A Bridge to the Stars

Innovative STEM Engagement Strategies
to Improve Enrollment and Diversity
in Kansas City

September 20, 2014

Dr. Daniel H. McIntosh
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Recruiting Diverse STEM Majors

- Engaging/recruiting underrepresented & disadvantaged high-school students remains a critical problem in STEM.
  - an economics problem
  - a cultural problem

Caroline Hoxby (Stanford U.)

*High-achieving students are students in 12th grade who have an ACT comprehensive or SAT I (math plus verbal) score at or above the 90th percentile and a high-school grade point average of A- or above. This is about 4% of U.S. high-school students.
Recruiting Diverse STEM Majors

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  - scientist visits classroom/school
  - students visit science center/laboratory
Recruiting Diverse STEM Majors

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- Traditional/common engagement solutions involve limited contact time with a broad audience:
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- Typical recruiting strategies target high-achieving, high-school & college students:
  - but cream of the crop from low-income demographic have socio-economic pressures to focus on more lucrative career tracks.
  - top achievement is not the only metric of potential success in STEM
Unique solution: an astronomy-based pipeline for urban H.S. students

- opportunity
- high-impact engagement
- recruitment of key demographic
The Pipeline: A Targeted Solution

- **Unique solution**: an astronomy-based pipeline for urban H.S. students

  - scholarships to enroll in university
  - Intro Astro course

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The Pipeline: A Targeted Solution

A Bridge to the Stars: Astro 101 in a University Setting for Inner City High School Students

- **Unique solution:** an astronomy-based pipeline for urban H.S. students

  scholarships to enroll in university Intro Astro course → student-centered 15-week exploration with a professional astronomer

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$1K/student
(tuition, fees, materials, transportation)
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- **Opportunity:** scholarships to enroll in university Intro Astro course
- **Student-centered:** 15-week exploration with a professional astronomer
- **Bridge from:** pre-college interest to STEM enrollment, major & career

- **High-impact engagement**

- **Recruitment of key demographic**

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**opportunities**
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- Student-centered 15-week exploration with a professional astronomer
- Bridge from pre-college interest to STEM enrollment, major & career

**high-impact engagement**
- $1K/student (tuition, fees, materials, transportation)

**recruitment of key demographic**
- Depends on success (UG Mentors) + roadmap (Career counseling)

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2014 Great Midwestern Regional Space Grant Consortia Meeting (Science Center of Iowa) Sep. 20, 2014

Dr. Daniel H. McIntosh
A Bridge to the Stars

- Highlights from first two years:

16 Bridge Scholars (75% female, 20% male) (80% AA, 10% HA) [17 scholarships]

Scholars Corey Smith and Diamond Wooten (Hogan Prep. Academy) in Spring 2013.

Scholars Michael Crisp (1), Elisha Verge (2), Amanda Woolley (1), Nataly Ulloa (1), Talia Lindsey (3) and Fatima Mohamed (1) in Spring 2014.

(1) Lincoln Prep. Academy, (2) KCMSD South West Early College Campus, (3) Hogan Prep. Academy
A Bridge to the Stars

Highlights from first two years:

16 Bridge Scholars (75% female, 20% male) (80% AA, 10% HA) [17 scholarships]
6 Bridge Mentors (50% female, 50% male) (need diversity here)

Mentor Casey Gilliam (Jr. - Physics & Astro BS)
Mentor Andrew West (Jr. - Psychology BA)
Mentor Brittany Liles (So. - Math BA) *now Astro/GEG

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16 Bridge Scholars: 40% in a STEM major*, 20% Astro major/minor**
A Bridge to the Stars

90% pass

16 Bridge Scholars: 40% in a STEM major*, 20% Astro major/minor**

*all with course grade >85%  **all owing to ASTR course experience
A Bridge to the Stars
Scholarships
(2014-2015)

A unique opportunity to take a UMKC Introduction to Astronomy course taught by a professional astronomer awaits you!

Receive university credit for a course that meets standard, general-education science requirements nationwide.

Choose from one of two interactive, student-centered explorations of the cosmos with Dr. McIntosh, an astronomer working at the forefront of research on the birth and growth of galaxies using the Hubble Space Telescope.

**ASTR 150**
Introduction to Astronomy: Gravity & Motion in the Universe
Fall: Tuesdays & Thursdays 4:00-5:15pm on the UMKC campus

**ASTR 155**
Intro to Astronomy: Interaction of Light & Matter in the Universe
Spring: Tuesdays & Thursdays 4:00-5:15pm on the UMKC campus

Eligibility:
Junior and senior high-school students in good academic standing with a real interest in astronomy and science (essay required).

