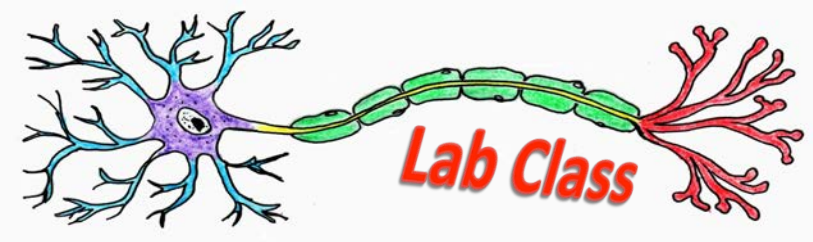
Bridging the Gap:
from
Classroom to Bench

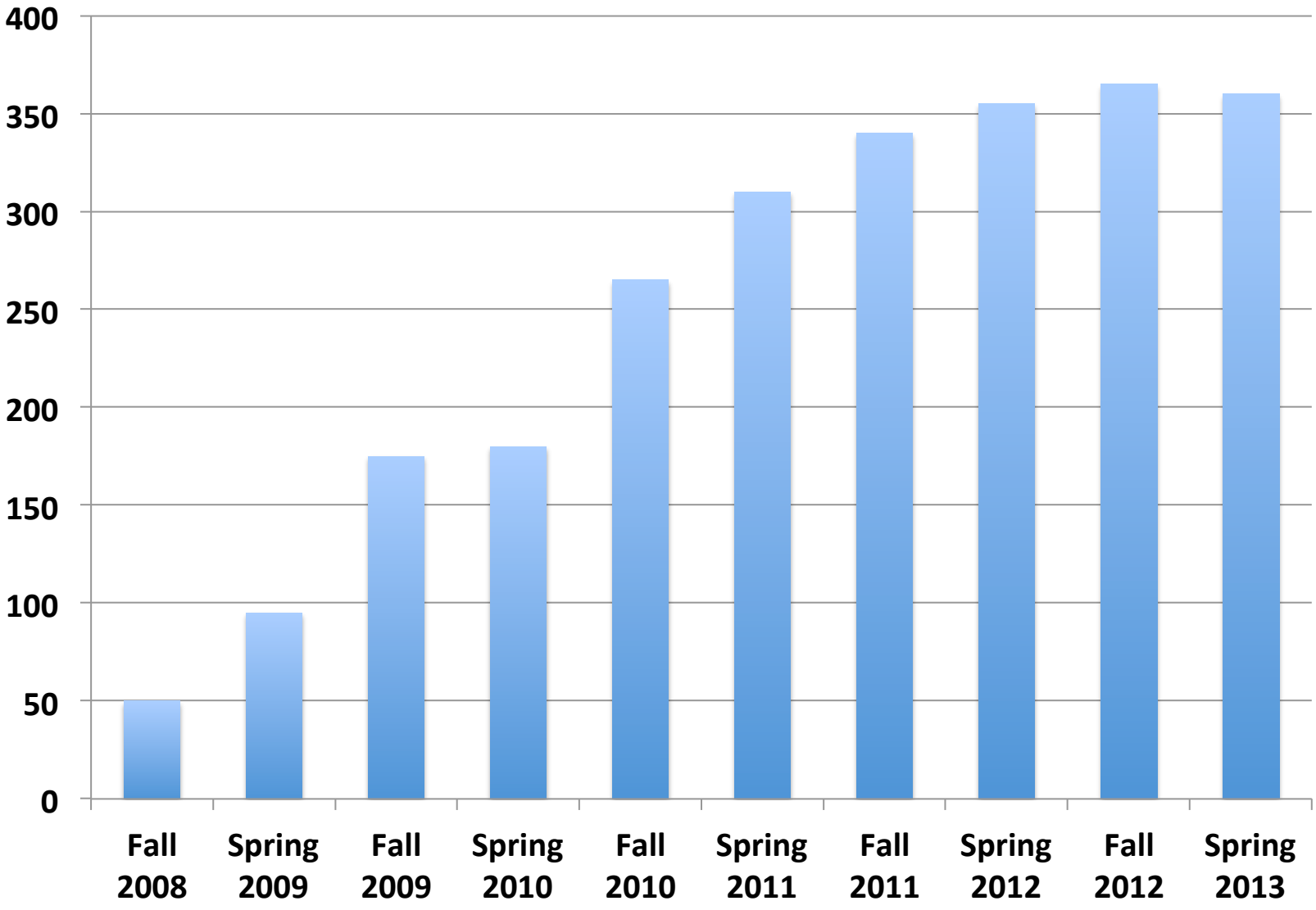


Meredith Knight, Ed.D. Candidate, School of Education
Paul Lipton, Undergraduate Program in Neuroscience
Boston University

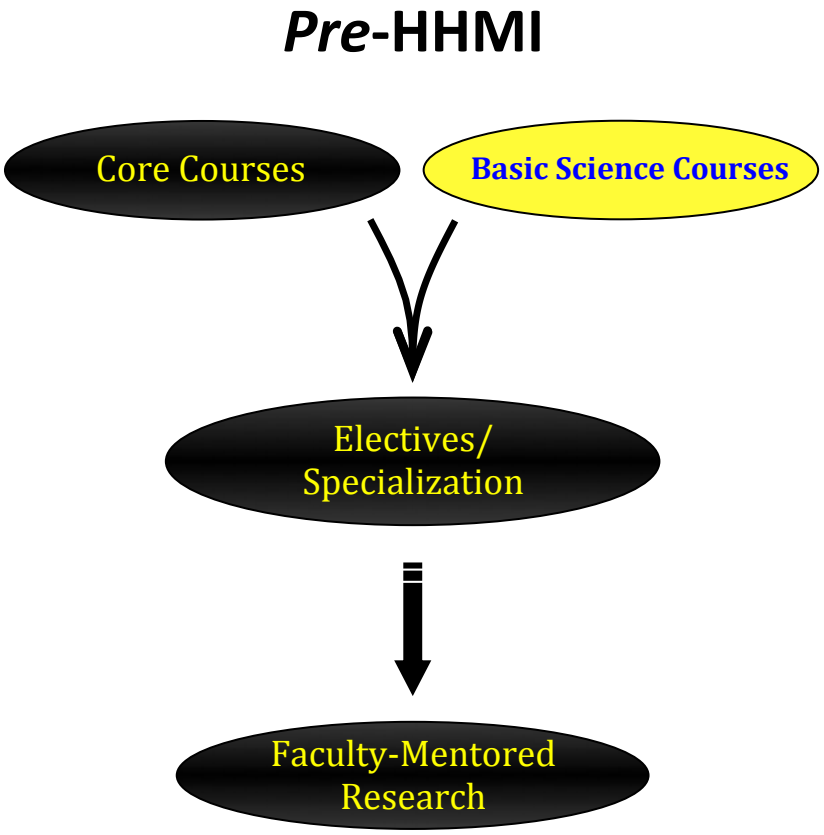
Overview

- Undergraduate Program in Neuroscience
- Theory of change
- Research Questions & Findings
- Next steps

