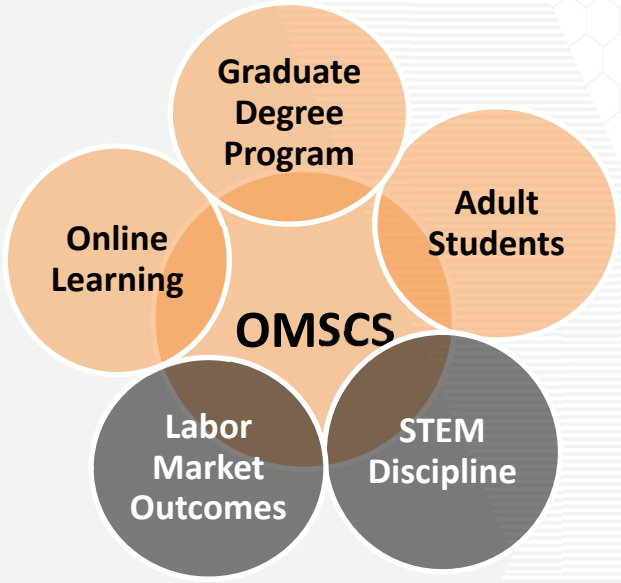
- What can we understand about the factors that matter for student attraction, retention, completion and career impacts?

OMSCS as enabling Career Change/Advancement?

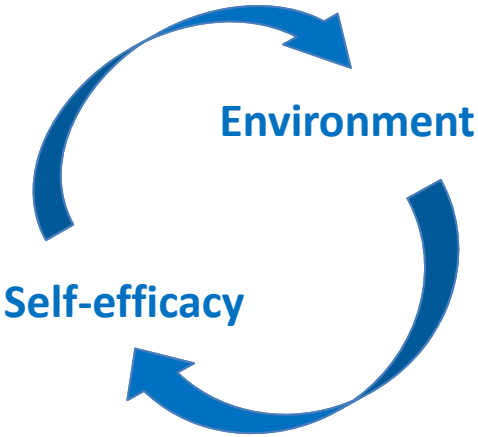


IT labor market does not require the MS (although does value it --$$)

How Does Efficacy Shape Perceptions?



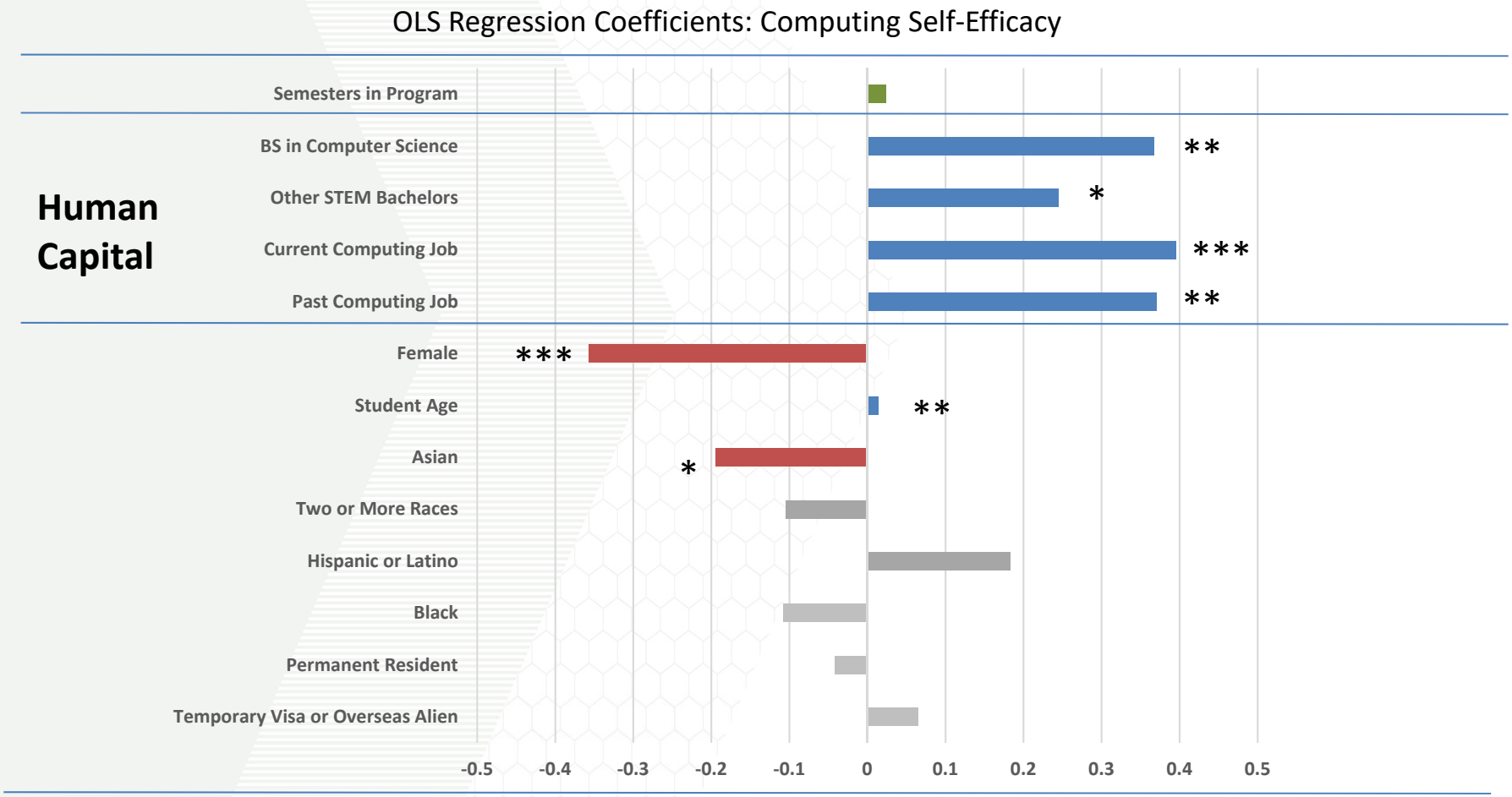
- Kreth Q, Spirou M E, Budenstein S, Melkers J. ***How Prior Experience and Self-Efficacy Shape Graduate Student Perceptions of an Online Learning Environment in Computing***. *Under Review*



