Data Equity Action Research Initiative

Presenters: Isaiah Adu, Rachel Burcin, Micah Nye

Action Research Team: Nina Zukowska, Gabriel Nixon, Olivia Sobek, Ignacy Stepka, Paul Schulte, Sreyas Venkataraman, Navin Ravie, Kevin Chen, Michal Wilinski, John M. Dolan, Vishwas Mruthyunjaya, Morgan Grimm

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Carnegie Mellon University Robotics Institute
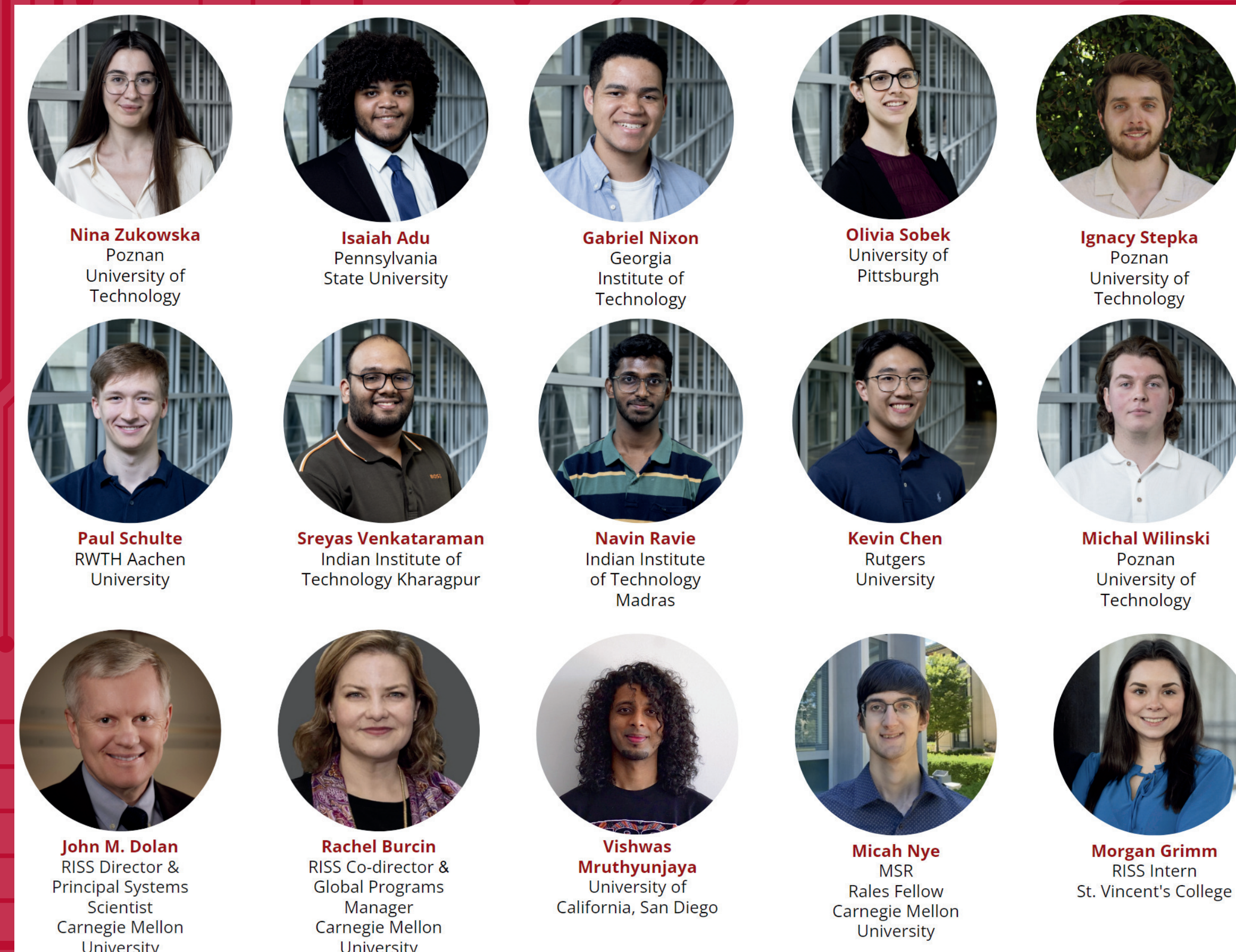
What is Action Research:

Participatory action research (PAR) is a research methodology in which individuals impacted by a particular issue engage actively with researchers throughout the research process. This collaborative approach seeks not only to deepen understanding of the problem but also to facilitate collective efforts to drive change and achieve improvements for all stakeholders involved.