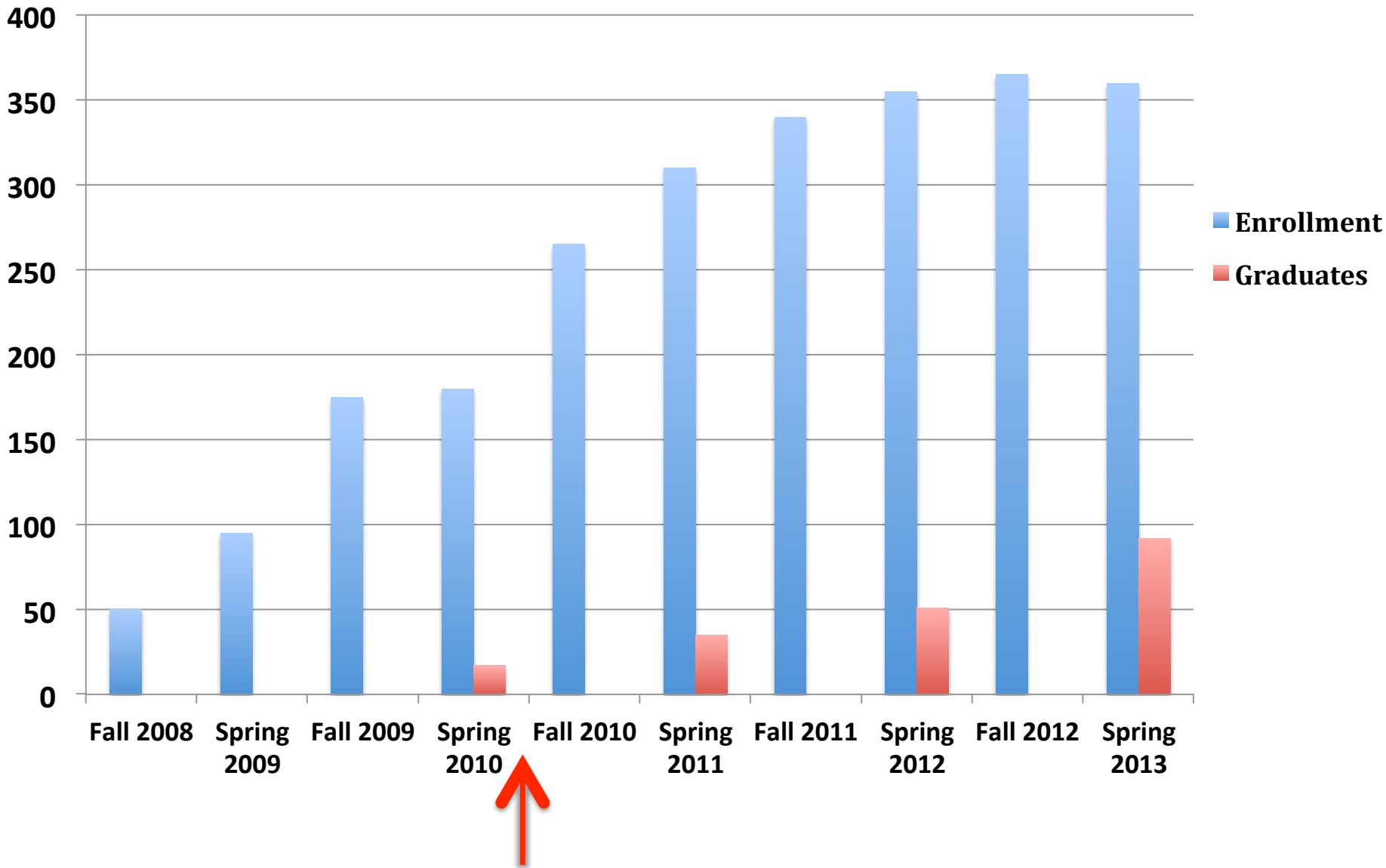
Undergraduate Program in Neuroscience Enrollment



Undergraduate Program in Neuroscience

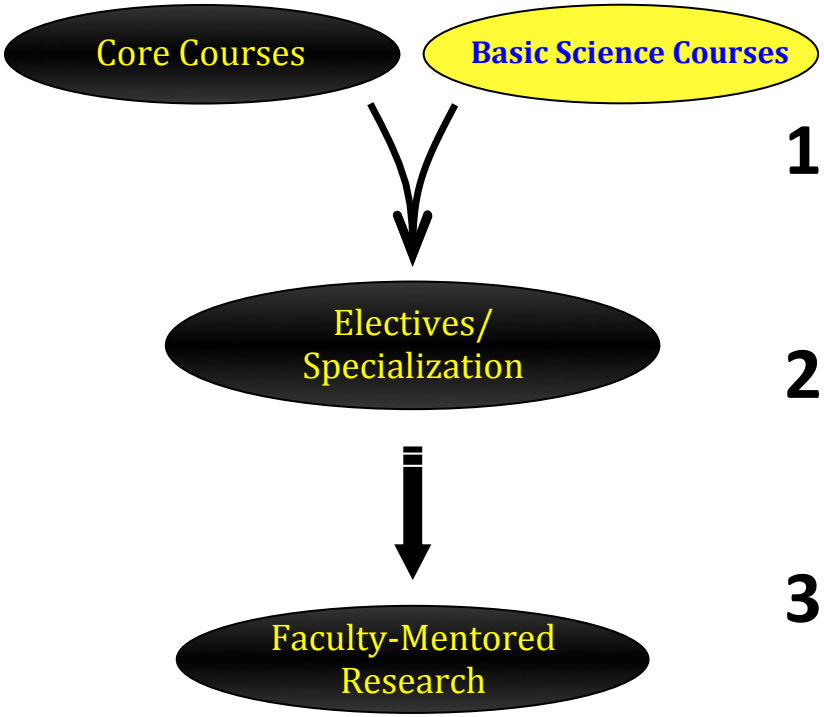


Undergraduate Program in Neuroscience Enrollment



Undergraduate Program in Neuroscience

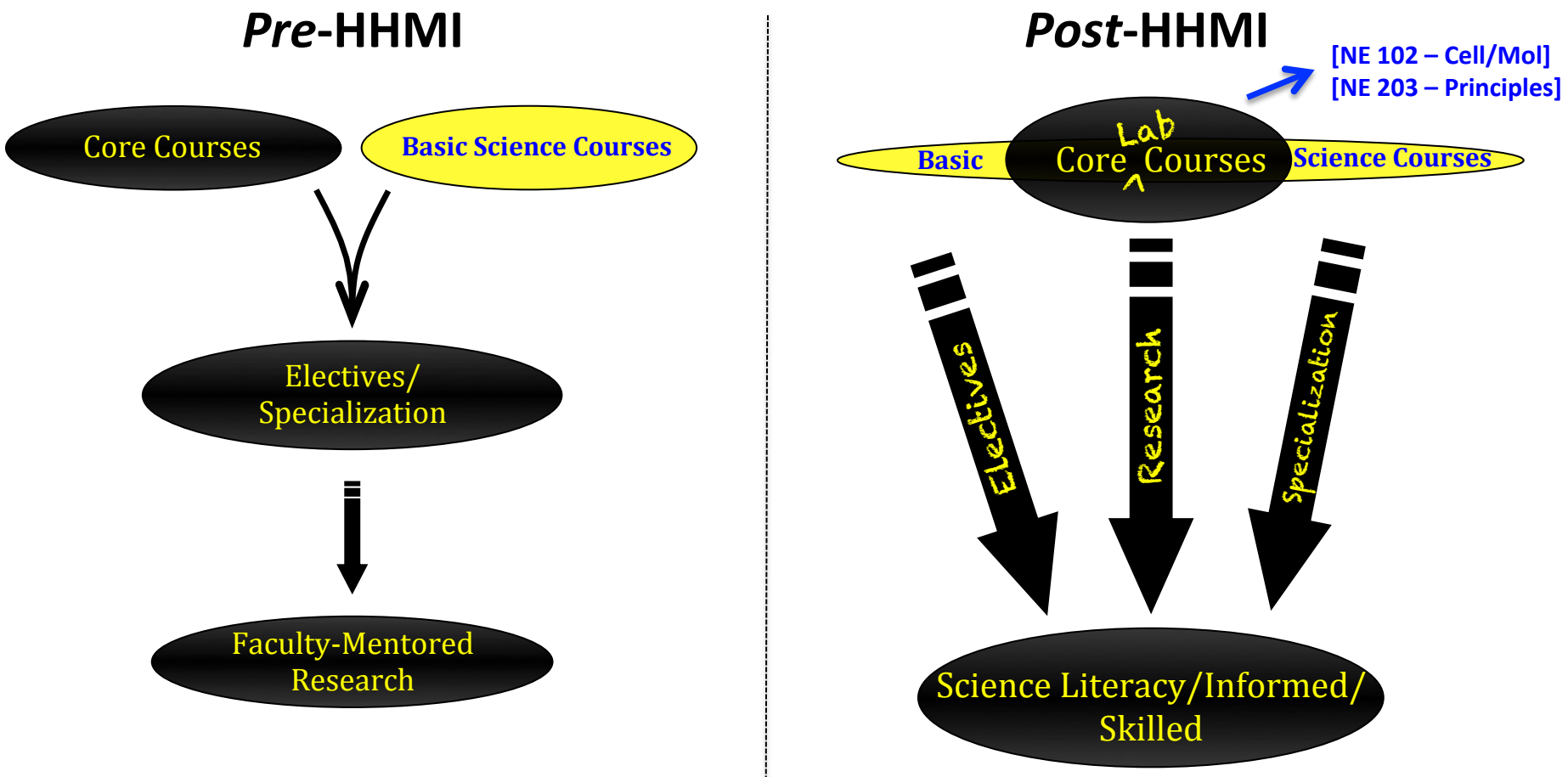
***Pre*-HHMI**



***Post*-HHMI**

1. **Should research be a/the goal?**
2. **Lab course =?= Research**
3. **…the Gap**

