

KU BEARS Final Report – Summer 2019

There were 24 faculty and 28 students involved in the fourth year of KU BEARS. All the faculty stated that they would involve students again in research and all of the students stated that they would participate in research again if provided the opportunity.

Below are questions and summaries from the final reports submitted.

Questions that the Student Answered

How has this experience contributed to your undergraduate education and your life goals?

Main points students discussed in the reports:

- Developed research skills
- Developed team-working skills
- Greater appreciation of research
- Gained experienced that could not be obtained in the classroom
- Greater understanding of high-level equipment
- Made connections between lecture and its application
- Better prepared for graduate studies
- Confidence and motivation to conduct research
- Connecting and communicating with other researchers
- Decided to continue research after graduation

Quotes from students:

“This experience has contributed to my undergraduate education by allowing me to work with a brilliant professor all summer and have him guide me on how I should be conducting my research and what steps I need to take to create a publishable article.”

“Increased my understanding of hands-on lab work and critical thinking in a lab setting. I hope to start applying to graduate school within the next few semesters and I feel more confident in my decision to do so now that I have done research for the summer.”

“This research has contributed to my undergraduate education in the sense that it allowed for a great opportunity to work one-on-one with a professor and conduct higher level research all while still being an undergraduate.”

“Not often are undergraduates able to conduct months long research alongside a faculty member, however the KU BEARS grant makes this possible. This experience will prove to be a big boost in reaching my ultimate academic goal of attending graduate school.”

“This has been an irreplaceable experience. This experience has provided me with a healthy appreciation of the work and dedication it takes to carefully and precisely analyze material culture in order to develop an understanding of the past.”

“My undergraduate education has been immensely impacted by this research experience. I feel as though I got ahead on research and lab techniques that are not demonstrated during class.”

“This experience contributed to my life goals overall by confirming that I do indeed enjoy the process of research and would look at it as a career goal in the future.”

“Now that I understand more about the research process, and have in fact contributed significantly to a long-term research project, I feel more confident pursuing one of my goals of being a researcher in some capacity for the rest of my life.”

“I have found research to be incredibly sustaining, challenging, and rewarding. I could not have known this without an opportunity like KU BEARS and the help of my professor.”

What experiences will you take from this summer's research that will impact your future in education, research, or professional career?

Main points students discussed in the reports:

- Be prepared
- How to be a better writer
- Presenting at a national conference
- Note taking skills
- Patience
- Flexibility
- Professional connections
- Critical thinking
- Problem solving
- Knowledge and experience to continue to conduct research
- Collecting, analyzing and interpreting data
- Laboratory techniques

- Laboratory management
- Research techniques and methods
- Modifying/Changing methods when needed
- Survey development and implementation
- Teamwork
- When to ask for help

Quotes from students:

“The lab techniques and use of new equipment allowed me the chance to better understand the field of study I am in and what I should expect after graduating.”

“I am sure that I would not be looking at graduate programs as seriously as I am now if I had not received a KU BEARS grant and been given an opportunity to perform a research study as an undergrad.”

“I think this research has not only excited me for graduate school, but also supplied me with a lot of knowledge that can become useful, as well as, look appealing on a resume.”

“This experience – whether it was the times I succeeded or the times I failed – will be the kind of knowledge that can guide me through my future work.”

“Before the summer I was rather unconfident in my abilities to even do the research, let alone get results and present it somewhere. After the summer I feel as if I have conquered both the self-doubt that was holding me back and the fear of presenting to an audience.”

“I have gained lots of precious experiences ranging from a strong academic foundation to valuable soft skills.”

“I believe that the KUBEARS experiences will eventually open new opportunities to participate in other research projects in the future, and will have an important impact on my higher education and career path.”

“This research experience has allowed me to improve my lab skills and techniques that will help me in conducting further research in the upcoming semester and, I hope, during graduate school.”

“As a result of the summer research I have confirmed that I would like to continue with research well into the future and that in turn will affect where I decide to go with my career upon graduation.”

“Through this research I experienced both professional and personal growth that will have lasting impact in my future.”

“In future academic and professional practice, I will always be able to think back to this research experience and admire our persistence and patience, and remember to stay focused on the goal and keep working.”

