PERCEIVED LEARNING GAINS OF NATURAL RESOURCE STUDENTS IN AN UNDERGRADUATE RESEARCH PROGRAM

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Introduction

- Undergraduate Research Experiences (UREs) have been noted as high impact pedagogical practices
- Many studies have described advantages for students
  - Enhances learning through mentoring
  - Increases retention
  - Increases enrollment in graduate education
  - Develops critical thinking, problem solving, & creativity (Council on Undergraduate Research, 2017)

Introduction

- However, some have suggested more empirical evidence is needed regarding specific learning gains from UREs (Seymour et al., 2004)

- The purpose of this study was to examine the experiences of NRM students participating in a URE

Objectives

- Determine the perceived learning gains of NRM students participating in a URE

- Compare first year URE participants' learning gains to those from participants with more than one year of experience

- Determine URE participants' level of satisfaction with the experience

- Determine URE participants' intent to pursue graduate education

Methods

- Population – all undergraduate students participating in the Borderlands Research Institute URE (2015-2016)
  - N = 16
- Survey of Undergraduate Research (Lopatto, 2004)
  - 21 items regarding research-related learning gains
  - 5 point Likert-type scale (1 = *no gain*; 5 = *very large gain*)
  - 3 open-ended questions regarding program quality and experience

Methods

- Survey was administered after the summer research symposium (August 2015, August 2016)
- Descriptive statistics were used for analysis
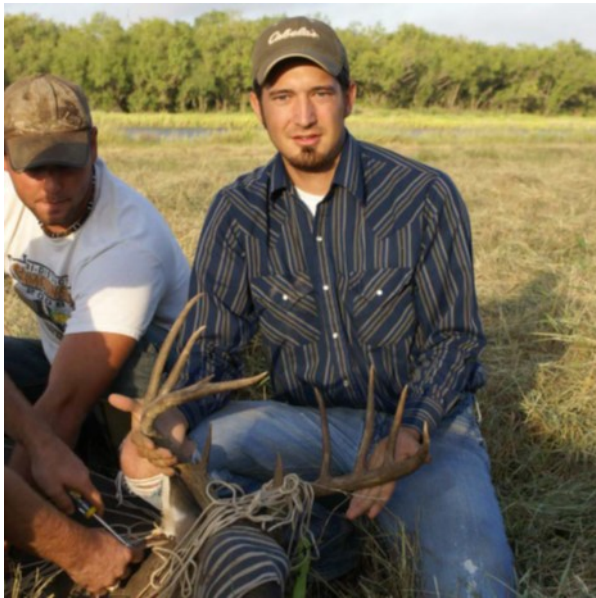
Demographics

- Mean age = 23.35 (s = 6.02)
  - Range = 20 – 45
- Gender = 7 male; 9 female
- Classification:
  - Freshman = 1
  - Sophomore = 3
  - Junior = 5
  - Senior = 7

Results – Learning Gains

Item	NG	SG	N	LG	VLG	% L/VLG
Understanding of the research process	0	0	0	2	14	100
Readiness for more demanding research	0	0	0	3	13	100
Understanding how scientists work on real problems	0	0	0	5	11	100
Learning to work independently	0	0	0	6	10	100
Becoming a part of a learning community	0	0	0	7	9	100
Ability to integrate theory and practice	0	0	0	6	10	100
Understanding research literature	0	0	0	5	11	100
Understanding how scientists/scholars think	0	0	0	7	9	100
Ability to analyze data	1	0	0	6	9	93.7
Assertions require supporting evidence	0	0	1	3	12	93.7

Results – Learning Gains

Item	NG	SG	N	LG	VLG	% L/VLG
Understanding science/scholarly inquiry	0	0	1	5	10	93.7
Self-confidence	0	0	1	4	11	93.7
Understanding how knowledge is constructed	0	0	1	5	9	93.3
Tolerance for setbacks	0	0	2	3	11	87.5
Learning to multi-task	0	1	1	7	7	87.5
Skill in interpretation of results	0	0	2	3	11	87.5
Clarification of a career path	0	0	2	6	8	87.5
Skill in oral presentation	0	0	2	6	8	87.5
Skill in academic writing	0	0	3	6	7	81.2
Learning ethical conduct of research	0	0	3	4	9	81.2
Learning how to manage time efficiently	0	0	4	5	7	75.0

