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Fostering career readiness among biology students taking a research course in diagnostic parasitology

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Background

Modern undergraduate biology education emphasizes the value of students engaging in research to enrich their learning. Undergraduate research (UR) is vital for both the education and professional development of STEM students. In particular, early experience conducting research is likely to influence a student's career path and the student's perceived fit for such a career (Yaffe et al., 2014). For many students, engaging in UR is transformative in clarifying their career trajectories. One study found that students who participate in UR realized both an excitement about science and an aptitude for research (Yaffe et al., 2014). Undergraduates report increased confidence in their abilities and attitudes characteristic of "becoming a scientist" as a result of UR (Hunter et al., 2006). A study by Lopatto (2007) found that students who participate in UR are likely to pursue scientific careers or post-graduate education in science.

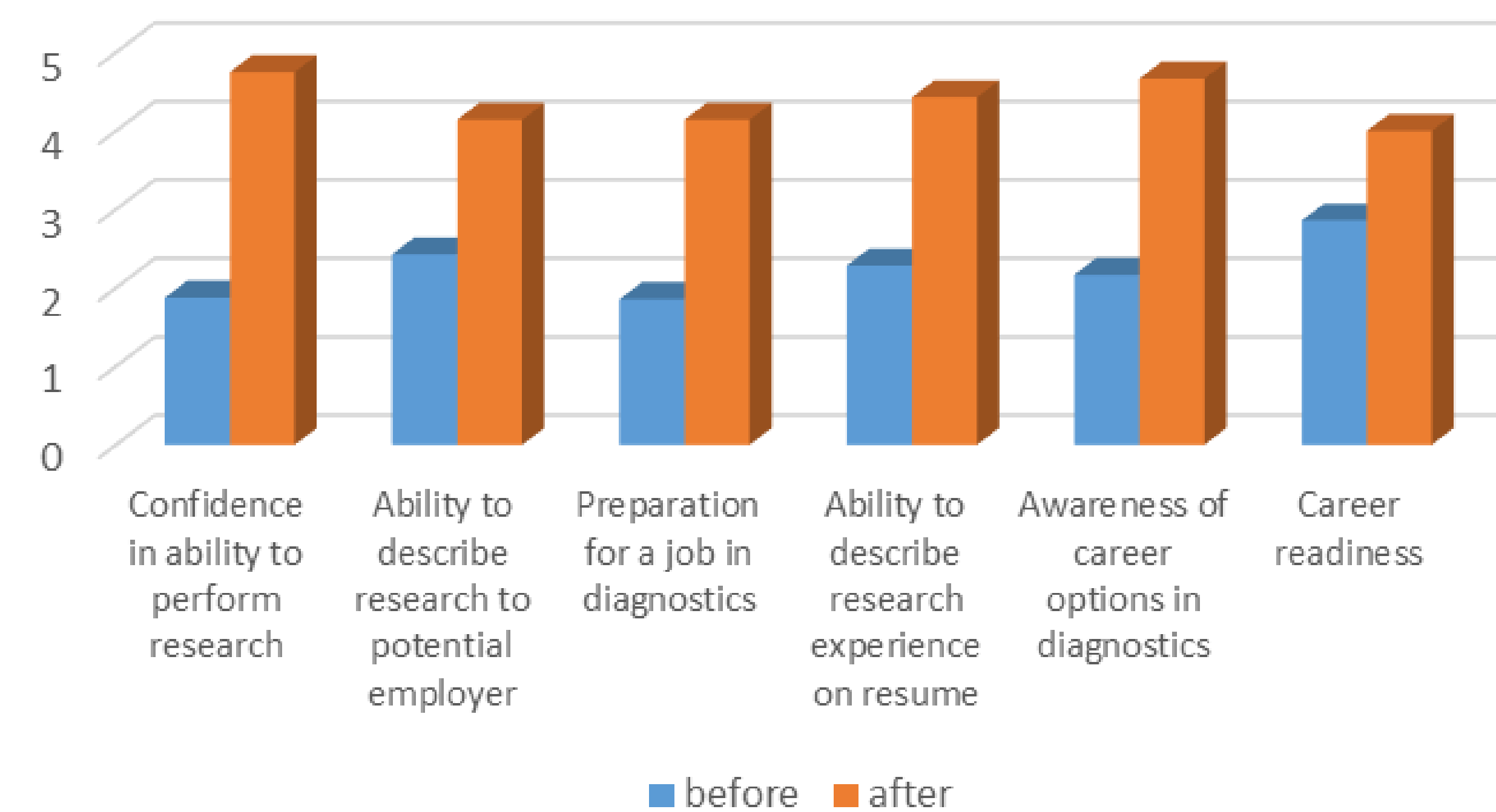
Course-based undergraduate research courses (CURE) engage students in original research within the framework of a course. Scientific careers require students to be proficient in hands-on research skills. CUREs provide opportunities for students to explore research as a potential career path while gaining transferable skills. A parasitology CURE course was developed at a private liberal arts university to improve research skills in biology majors. The course focused on diagnostic tests to identify parasitic infections. This work describes impacts on career readiness among biology students taking the parasitology CURE.