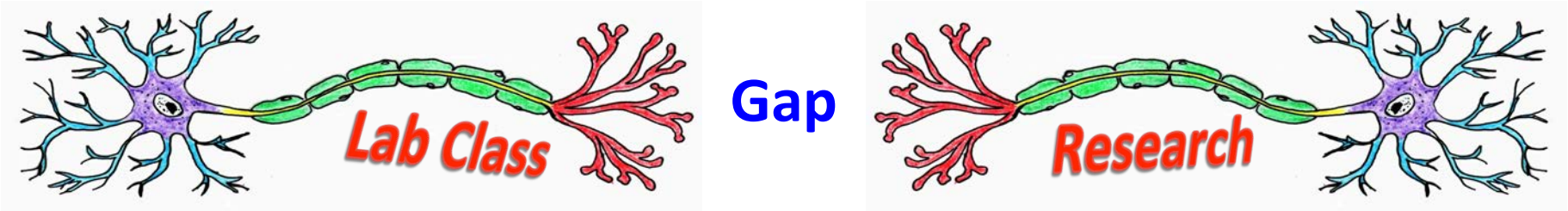
Undergraduate Program in Neuroscience



Theory of Change

Early research-based coursework and research experiences will improve:

1. Students' understanding of research/science/career paths
2. Students' satisfaction with major/college
3. Bridge the gap between lab course/research



RQ1: Effect of lab classes on research experience

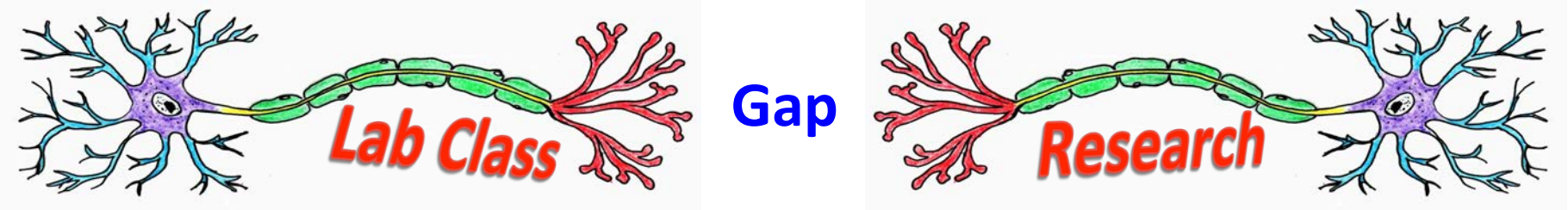
RQ2: Effect of research on academic experience

Data Collection

May 2011	Jan 2012	May 2012	Aug 2012	Dec 2012	Aug 2014
Senior survey (N=31)					
		Senior survey (N=31)			
	NE 102 pre survey (N=101)	NE 102 post & focus groups (N=101)	Summer survey & focus groups (N=10)	NE 203 post survey (N= 56)	
			Junior & senior survey & focus groups (N=28)		
			Mentor survey (N=20)		
				NE 203 post (N=41)	
					UROP survey (N=70)

RQ1: Effect of lab classes on research experience

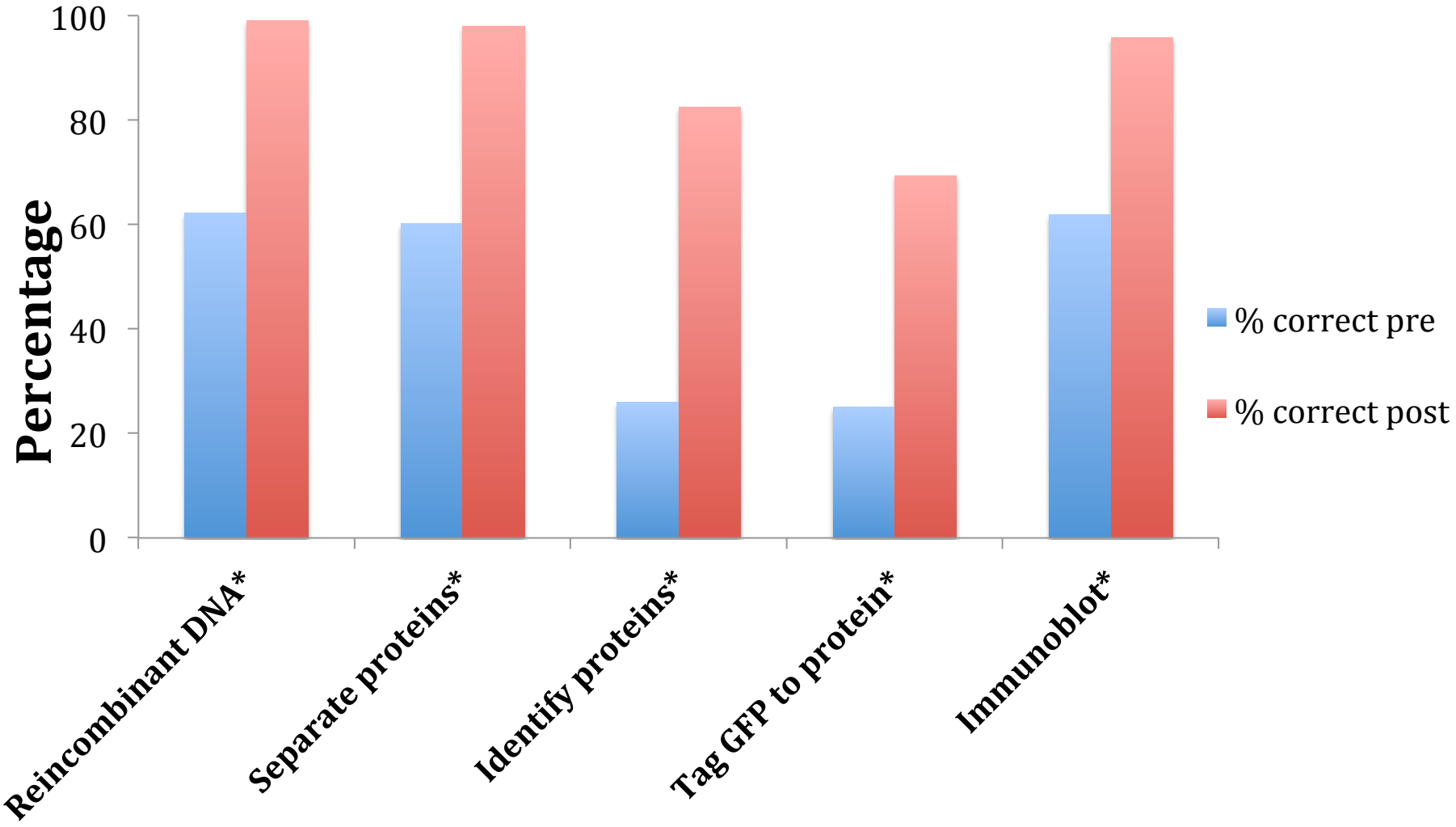
1. Pre/ post assessment – NE 102
2. Focus groups – summer research students
3. Post assessment – NE 203
4. Mentor feedback survey