% Large or Very Large Gains by Experience

Item	1st Year	> 1 Year
Understanding of the research process	100.00	100.00
Readiness for more demanding research	100.00	100.00
Understanding how scientists work on real problems	100.00	100.00
Learning to work independently	100.00	100.00
Becoming a part of the learning community	100.00	100.00
Ability to integrate theory and practice	100.00	100.00
Understanding research literature	100.00	100.00
Understanding how scientists/scholars think	100.00	100.00
Assertions require supporting evidence	90.00	100.00
Understanding science/scholarly inquiry	90.00	100.00
Tolerance for setbacks	80.00	100.00

% Large or Very Large Gains by Experience

Item	1st Year	> 1 Year
Ability to analyze data	100.00	83.33
Self-confidence	100.00	83.33
Skill in oral presentation	90.00	83.33
Clarification of a career path	100.00	66.67
Learning to multi-task	100.00	66.67
Skill in the interpretation of results	100.00	66.67
Understanding how knowledge is constructed	100.00	66.67
Learning how to manage my time more efficiently	90.00	50.00
Skill in academic writing	100.00	50.00
Learning ethical conduct of research	100.00	50.00

Satisfaction, Enjoyment, Value, and Further Education

Item					
How would you rate your overall BRI URE and Mentorship Program?	0	0	0	2	14
How would you rate your enjoyment of the research process?	0	0	1	7	8
How much value do you feel this URE added to your college education?	0	0	0	3	13
How likely are you to pursue a higher level of education?	0	0	1	7	8

Note: Item 1 (Very Dissatisfied – Very Satisfied); Item 2 (Dislike Greatly – Like Greatly); Item 3 (No Value – Extreme Value); Item 4 (Very Unlikely – Very Likely)

Open-ended Responses

- "I learned that I need to constantly question everything, and I learned that staying individually motivated is key."

- "…I was convinced that as a female my opportunities…in the field were limited. I now believe that I have the same probability as any other male to have a career and job in the field."

- "I have been able to apply what I have learned in the classroom to real-world scenarios…"

Open-ended Responses

- "…I know that I had very little contact with my advisor. Although this was mostly my fault for not going and talking to him, I still think it would be good to make the mentees get to know their advisors."

- "Greater communication between advisors and mentors regarding their expectations of the undergraduate researchers would be beneficial."

- "For some of them [graduate mentors], they don't even know how to be a 'boss' or 'leader.' So, they should know and understand that been [sic] a 'mentor' is an extra responsibility. They should be willing to spend time with their technicians in order to help them succeed…"

Conclusions/Recommendations

- Majority of participants reported large/very large gains for all items
  - Smallest gains were realized in research-related skills vs. soft skills
    - time management, academic writing, presenting orally, interpreting results, multi-tasking, and ethical conduct of research
- How are these skills being taught?
  - Should instruction be more explicit in these areas?
  - Future research might investigate mentors and how they teach research-related skills and soft skills

Conclusions/Recommendations

- First year participants reported less gains in understanding science/scholarly inquiry, tolerance for setbacks, and understanding assertions require evidence

- More experienced participants reported smaller gains on over half of the items
  - Is this because they perceived they already knew these skills?
  - What should the teaching focus be for more experienced undergraduate researchers?
    - Proficiency vs. Skill Acquisition

Conclusions/Recommendations

- Majority of participants reported high levels of satisfaction, enjoyment, value, and a desire to pursue higher levels of education
  - Responses showed mentors might need more preparation
  - Open-ended responses were helpful, however, qualitative inquiries might further parse out the variables

What questions do you have?