- Identify the Problem
- Develop Action Plan
- Collect Data
- Analyze Data and Form Conclusions
- Report the Results
- Adjust the Theory and Start Again
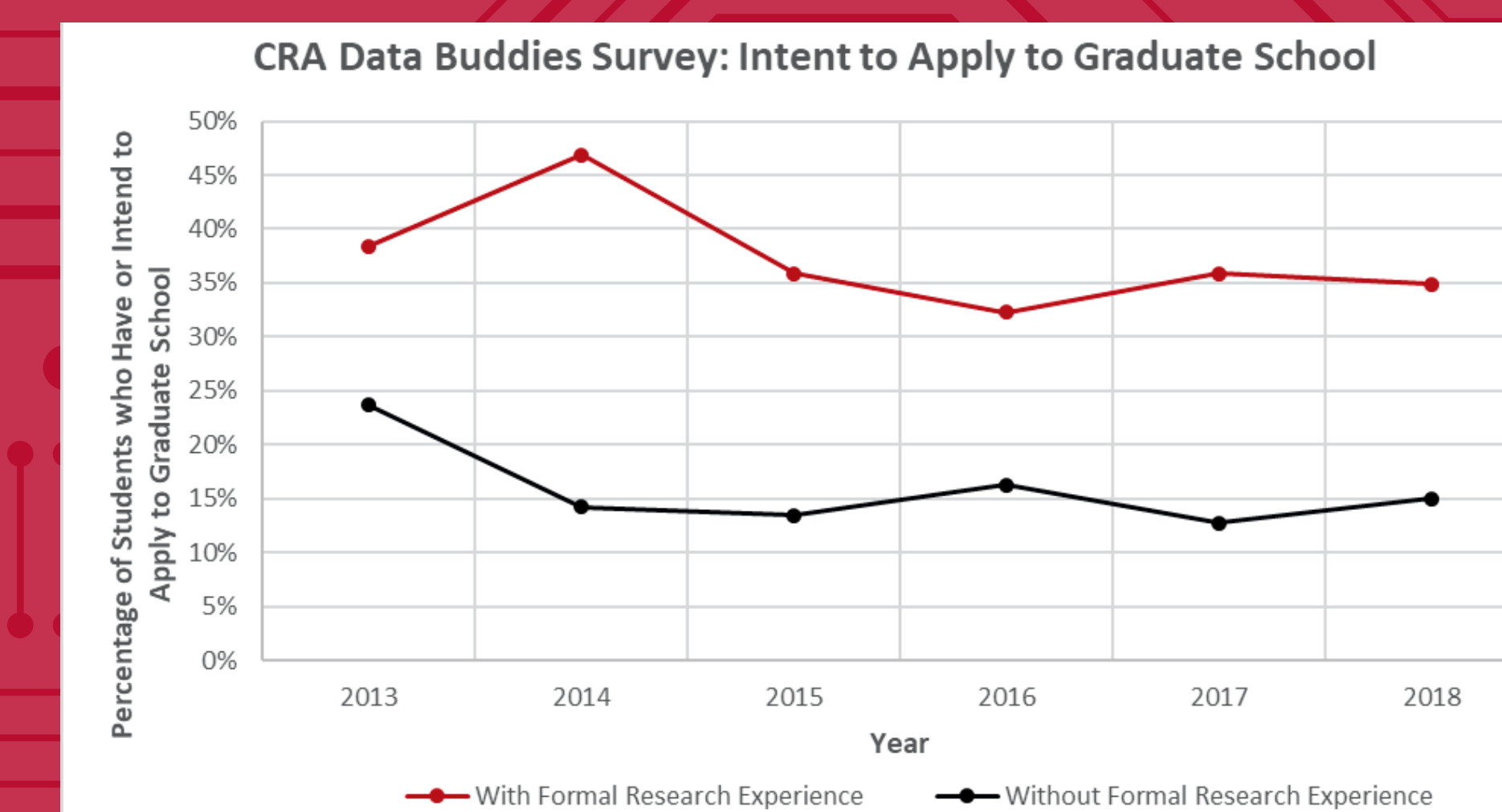
Identifying the Problem:

