

Innovative Ways to Engage Students in STEM

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UNO Math-Science Learning Center Director



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MSLC
MATH-SCIENCE LEARNING CENTER



UNIVERSITY OF
Nebraska
Omaha

Context

- Omaha metro area
 - Pop ~750,000



- The University of Nebraska at Omaha
 - A metropolitan university of ~14,000 students
- Chemistry Department
 - 500-600 students in Gen Chem I per year
 - Undergraduate only



4 projects – briefly

- UNO Math-Science Learning Center
- STEM Talent Expansion Program
- Course Integration of Early-Undergraduate Research
- College of Education Collaboration



1: MSLC - Mission

*To increase student learning
achievement in Math and Science*

To foster sustained learning

*And to advance the academic community
in Math and Science most interested
in student success.*

*The MSLC strives to aid the entire spectrum
of UNO students.*

MSLC - Quick Facts

- Student centered
- Faculty connected
- Campus hub/partner
- Highly visible location
- Permanent budget
- ~1300 student visits/week



...es? 84%

...wise dropped a course? 36%





MSLC – Annie's Story

The word **SCIENCE** was a synonym to me of TRAUMATIC experiences from Junior High.

I was tempted to drop out again thinking that "I'm just NOT a science person"...when I saw a sticker that read "new TUTORING SCIENCE CENTER AT DURHAM".... I was there last week and have been attending ever since.

Today, thanks to little sessions that complement my work at home and in class with WONDERFUL YOUNG TUTORS I have gotten A's in all my science tests...A's!!!!!!!

For the first time in my life I can say proudly that **I love Science.**



2: STEP

STEM **T**alent **E**xpansion **P**rogram

2004-2009

1. Articulation of complete STEM programs MCC → UNO
2. Scholarships to help attract and retain students
3. Expand, align, and strengthen experiential education opportunities and student support services
4. Develop new STEM degree/certificate options
5. Increase outreach and recruitment initiatives targeting prospective STEM students.



Pathways – made straight

- *Articulation of Complete Programs (MCC → UNO) Is Now Available in **Seven STEM Areas***

- biology, chemistry, biotechnology, mathematics, physics, bioinformatics and computer science

- ***Six New Associate Degrees Created at MCC***

- pre-biology, pre-biotechnology, pre-chemistry, pre-mathematics, pre-physics, and pre-bioinformatics