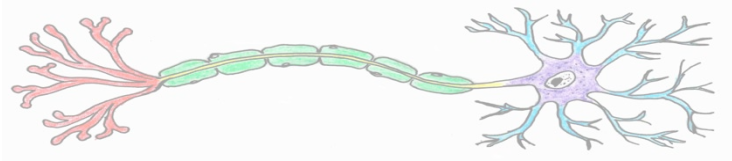


RQ2: Effect of research on academic experience

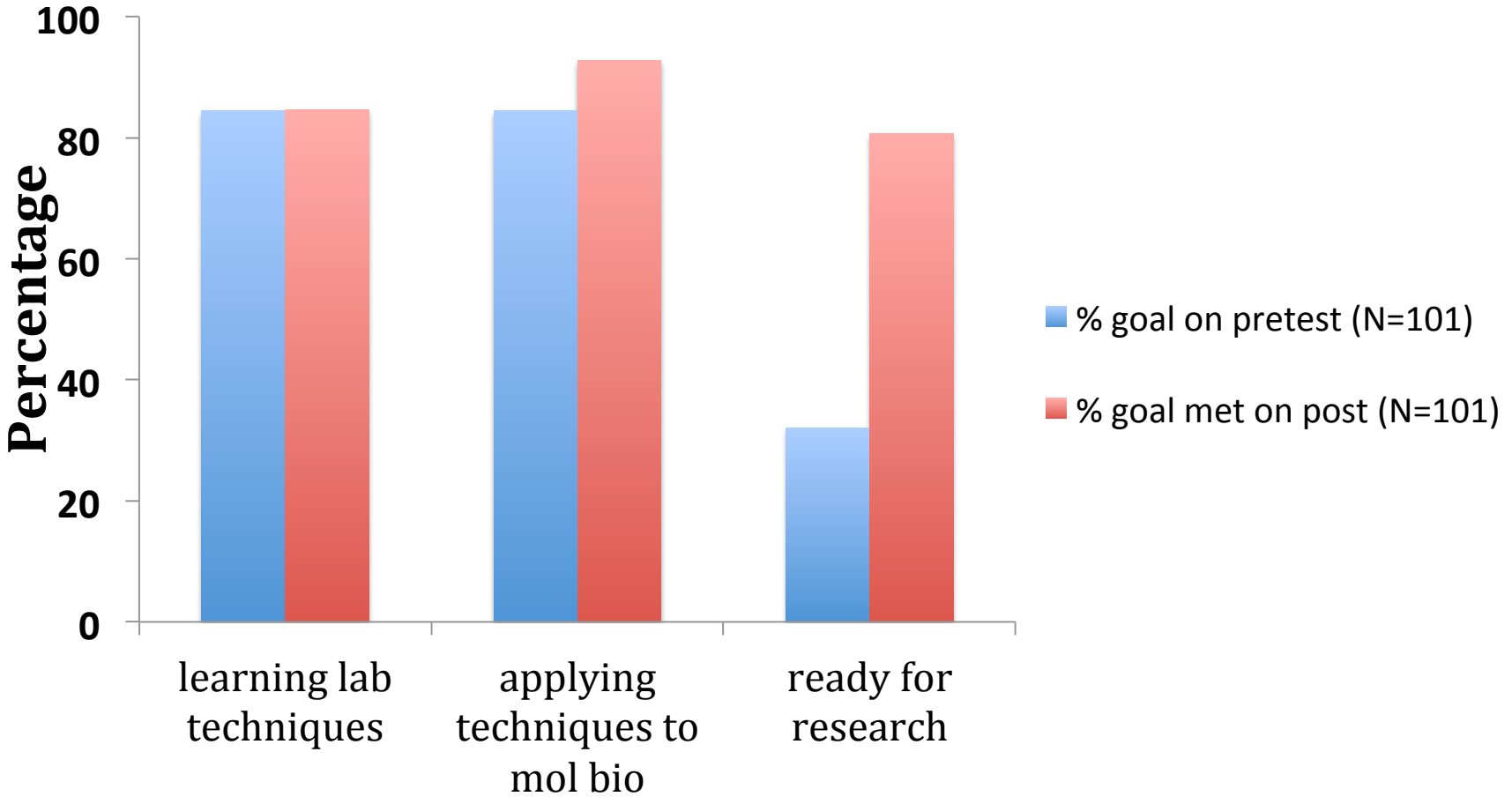
5. Focus groups – summer research students
6. Post assessment – NE 203
7. Survey of all summer research students
8. Neuroscience senior surveys

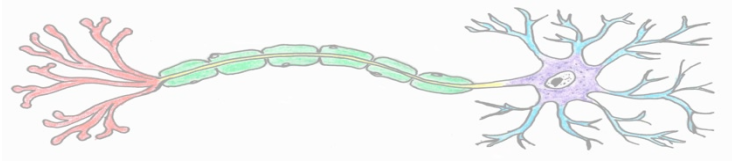
NE 102: Students gain knowledge of lab skills (n=101; pre/post)





NE 102: Students report readiness for research





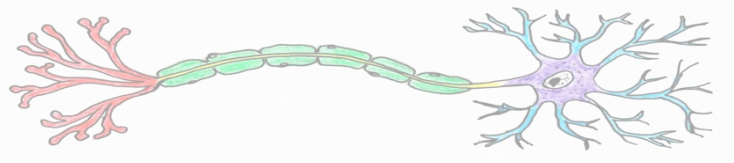
Focus groups after summer research: Smooth the transition to research (NE 102 & 203)

"I learned how to use a pipette. **I learned really simple things that they kind of took for granted in the lab**."

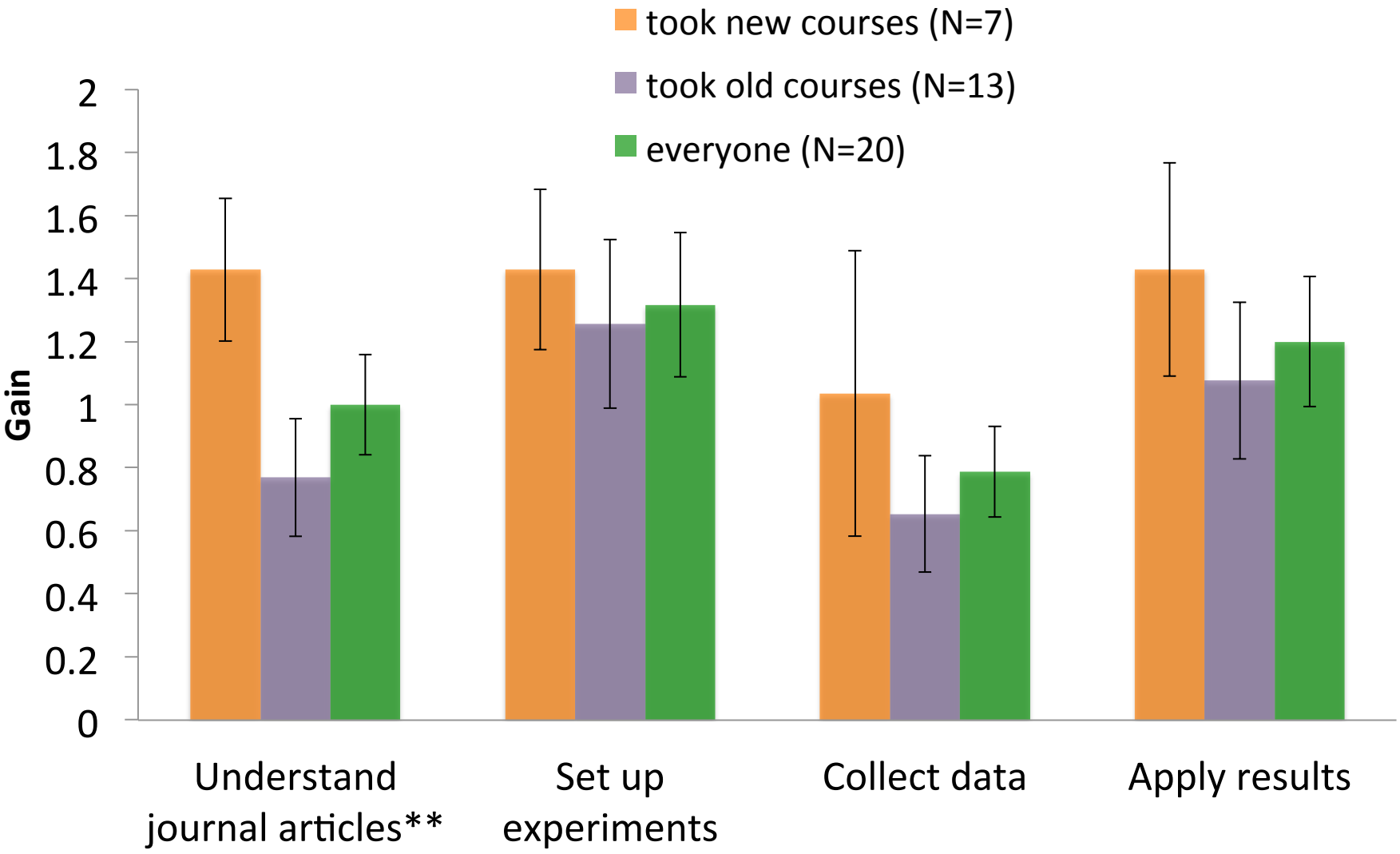
(NE 102 student, sophomore)

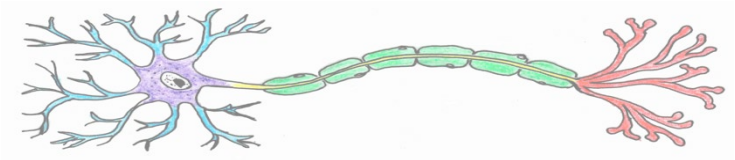
"**NE 203 was a big help in terms of learning actual lab etiquette and practices and stuff like that.**"