- Talent and ideas are distributed equitably; however, opportunities are not.
- There are ongoing barriers contributing to the underrepresentation in STEM fields, which leaves many domestic students and communities without access and at a disadvantage.
- Incomplete educational landscape data both locally and nationally to support data-informed policies and planning aimed to enhance participation in STEM.

Plan of Action:

Our action plan investigated whether system change is possible? We assembled a diverse and engaged team representing eight countries, ten first languages, and thirteen home universities.

Our Action Research Team:

Nina Zukowska — Poznan University of Technology
Isaiah Adu — Pennsylvania State University
Gabriel Nixon — Georgia Institute of Technology
Olivia Sobek — University of Pittsburgh
Ignacy Stepka — Poznan University of Technology

Paul Schulte — RWTH Aachen University
Sreyas Venkataraman — Indian Institute of Technology Kharagpur
Navin Ravie — Indian Institute of Technology Madras
Kevin Chen — Rutgers University
Michal Wilinski — Poznan University of Technology

John M. Dolan — RISS Director & Principal Systems Scientist, Carnegie Mellon University
Rachel Burcin — RISS Co-director & Global Programs Manager, Carnegie Mellon University
Vishwas Mruthyunjaya — University of California, San Diego
Micah Nye — MSR Rales Fellow, Carnegie Mellon University
Morgan Grimm — RISS Intern, St. Vincent's College

Leveraging our varied experiences, we defined the focus of our investigation to include:

- Demographic Data of Computer Science and Engineering Students
- Undergraduate and Graduate Student Level Demographics
- Admissions Data from Home Universities and Ten Peer Institutions
- Undergraduate Research Experiences
- Identification of Examples of Positive Change
- Contextualization of Data Through Multiple Perspectives

Collected Data:

We examined national education datasets relevant to engineering and computer science, including the National Integrated Postsecondary Education Data System (IPEDS), American Society for Engineering Education (ASEE) Engineering & Engineering Technology by the Numbers, 2022, NSF INCLUDES Engineering Plus Tableau Dashboard, Computing Research Association (CRA) Taulbee and Data Buddies Surveys, and Carnegie Mellon Robotics Institute Summer Scholars (RISS) longitudinal data study.

Key Findings:

Impact of Undergraduate Research

CRA Data Buddies Survey: Intent to Apply to Graduate School

X-axis: Year (2013, 2014, 2015, 2016, 2017, 2018)
Y-axis: Percentage of Students who Have or Intend to Apply to Graduate School (0%–50%)
Legend: With Formal Research Experience / Without Formal Research Experience