Objectives

1. Train biology students in research methodology
2. Familiarize undergraduates to the primary scientific literature
3. Engage undergraduates in scientific communication
4. Develop student confidence in their ability to conduct research
5. Raise awareness of scientific career options and improve career preparation



Figure 1: Perceived impact on career preparation among students before and after taking the diagnostic parasitology CURE.



Process

Participants

Thirty junior or senior biology majors from Johnson C. Smith University (JCSU), a private liberal arts HBCU in Charlotte, NC, were enrolled in the course entitled, Special Topics in Parasitology Research from 2018 - 2022.

Research Course

This was a CURE created in Spring 2018 with the original goal of improving basic research skills among biology majors. Early iterations of the course emphasized benchtop research skills and critical evaluation of the primary scientific literature. The course was offered online in 2020 and 2021 as a result of the COVID pandemic. While no longer able to conduct original, lab-based experiments, the course was revised to develop other essential scientific research skills such as data analysis, experimental design, and scientific communication.

The course met once weekly for 3 hours and included 3 parts: (1) lecture to introduce a particular diagnostic test including how it works, the procedure and its applications; (2) transition to the parasitology research laboratory for students to perform the diagnostic test; and (3) individual or collaborative analysis of a corresponding article from the primary literature. At the end of the semester, students were advised how to update their resumes to highlight their new research experiences.

Evaluation

Students completed weekly assignments to reinforce the rationale of the research test, review the procedure and analyze data. Students were also assigned a relevant article to read and analyze each week to complement the diagnostic test and parasitic disease being discussed. Students maintained weekly learning journals to reflect on the skills they were learning. For the capstone project, students created a research poster describing one of the major parasitology diagnostic tests and presented it in a poster session during the last class session.

Assessment

Student learning was assessed by a retrospective pre-post assessment of students' knowledge of research. This assessment used a Likert scale from 1-5. For each criterion, students were asked about their knowledge prior to and after taking the CURE. Students also responded to anonymous, open-ended questions regarding their experience in the course. Both of these assessment tools were used to evaluate student perceptions of their career preparation.

Results

Results from the retrospective pre-post assessment of students' knowledge of research are summarized in Figure 1. Overall, the students indicated that they gained valuable research experience by taking the course. Responses showed gains in students' perceived confidence in their ability to conduct research. Students also indicated that after taking the CURE, they were better able to describe their research both on their resumes and to potential employers. Student responses also suggested that they became more aware of career options in diagnostics and prepared for such jobs. After taking the course, students noted increased confidence in their general career readiness.

Conclusion

Engaging in research is clearly a beneficial way to prepare undergraduates for their careers. The findings from this study are in agreement with previous research that indicates students who take part in UR benefit by increasing confidence, clarifying and preparing for careers or graduate school (Seymour et al., 2004). The course described here could be used as a model of research-based curriculum at JCSU and other universities to enhance career readiness among undergraduates. Results from this study may serve as a foundation for informed discussions and educational research projects that will lead to a better understanding of CUREs and their outcome on career paths of UR students.

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