- ***Three New Bachelor's Degrees (or Degree Tracks) Created at UNO***

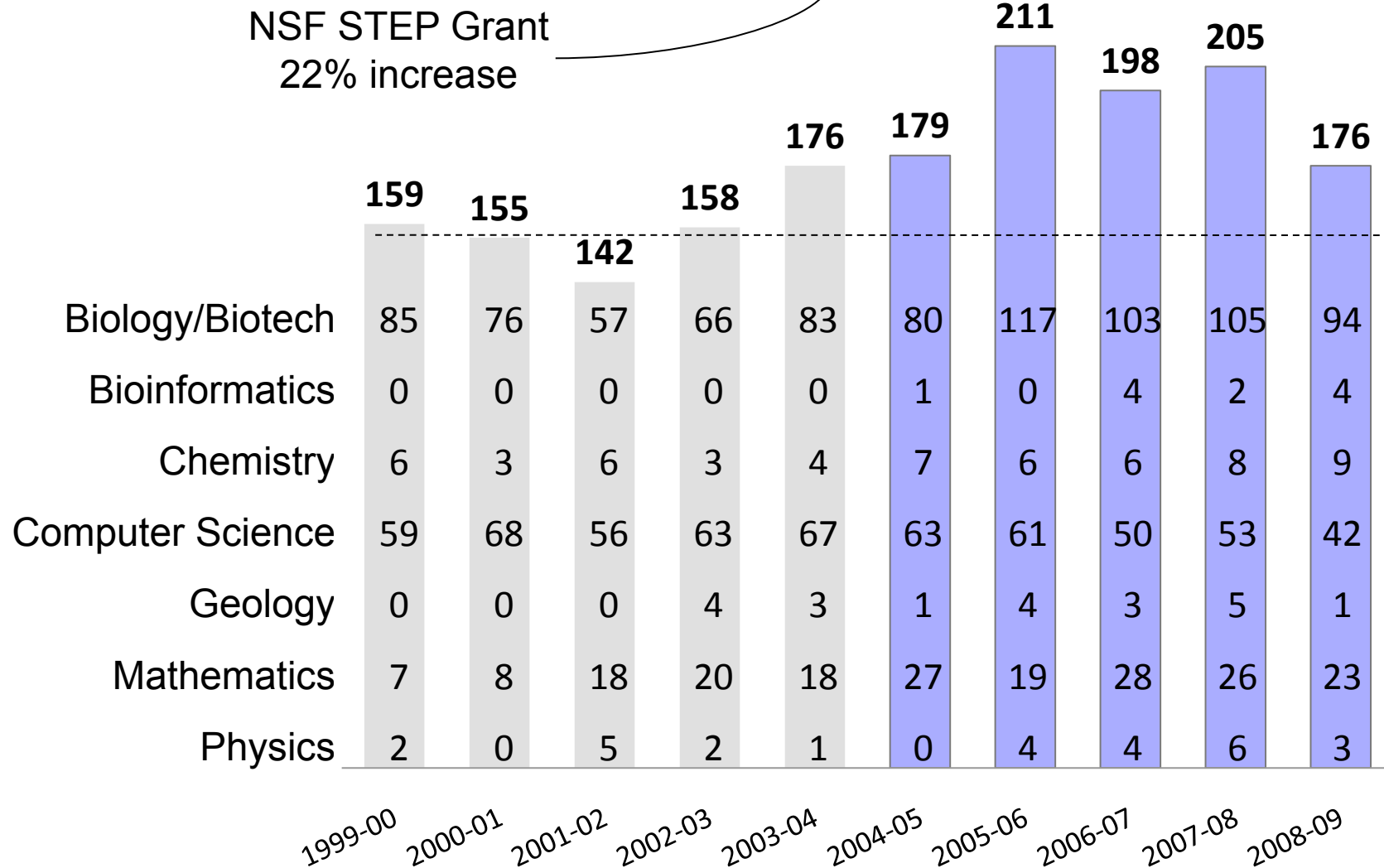
- Bioinformatics, Information Assurance, Medicinal Chemistry

- ***Math-Science Learning Center*** – opened Sep 2007

- ***MCC STEM Recruitment Coordinator***

- ***Increased Undergrad Research Awareness***

UNO STEM Graduates



MCC Student Activity

MCC Transfers to UNO	142	146	141	163	175	188
MCC pre- Majors	0	164	217	243	327	327
New Bridge Scholarships	0	4	15	20	16	18

03-04 04-05 05-06 06-07 07-08 08-09





3: Course Integration of Early-Undergraduate Research

- Drinking water analysis
- Soils analysis
 - Analysis of archeological samples
 - Phytoremediation studies and geochemical prospecting
 - Acid and mineral analysis of rain water
 - Collaboration with sociology studying lead in hair samples



EUR Structure

- **Geology students collect samples** which are then distributed to the chemistry students
- **Chemistry students analyze *samples*** and return the analysis data
 - Accompanied by an **oral presentation** of the method, techniques and experimental uncertainty
- **Geology students analyze the *data*** for geologic/geographic correlations
 - Followed by an **oral presentation** of the findings/conclusions to the chemistry students

EUR Topics

- Why lead in soil?
 - Within the city of Omaha is a well documented area of lead contamination currently being remediated (EPA Superfund)
 - Health/community impact
 - Multiple possible sources of lead origin
 - Lead smelting plant, paint chips, leaded gasoline, others?

- Why drinking water?
 - **We all use/consume it on a daily basis**
 - It is variable
 - By day, geography, home, etc.
 - Its quality is closely monitored/regulated