RISS Compared to CRA Data Buddies Survey

Y-axis: Percentage of Students who Have or Intend to Apply to Graduate School (0%–100%)
Categories: CRA Without Formal Research Experience, CRA With Formal Research Experience, RISS
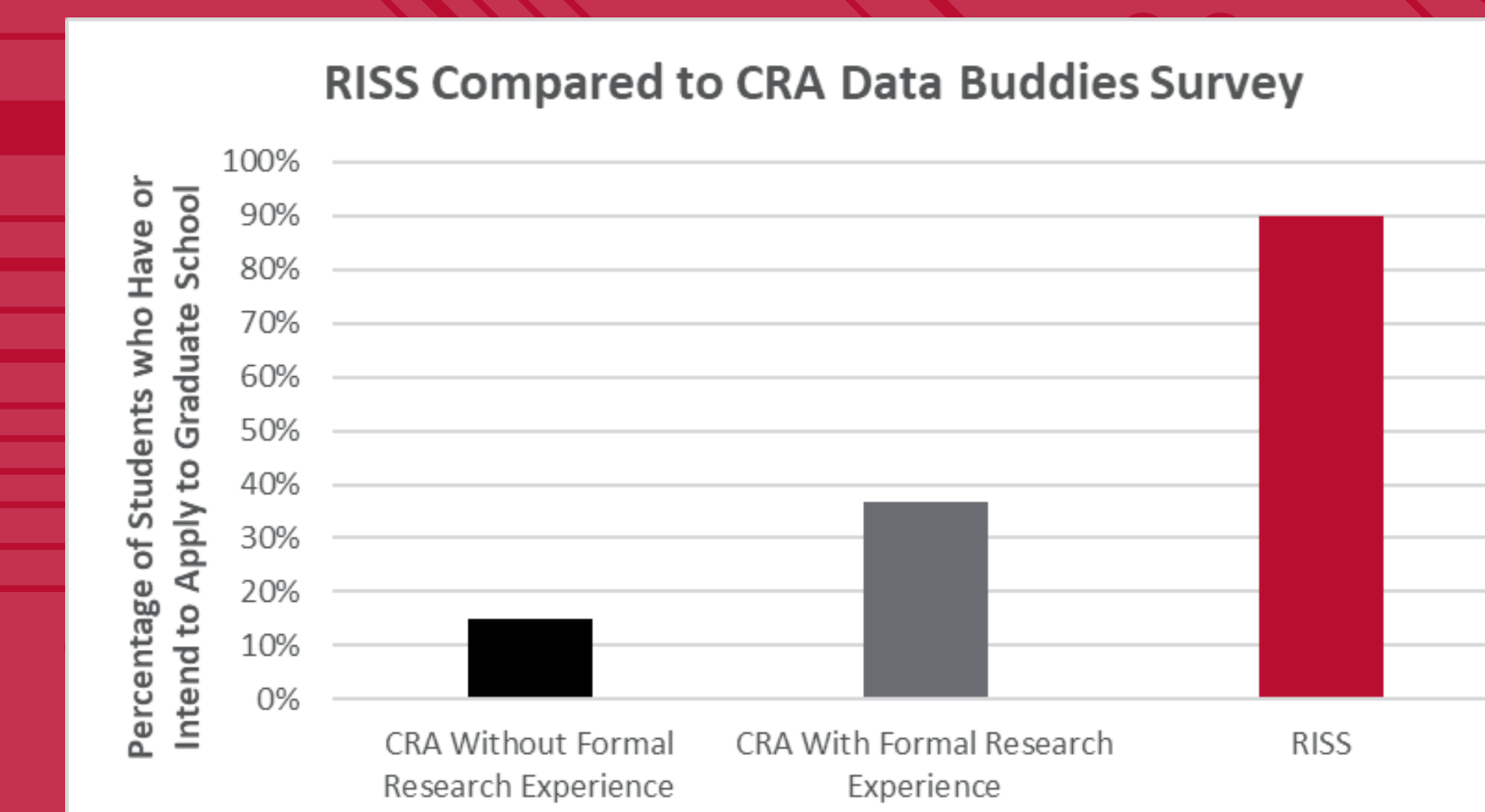
More Data and Research Is Needed

Examples of Positive Change

Gender Balance:
Carnegie Mellon University CS Undergraduate Level Approximately 50% of undergraduate students identified as female. The work towards achieving this gender balance was supported through the strategic leadership of Dr. Andrew Moore, Dean of the School of Computer Science, and partnerships throughout the faculty and staff.

Increased Participation of Minoritized Groups: University of Pennsylvania Computer CS Graduate Level:
We observed an increase in the number of students identifying as black/African American at the CS graduate level. Through conversation with members of the University, we learned of programs encouraging and supporting applications from underrepresented candidates.

Transparency & Collective Action: The University of California, Berkeley College of Engineering Equity & Inclusion Strategic Plan:
The University of California, Berkeley has released comprehensive demographic data on its student population, encompassing aspects such as gender, ethnicity/race, and geospatial access. The publicly accessible equity and inclusion strategic plan outlines governance structures, strategic priorities, metrics for assessment, and accountability measures.

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