# Transforming STEM Education at Two-Year Colleges

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## Need / Motivation

To ensure continued U.S. competitiveness and prosperity, our Nation must foster a strong, STEM-capable workforce[1]. Half of the people who go into STEM fields start at community colleges[2]; thus, community colleges need to be part of the solution in order to meet the expected demand for STEM workforce. Less than 10% of funded STEP projects have been awarded to community colleges[3], thus more research is needed on that population of STEM students. Furthermore, community colleges often have a more diverse student body which can help increase the number of women and underrepresented minorities in STEM fields.

## RiSE Project Goals

The RISE project will attain these four main objectives:

1. Increase the number of STEM students graduating with associate degrees and transferring to baccalaureate institutions,
2. Increase the diversity (women and underrepresented minorities) of STEM majors, graduates and transfers,
3. Increase the percentage of STEM majors progressing through gateway STEM courses, and
4. Decrease the mean time to associate degree attainment.

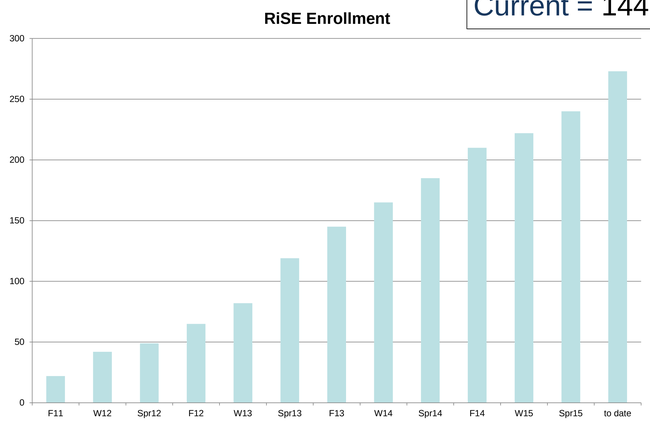
## RiSE Project Activities

1. Outreach events including STEM Saturdays, Haunted STEM Lab, Summer STEM Exploration, and STEM Magical Mashups.
2. Curricular redesign based on research (discussed via a monthly Journal Club) on active-learning techniques such as PBLs, POGIL, “flipped” teaching, clickers/personal response systems, group assessment, and student reflection.
3. Student support services that include faculty mentors / advisors, cohort STEMinars, study rooms with peer tutors, supplemental instruction, math support workshops and courses, early alert, STEM service learning opportunities, undergraduate research opportunities, and transfer assistance for students transferring to local colleges and universities.
4. Evaluation and assessment that measures the success of the project validating institutionalization and broad dissemination while helping faculty and students reflect and improve on their teaching and learning.

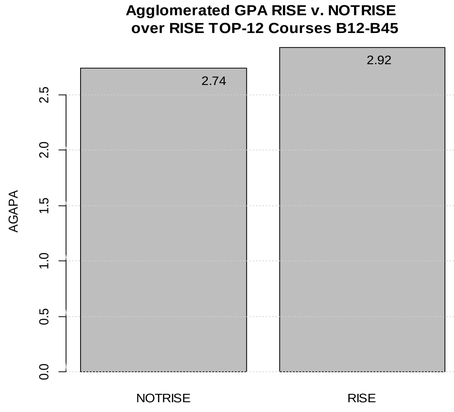
## Results: Impact on Students

RiSE student program membership:.

Total = 273
Current = 144



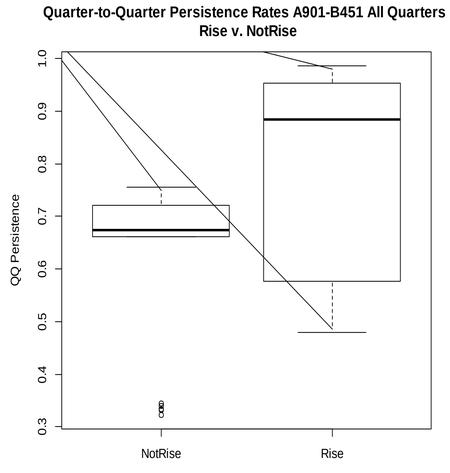

RiSE Student GPA vs “Agglomerated” STEM Student GPA:




Median GPA:
2.74 Non-Rise
2.92 Rise

We find that the mean GPA across the RISE-pattern courses for students in the RISE population are statistically significantly ($p<10e-6$) higher than the mean GPA across RISE-pattern courses for students in the Non-RISE population.

Student Persistence: RiSE versus non-RiSE STEM

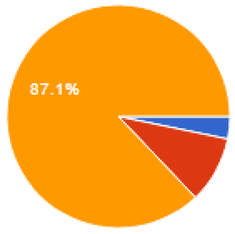



RiSE persistence higher by 21%
p-value = 0.000906

## Results: Impact on Faculty

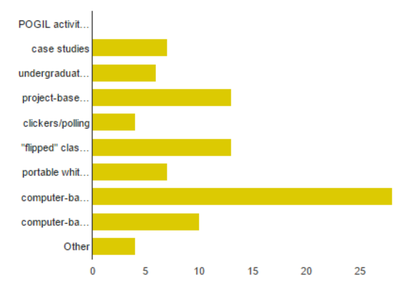
**Faculty Survey Results**

**Compared with five years ago, my classes include**




| | | |
|---|---|---|
| more lecture, fewer activities than before | 1 | 3.2% |
| about the same lecture and activities as before | 3 | 9.7% |
| less lecture, more activities than before | 27 | 87.1% |

**Over the past four years, which of the following classroom techniques have you used REGULARLY**




| | | |
|---|---|---|
| POGIL activities | 0 | 0% |
| case studies | 7 | 22.6% |
| undergraduate research projects | 6 | 19.4% |
| project-based laboratories | 13 | 41.9% |
| clickers/polling | 4 | 12.9% |
| "flipped" classroom | 13 | 41.9% |
| portable white boards | 7 | 22.6% |
| computer-based exercises (out of class) | 28 | 90.3% |
| computer-based exercises (during class) | 10 | 32.3% |
| Other | 4 | 12.9% |

## Next Steps / Challenges

- Working to address the challenge of sustaining the effective components of the RiSE Project.
- Continually rebuilding and educating new staff and administration due to numerous retirements and departures.
- Continuing to try to identify STEM students as early as possible in order to provide support to help them be successful and for assessment purposes.

## References

1. 2014 NSF Report, *Revising the STEM Workforce; http://www.nsf.gov/pubs/2015/nsb201510/nsb201510.pdf*
2. http://www.usnews.com/news/stem-solutions/articles/2015/07/01/outreach-from-community-colleges-helps-to-build-stem-pipeline
3. STEM Central (https://stem-central.net/)

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