Has the research experience met your expectations? Why or why not?

Quotes from students:

“The research has exceeded my expectations. Working with these things day after day has given me a new appreciation for science as a whole.”

“The research experience I had over this past summer has exceeded my expectations. I was not aware researching required patience and a tremendous amount of time to acquire enough knowledge to create a solid piece of writing.”

“The summer research experience exceeded my expectations and impacted me in more ways than I thought it would.”

“This research has definitely met my expectations. I can say, looking back on it, that I believe this experience has probably solidified my decision to pursue graduate school more than anything else I have done in my academic career.”

“This research has definitely met my expectations. I not only gained experience, but also developed as a researcher.”

“This research experience has surpassed my expectations. I have felt like a valued member of the research team and have been able to grow my confidence with conducting research.”

“The research has met and surpassed my expectations. Never would I have thought in the beginning of this all that I would be working on writing my first mathematics paper just a few short months later. The KU BEARS research was an outstanding opportunity for me, and I am forever thankful both to the university and my professor for selecting me to participate.”

“My summer research experience has exceeded my expectations. I expected to have a few decent results that may or may not be publishable. Instead, I have enough results to occupy two papers.”

“This experience has met all my expectations. I obtained a more complete understanding of my field of study and was able to get a lot of hands-on experience.”

“Yes, in fact the importance of the work tasks and responsibilities given to me as an assistant researcher exceeded my expectations. I felt my role was valued and that my supervisors/colleagues trusted me (many times even more than I trusted myself) and this created a sense of empowerment that will linger beyond the research trip.”

“Yes, this experience has absolutely met my expectations. I know that this research has changed me, especially as a future educator and scholar.”

Would you participate in research again if given the opportunity? Why or Why not? What skills do you think you developed or strengthened through the research experience?

All students indicated that they would participate again if given the opportunity.

Skills developed or strengthened:

- Critical thinking
- Problem solving
- Time management
- Patience
- Responsibility
- Organization
- Attention to detail
- Information literacy
- Coding data
- Data analysis and computational skills
- Computer programming
- Leadership
- Confidence
- Formulating a research question to answer
- Communication
- Proposal writing for a conference presentation
- Presentation skills

- Networking
- Professionalism
- Decision making
- Research techniques specific to the field
- Techniques and procedures for equipment
- Reading literature and extracting information needed

Quotes from students:

“I would absolutely participate in this research again. The people who I’ve worked with have made this experience worthwhile and have shown/taught me things I will never forget.”

“If I had the opportunity, I would definitely participate in research like this again.”

“I would absolutely do research again given the opportunity. The KU BEARS program paved the way to allow me to continue the research project into the fall semester through the independent research for credit offered through the university.”

“I would absolutely participate in this again if given the chance. I loved every moment of this experience and was ecstatic to be able to have this opportunity. It was one I would not trade anything in the world for, and if given the chance to do it again, I would without hesitation.”

“I would definitely participate in research again. Being able to work one-on-one with professors is such a valuable experience and is one every student should try to have.”

“Yes, I would absolutely participate in research again. I think these kinds of opportunities are what make the college experience special. I am very happy to have had this experience.”

“If given the opportunity, I would absolutely participate in research again. I enjoy the process of problem solving and working with my hands as well as continually learning new things.”

“I had the opportunity to write my first scientific abstract, which challenged and strengthened my scientific writing skills. These are both valuable skills that I plan to incorporate in my education and professional career.”

“The skills I have strengthened through this research experience certainly include my patience and attention to detail. I have honed my ability to think critically.”

“This project has also helped prepare me to properly write and talk about my research in front of other students and colleagues.”

“If given another opportunity, I would definitely get involved in research again. In fact, I will continue working on the KU BEARS summer research project in the fall. I realized how much I matured in both academic background and laboratory skills after engaging actively in a research project.”

“I definitely strengthened my lab techniques. Also, I developed strong independent working skills and was able to solve problems on my own. I definitely developed more awareness to details. I am very thankful to have had this experience, and I believe it will definitely help me in my future career.”

Questions that the Faculty Member Answered

What skills did the student learn, what skills did they obtain, and can the student demonstrate those skills?