Six scholarships are available for Fall 2014. Each covers tuition, fees, student Metro bus pass, and required course materials.

Application Deadline: Friday May 16, 2014 (5pm)

Application material and info - http://cas.umkc.edu/hscp/bridge-to-the-stars.asp

Made possible through funding by the NASA Missouri Space Grant.

Mentor screening must have maturity & desire to teach others

Attention Astro155 students!

I am looking for motivated students to mentor a small group of urban high-school students who will be awarded scholarships to take Astro150 at UMKC this Fall (2014).

Earn $50/week and free enrollment in Astro150 to work with the scholarship students in class (TPS, LT, etc.) and meet with them outside of class 1-2 times weekly. Gain mentoring experience and a solid professional reference for your resume!

Accepting applications from current Astro155 students with a strong academic record. Not required to be a science major. Looking for students with a desire to help others succeed. Class meets Tu/Th 4:00-5:15pm. Weekly mentoring meetings TBD based on your schedule.

Application:
- Email a short (1-page) statement describing your interest in this opportunity.
- Please include contact information (email address is fine) for one reference.

Application Deadline: Friday May 16, 2014 (5pm)

For questions contact: Prof. McIntosh (mcintoshdh@umkc.edu)

Made possible through funding by the NASA Missouri Space Grant.
Building an effective Bridge Network

Partnerships established with:

- KC Public Schools
- KC STEM Alliance
- PREP-KC
- Science Pioneers
- UMKC High School College Partnerships
- UMKC Institute for Human Development
- plus counsellors/administrators at Hogan Prep. Academy
- KCMSD South West Early College Campus
- Lincoln Prep. Academy

Critical for promoting even an exciting opportunity, need to build relationships with city high-school S&M teachers to increase candidate pool.
A Bridge to the Stars (2.0)

- Expand pipeline to a 3-tier Bridge to the Stars:

  - **A Bridge to the Stars (1.0)**
  - former **Scholars** enrolled at UMKC mentor next Bridge **Scholars**
  - former **Mentors** receive scholarships for research skills training course*

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**Scholarship**

**Mentoring Internship**

**Research Training**
A Bridge to the Stars (2.0)

- Expand pipeline to a 3-tier Bridge to the Stars:

  **Scholarship**
  - A Bridge to the Stars (1.0)

  **Mentoring Internship**
  - former Scholars enrolled at UMKC mentor next Bridge Scholars

  **Research Training**
  - former Mentors receive scholarships for research skills training course*

*100% of successful students have joined the Galaxy Evolution Group and received internships.*
Best engagement/learning by hands-on research (discovery):
- requires a starter toolkit to make real contributions
- but can be time-intensive for busy faculty
Research Training with Limited Resources

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**Solution:** UGs build skills & experience scientific process/team by working through set of tutorials

- activity #1
- activity #2
- activity #3

... each activity builds on previous
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- Adaptable: classroom, group or laboratory setting
- Effective use of small F&S $ for engagement/recruitment of underrepresented groups
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Important for Astro (big data) research where shadowing is less effective/engaging.

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Active Environment = Access & Inclusion

- Offer more than just academics, training and research ...
Active Environment = Access & Inclusion

- Offer more than just academics, training and research . . .

encourage open discussion . . .

**Astro Hour**

**Who:** Open to all students interested in astronomy!

**What:** Informal forum on recent discoveries in astronomy. Student-centered, round-table discussion. Moderated by UMKC astronomers Profs. Brodwin & McIntosh

**Where:** Physics & Astronomy conference room, FH 256

**When:** Fridays, 1:30-2:30pm

**Why:** Get answers to your questions! Learn how scientists do science. Meet other students with similar interests.
Active Environment = Access & Inclusion

- Offer more than just academics, training and research . . .

encourage open discussion . . .

and creative EPO opportunities.

Sep. 2013: Holst Concert - over 400 visitors!

Students from Astro Hour designed and hosted EPO posters at Kauffman Performing Arts Center event.
A Closing Question

- Current political & economic climate is challenging for STEM:
  - tension between call for STEM recruitment and decreasing STEM funding

- Question: How do we engage/educate the public effectively about the cost vs. benefit of STEM research in general, and NASA missions in particular, without being boring and coming off as self-serving?
  - Federal administrators cannot lobby the public for improved funding.
  - Science is widely popular, but public does not understand cost.
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  - Federal administrators cannot lobby the public for improved funding.
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- What’s missing is a clear & entertaining way to help the public connect the dots between the great stuff we do, it’s very low relative cost, and its huge impact (historically) on the US economy.