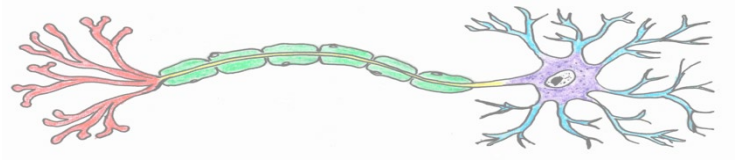
(NE 203 student, junior)



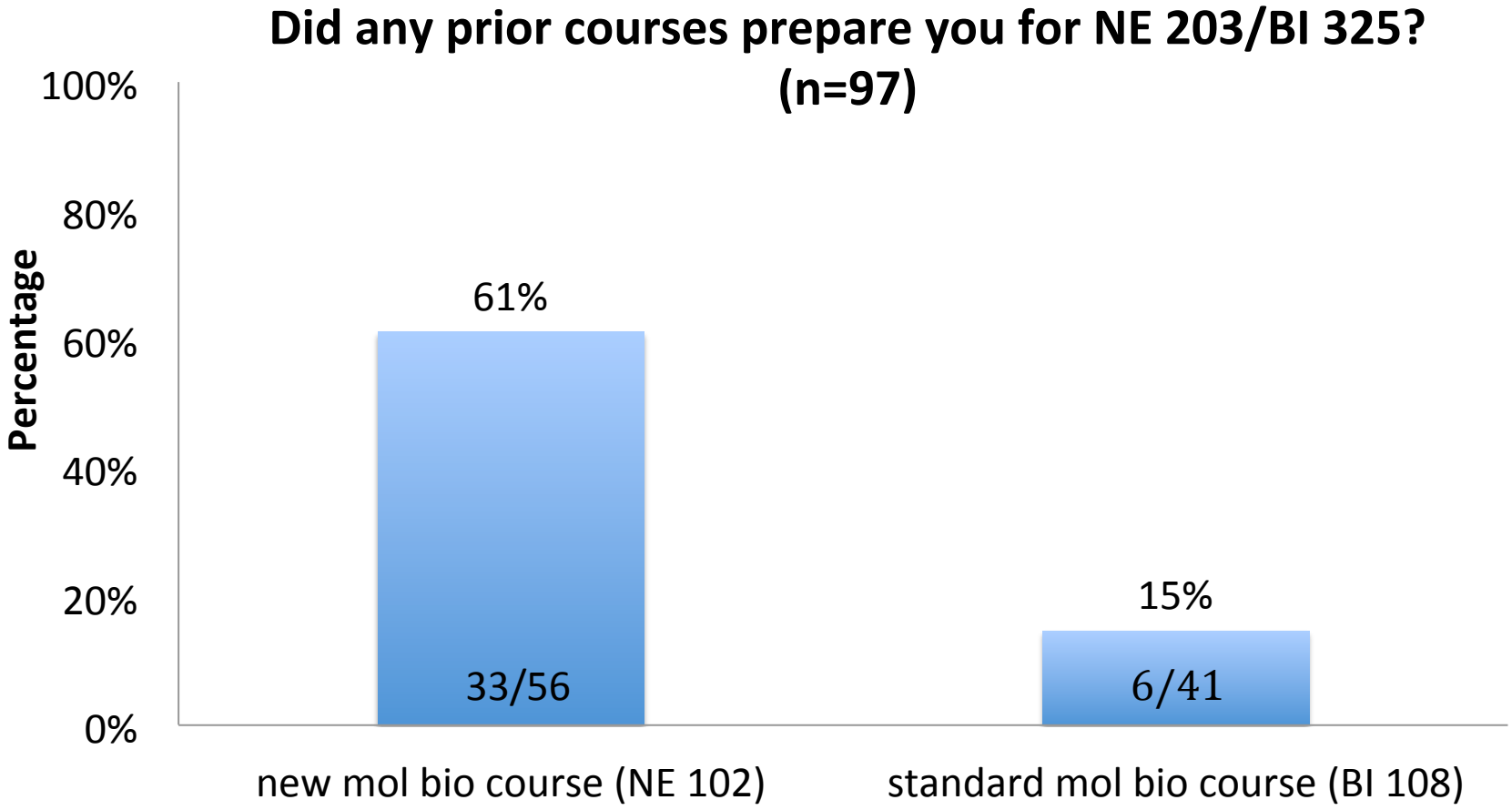
Mentor survey: Greater gains during summer (NE 102)

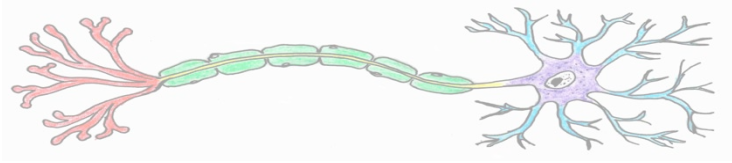






Post survey: Preparation for subsequent courses

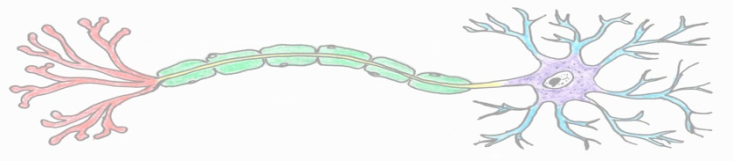




RQ1 Summary: The new lab courses

Students gain

1. knowledge of lab skills
2. smoother transition to research
3. better link with course sequence



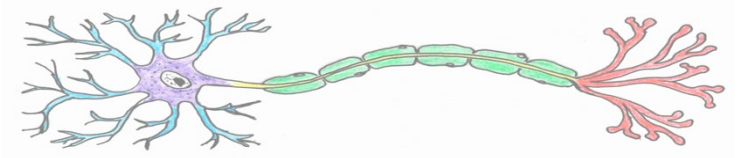
RQ2: Effect of research on academic experience

Senior survey (N=62) 2011, 2012
93% respondents did research (58/62)

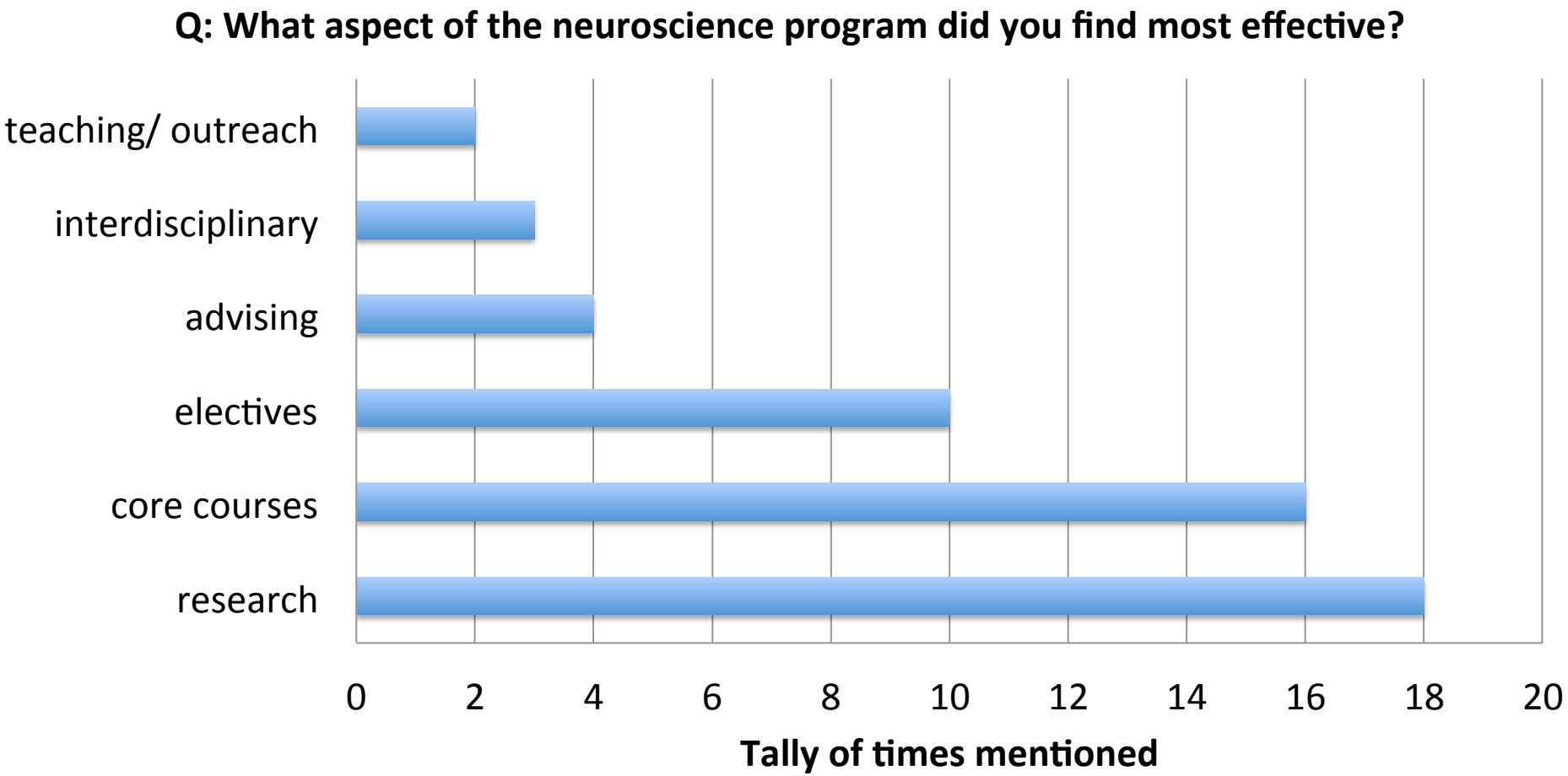
"Research component gives real life experience."