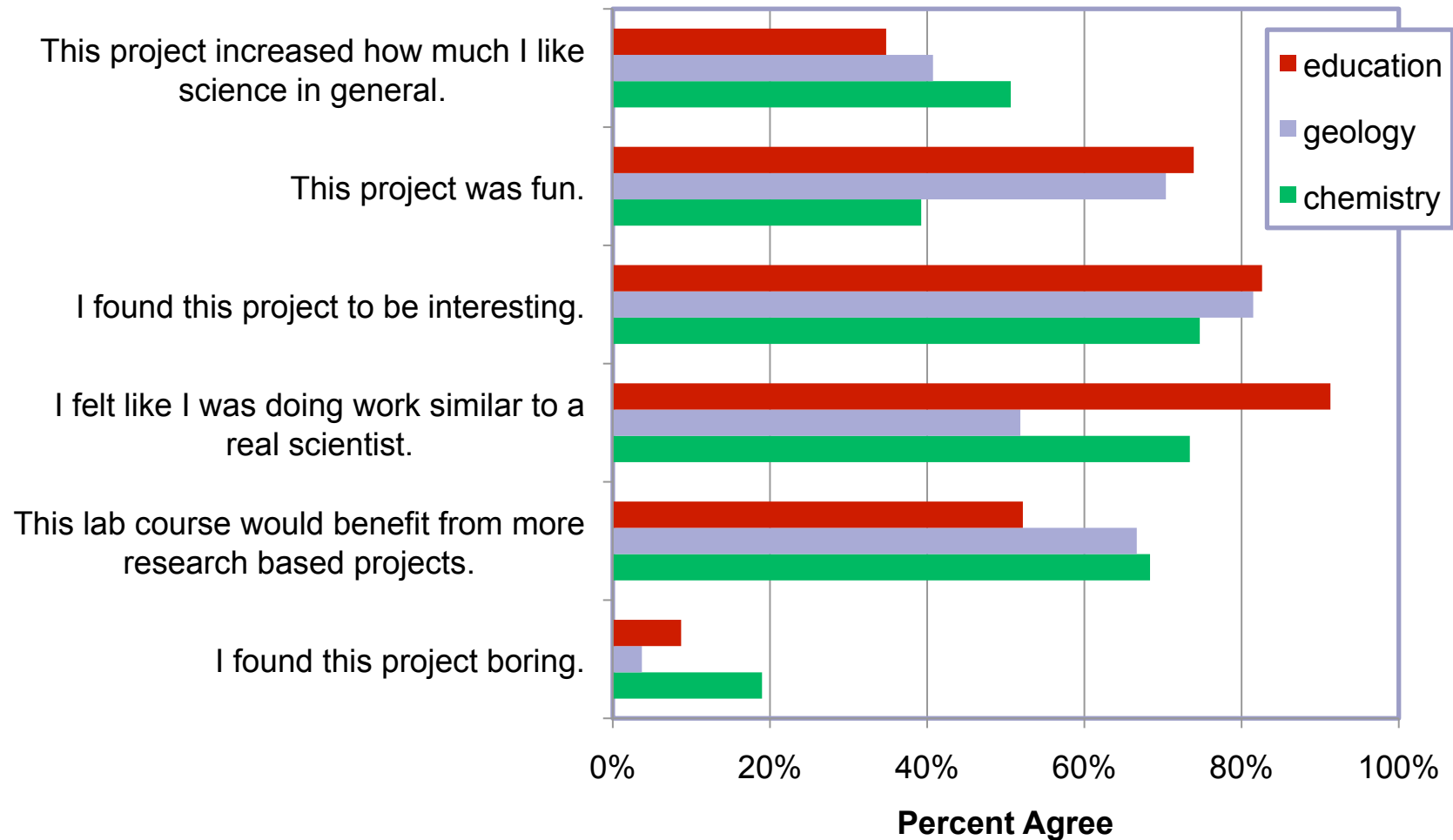


Important Factors

- Relevant
- Accessible
- New/fun/exciting
- Repeatable
- **Authentic research experience**
- Equipment availability and cost
- Modern/high-tech
- Integrated into existing courses



Participant Comparison





4: College of Education Collaboration

- NU-Teach (modeled after U-Teach)
 - Increase the number of STEM graduates
 - Double the number of secondary math and science teachers
 - Strengthen the content knowledge of current and future math and science teachers
 - Features targeted freshmen recruitment, targeted content and pedagogy courses and inquiry based experiences



General challenges to overcome

- Lack of faculty time
- Faculty resistance to change
- Isolated courses
- Generational differences
- Perceptions and misconceptions
- Students' self-confidence in science
- Social isolation (e.g., ethnic, gender)
- Short-term reward mindset
- Summer attrition



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For more information visit

www.unomaha.edu/STEP

www.unomaha.edu/MSLC

water.unomaha.edu