- Students learned more about the research process; skills and techniques needed for research in their selected fields of study; how to use equipment; and programming.
- Increasing ability and confidence in using literature search engines and reading literature
- Obtaining data, analyzing data and formulating results and conclusions
- Statistical and computational skills
- Data organizing and archiving
- Record keeping
- Problem solving
- Scientific writing
- Experimental design and modification
- Scientific methods
- Critical thinking
- Troubleshooting
- Critical reading
- Organization
- Leadership

- Collaboration
- Decision making
- Project management
- Communication skills

Quotes from faculty:

“She has walked away with the ability to now conduct a full study on her own. We sat together for many hours working through our analyses and seeing how they aligned with our theory, previous research, and our goals and expectations.”

“...helped her obtain the skillset of preparing a literature review for a conference/journal article. She also learned how to create a systematic methods plan and to then actually conduct that plan consistently and rigorously.”

“They learned that research problems are much more involved than typical homework, and that it is necessary to not give up, continue working, and persevere even when things are difficult.”

“I believe this has increased her confidence in her scholarly abilities and spurred her to consider presenting her findings in a poster format at the upcoming annual meeting.”

“The student has developed excellent lab and field skills that be valuable to her professional goals.”

Would you involve an undergraduate student again in your research? Why or Why not?

All faculty indicated that they would involve students again in research.

Quotes from faculty:

“Students are always welcome to join me in research and I will be happy to continue to have them; but I have never enjoyed so much time in the lab with one student as I did with the KU BEARS grant student. We had whole days to work together this past summer and those times are just never available to faculty or students during the school year. The student became a very competent lab researcher who helped me further my own research. We made great progress. It was amazing. I hope to offer summer research opportunities to more students in the future.”

“I would absolutely involve an undergraduate again. While this is not the first time I have worked with a student for research purposes, it was my first experience with KU BEARS. Having the summer to just work with the student and really concentrate on the research project was invaluable.”

“I love working on research with undergraduates at KU. It provides them with such a different prospective of academia and potential careers that is difficult to achieve in the classroom. I also love how it brings positive attention to KU, especially in the ways that these students often go on to have great careers or to grad school.”

“Absolutely I would. Involving undergraduate students again in my research agenda has been at the foundation of my career at Kutztown. I have been honored by having past students reap the benefits of the KU BEARS grants.”

“I could not be more excited for my current research students as they have the ambition, the creativity, and the intelligence to carve out their own research idea and forge ahead in their academic careers. I believe that is something that the university should strongly promote in order to project an increasingly positive image of Kutztown to the community.”

“This is a great opportunity for me to mentor undergraduate students and share my enthusiasm and passion for science with them. I am always impressed with their creativity and critical thinking. I would gladly involve another student again in my research.”

“I will continue to involve undergraduate students in my research. It is important for students to discover the ability to contribute to science by generating original research that serves as the foundation for the materials that eventually become part of the textbooks used in their education inside the classroom.”

“Absolutely, I would involve an undergraduate in research again. I believe that undergraduate research in all fields and across all levels is transformational.”

“Yes, I would definitely involve undergraduate students again in my research. Working with students is mutually beneficial for everyone.”

“I would certainly involve undergraduate students in research again. It is important to give students a chance to conduct research, not only to promote active scientific exploration, but to help students further themselves professionally. Undergraduate

research is one of the most productive ways of educating students and fostering their interest in areas of science.”

“I am a strong believer in almost everything there is no substitute for experience. Undergraduate research is an invaluable way for students to gain experience in the application of scientific principles in a way that is nearly impossible to replicate in the classroom. I would definitely involve undergraduates in research in as many avenues as possible to share that experience. Students of almost all academic levels can benefit from the hands-on experience gained by participating, in various capacities, in undergraduate research.”

“Yes, I have always incorporated students as an integral part of my research program and rarely conduct research without the aid of students. For me including students serves three roles: 1) it trains the future cohort of researchers by gives them formal training in basic research design and methodology, 2) it connects students with the larger scientific community, and 3) it benefits the quality of my research. While it is certainly time consuming to train students for research, doing so ensures that I have carefully thought over all of the minutia involved in research design and often allows me to find important design flaws that I may have overlooked in earlier phases of research development.”