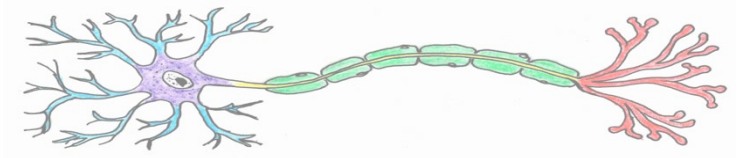
"The focus on research provided me with valuable guidance and skills for the future."

"The research was a very important part of my undergrad experience."



RQ2: Most effective aspect of undergraduate exp.

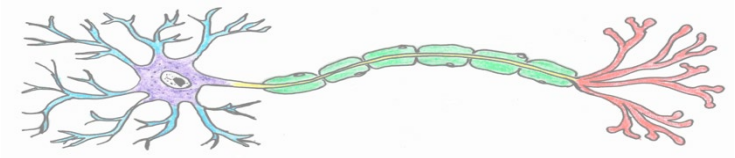




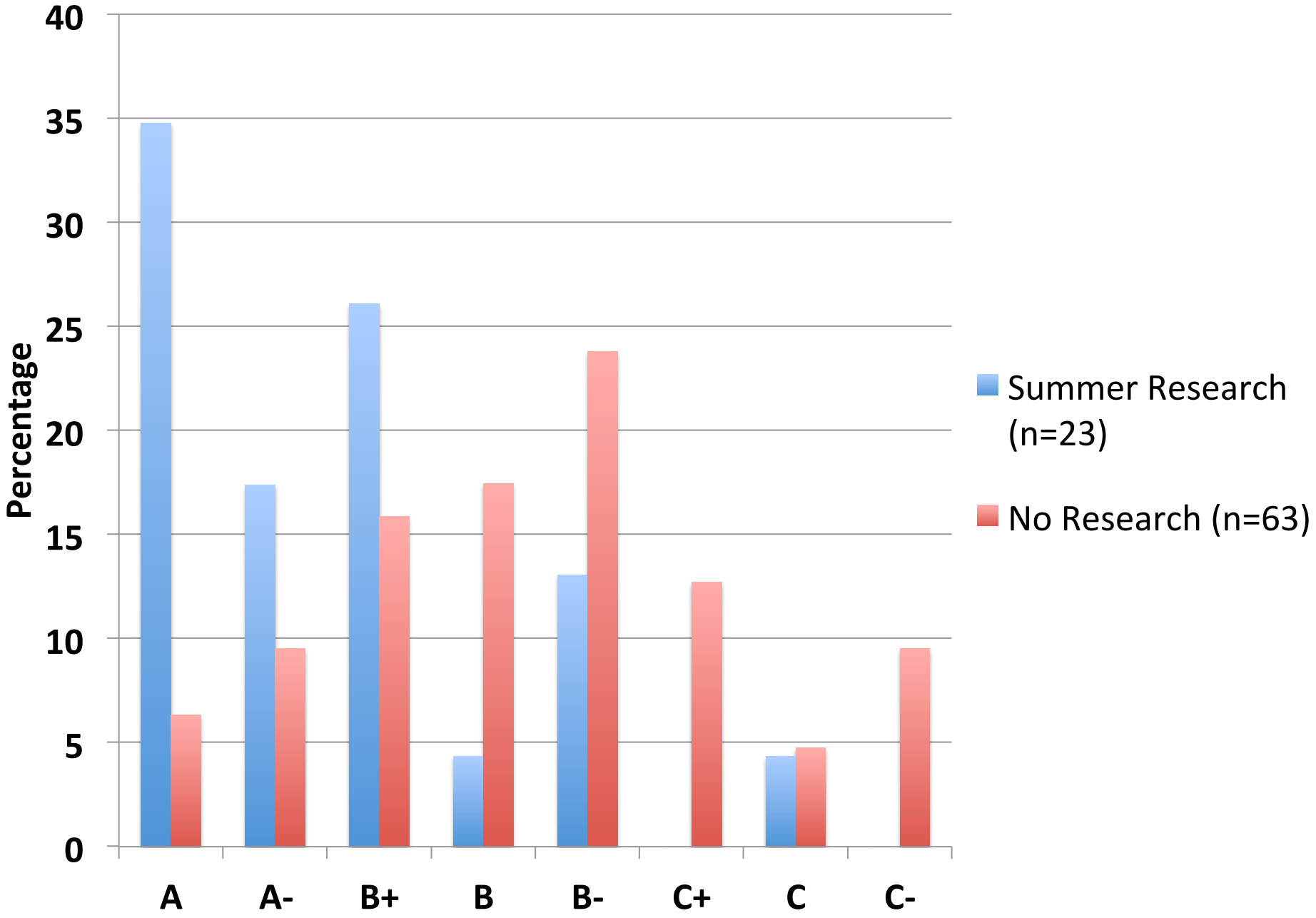
RQ2: Positive effect on coursework

"**I'm actually far more excited to tackle my coursework in the fall ……I'm actually going to know significantly more than I would have if I hadn't done this summer research**." (focus groups, 2012)

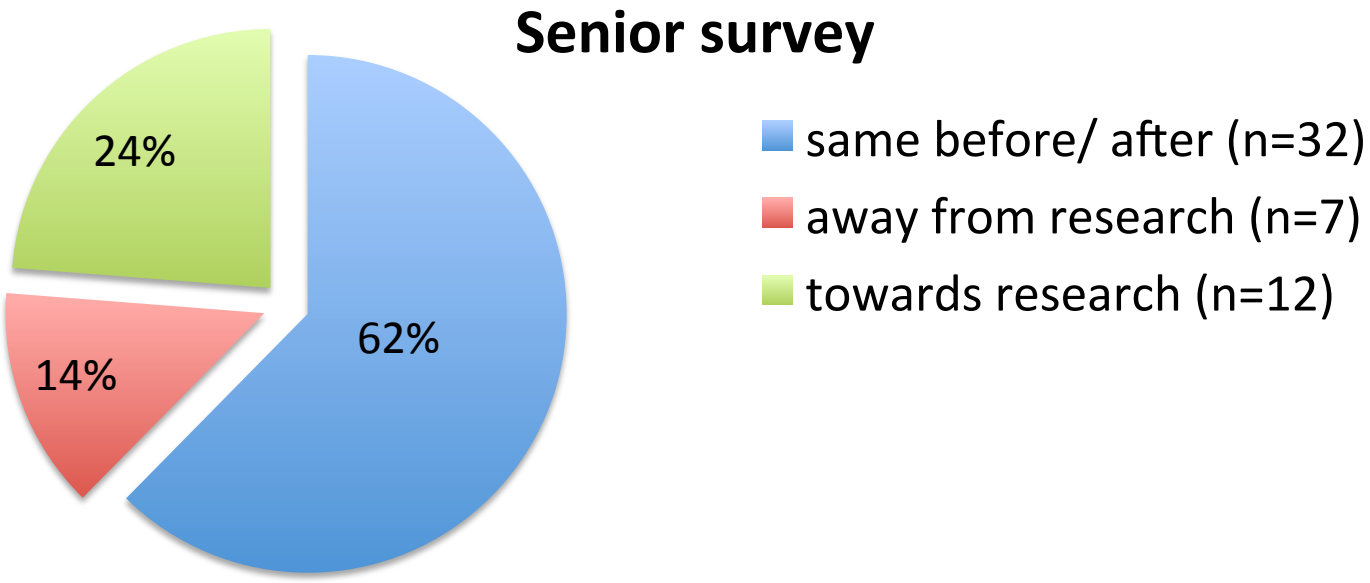
"I think [reading journals] definitely would help in how I approach literature or textbooks for class because **now I know how to pick things apart better that would otherwise be difficult to understand**" (focus groups, 2012)



NE 203 Grades / Prior Summer Research



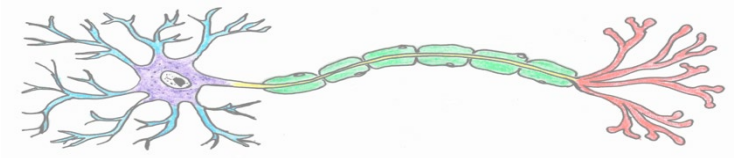
RQ2: Clarification of career plans



Q: Did this program help to clarify your academic/ professional goals?