- **Student perceptions** older students and women perceive the OMSCS environment
  - **BUT** pre-existing student self-efficacy has a mediating effect
- **Self-efficacy** CS degree or job experience do not explain self-efficacy

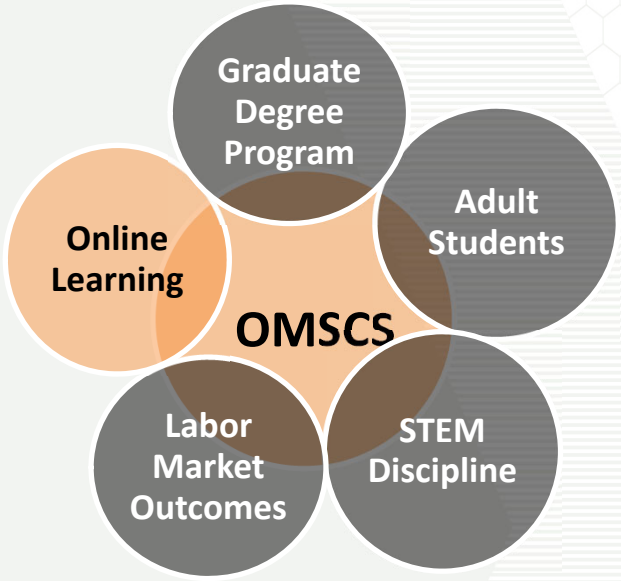
- **KEY FINDING:** Bi-directional relationship between self-efficacy and the online learning environment

Challenge: Helping Mid-Career Students to Succeed: Boosting Area-Specific Self-Efficacy?



*** p<0.001, ** p<0.01, * p<0.05

How Do Students "Participate" ?



- Stevens J, Kreth Q, Ruthotto I, Melkers J. ***Virtual Inequality? An Exploratory Study of Participation Patterns among Graduate Students in an Asynchronous Online Discussion***

- **Question:** Does the online environment remove barriers to participation?
- **Focus:** understand learner characteristics and participation patterns (PIAZZA)
- **Findings:** Demographics variation in the frequencies of *active* (posts, asks) and *passive* (views) participation based on Piazza user data
  - Women and under-represented groups engage at lower rates (esp answers)

Future work: New Opportunities to Learn About CS Mid-Career Students

- **Future Research Questions of Interest**

- What motivates students to pursue an online degree versus a traditional degree?
- Does online education help to increase the diversity of students in STEM disciplines?
- Which factors predict the persistence of students in online learning?
- What are the returns to an online degree?