"I think research experience really helped my understand what my future plans may be."

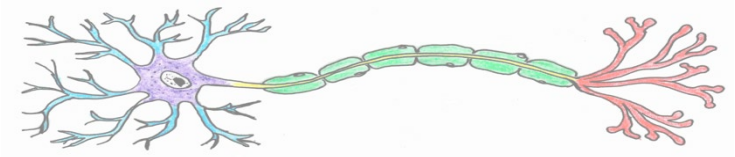
"Yes, although I have decided not to pursue neuroscience, my research experience has helped me to find a new path in special education."



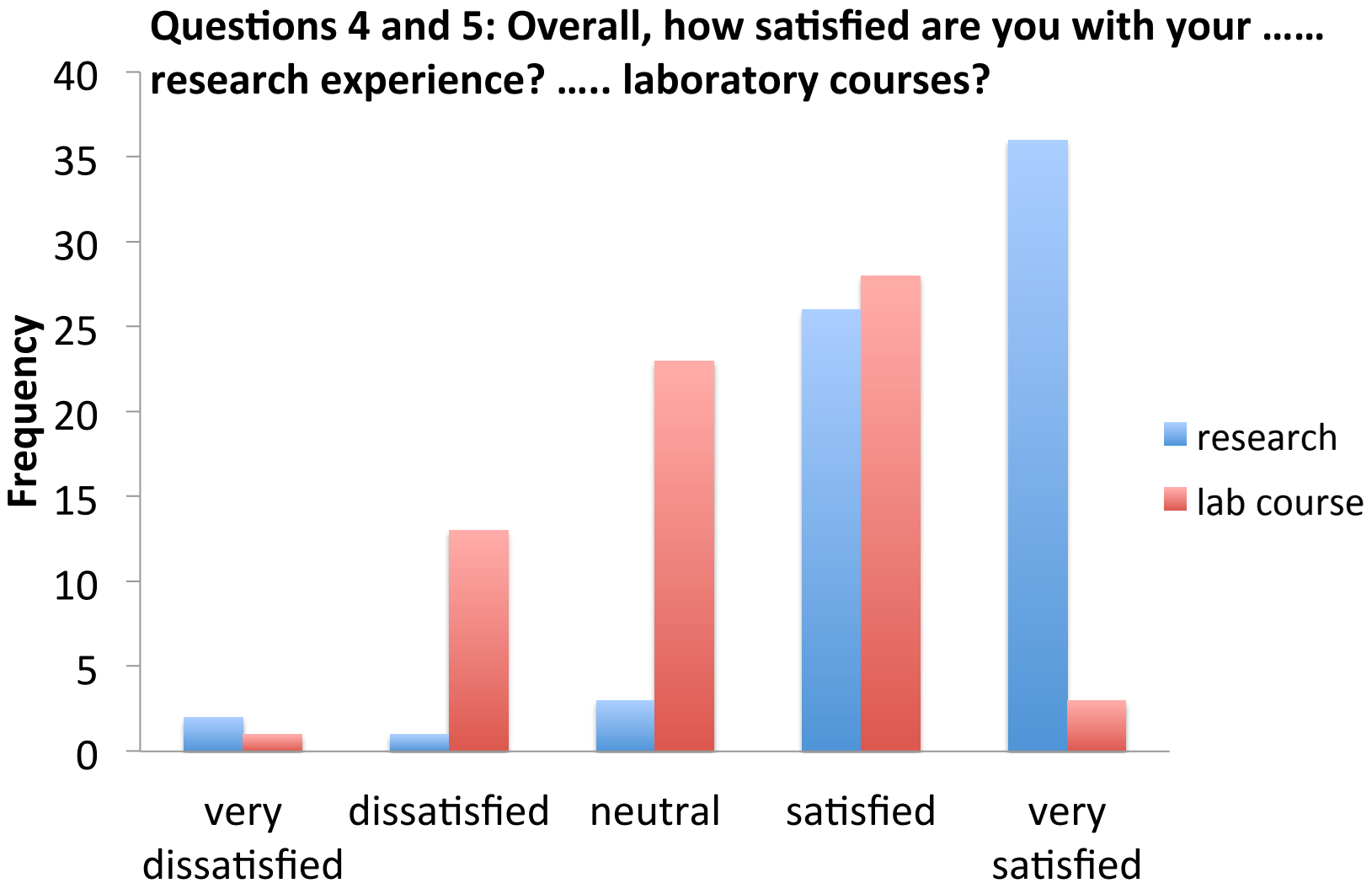
RQ2: Summary – Research experiences

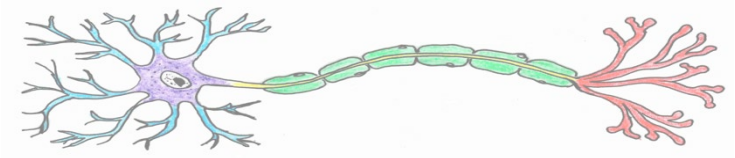
Students gain:

1. Real world context for science content
2. Positive effect on course work
3. Clarification of career plans

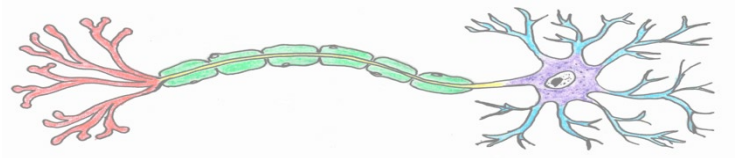


Bridging the gap: Satisfied with research, not lab courses



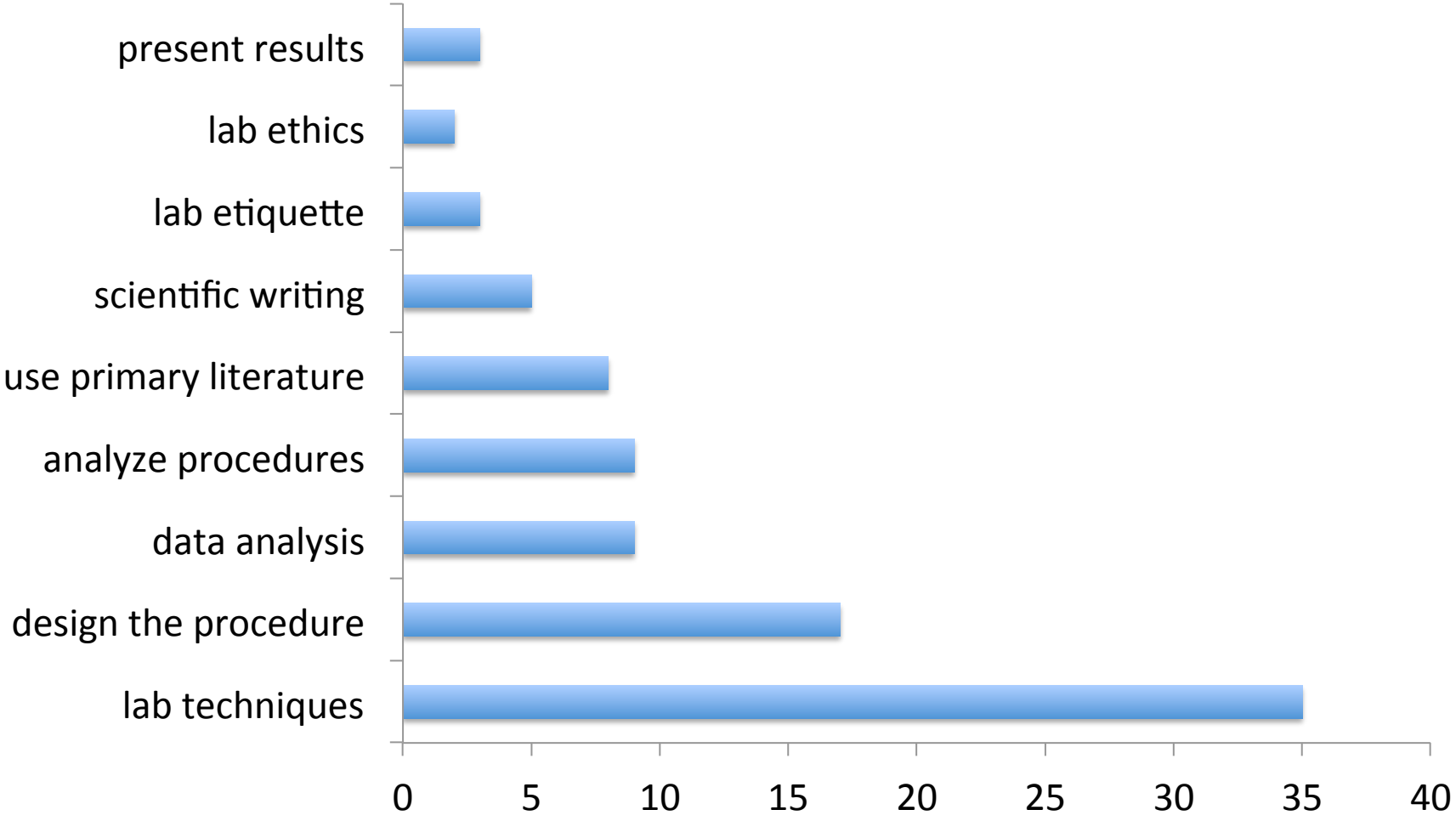


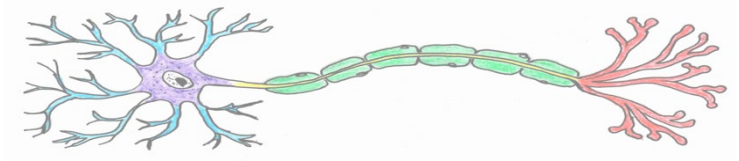
Gap



Bridging the gap: How to improve lab courses

Question 2. What types of activities would you include in a laboratory course that would help introduce undergraduate to scientific research? (open ended Q, n=70)





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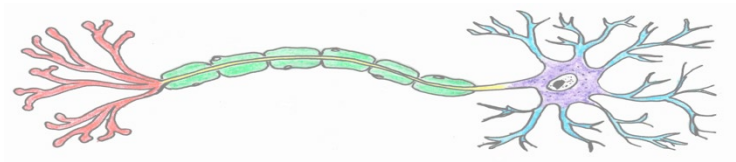
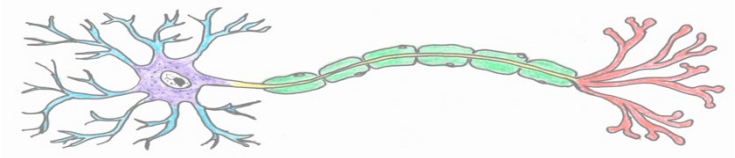


Bridging the gap: Focus on lab techniques

"I would design the course so that it **is laboratory work only, without lectures or discussion sections, so that it is focused entirely on what goes on in a laboratory and how to conduct research**." (UROP survey - Biology major)

"Techniques. Every single lab that does research on campus only has a couple of things that they do. …it's a very certain niche what you actually deal with**. So if there was just a survey class that gives you all the things you can possibly use as tools**……" (Neuro major – focus groups)



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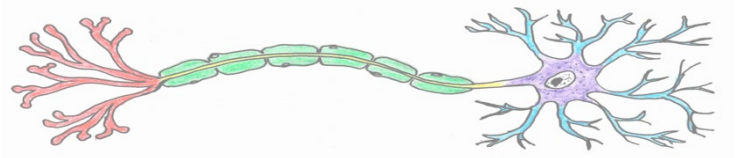
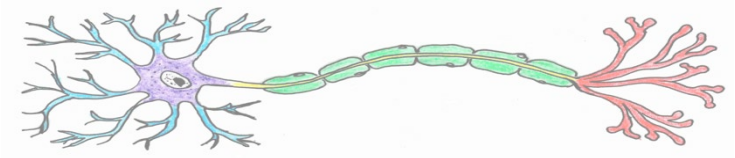


Bridging the gap: More student involvement

"I would try to set up the lab to **encourage actually having to think about what you're doing instead of just following the procedure**." (BMB major)

"Having to plan in advance and figure out the logistics of your experiment is just as valuable of a skill as being able to run experiments and collect data. Traditional undergraduate labs (in my experience) do not force the students to think about the experimental design. Students do not normally have to consider questions such as, "Is this the most effective way of taking this measurement?" or, "Could I choose a simpler way of constructing this apparatus?" (physics major)



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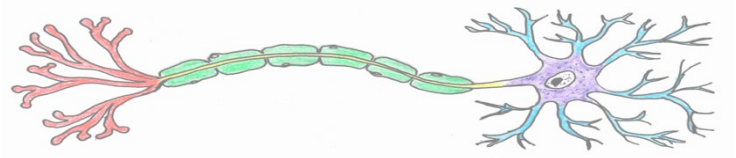


The Gap – Issues

- Focus on low level skills/techniques?
- "Scaling up" intensive research experiences to large courses
- Time required for research
- Number of faculty labs

- *How do you "bridge the gap?"*

Future plans

Integrated Science Experience (I.S.E.)

Goals

1. Improve retention
2. Establish community of undergraduate scientists
3. Prepare future STEM faculty in research-based teaching & learning
4. Increase participation of research-active faculty in intro science program & research based education

Freshman Seminar (~800-1000 students)

Nature of Science

Model development; Data management, interpretation, & analysis; Roots of scientific motivation
Social/moral authority of science/scientists; Relationship to law, government, ethics, religion
Funding; Dissemination & communication; Science careers

Integrated Freshman Life Science Lab (~400 students)

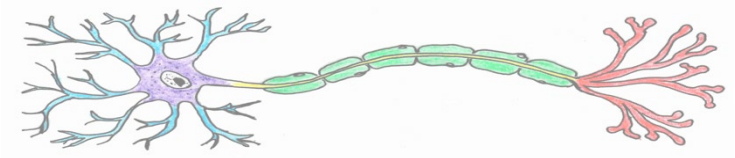
Combined introductory chemistry/biology/neuroscience lab

Biotechnology; Macromolecule/Alzheimer's Disease; Nerve Cells; Kinetics & enzyme inhibitors

Integrated Sophomore Life Science Lab (~500 students)

Combined organic chemistry/cell biology/neuroscience lab

Natural Products Chemistry; Medicinal Chemistry; Biopolymers; Nanoparticles



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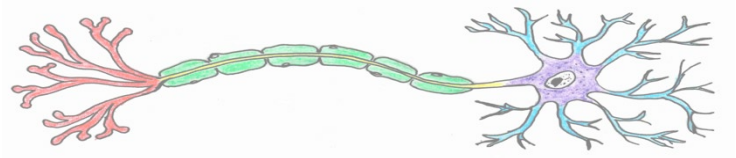
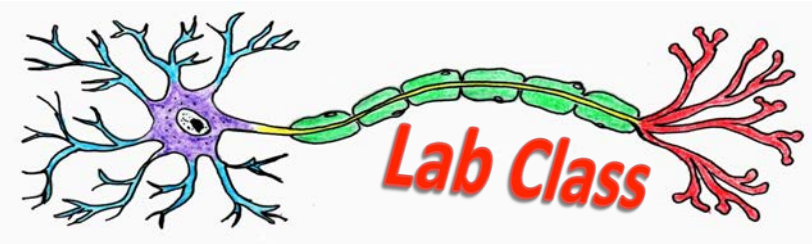


Summary and Conclusion

Many benefits to early research and research-based coursework



Gap

Overemphasis on low level skills over high level thinking?

Measurement is a challenge

Gap still exists

Join us in Boston for the

Northeast Regional Learning Assistant Workshop

February 7th and 8th, 2014 at Boston University

For more information, please visit www.bu.edu/laprogram/workshop
or contact Kathryn Spilios (kspilios@bu.edu) or Manher Jariwala (manher@bu.edu)

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Participate in sessions and discussions focusing on:

- Starting an LA program
- Preparing and Supporting LAs
- LA Panel Discussion/Observing LAs
- Using LAs to Flip Your Classroom