

Abstract

Need: The Jackson State University Course-Based Undergraduate Research Experience (JSU-CURE) is a program designed to enhance the undergraduate STEM education offerings in the JSU Department of Biology, and in turn, better equip and prepare our underrepresented students for entrance into STEM-related professional careers. **Guiding Questions:** The purpose of this poster is to share ways by which the JSU-CURE mission was accomplished during the recent period when there were limited face-to-face interactions due to the COVID-19 restrictions. Our aim was to teach basic research skills in a safe, interesting, and course-based manner via remote virtual methods. **Outcomes:** The research activities employed included: 1) Locating, reading, and citing reliable resources, 2) Making observations, and producing a written scientific report complete with Purpose, Objectives, Materials and Methods, Results, Discussion, and Reference sections, and 3) Designing, performing, and writing a scientific report describing the experiment. Examples of the experiments conducted included: 1) Seed germination under various environmental conditions, 2) Plant Propagation under various environmental conditions, and 3) Discussions of common objects such as flowers, fruits, or leaves, which required observations, research, annotated photos, and scientific reports. One of the activities that students found especially enjoyable was Plant Propagation. **Broader Impacts:** The ultimate goal of the JSU-CURE Program is to transform traditionally taught lectures and labs into courses that actively engage students in authentic scientific inquiry through inquiry-based instruction. The project will also enhance undergraduate academic performances by: developing their research skill-sets, stimulating their interests in discovering and understanding the intricacies within the biological sciences, and preparing them for entry into graduate studies and/or STEM workforce.

Materials and Methods

Since students would be performing the various activities in a home environment, it was important that each experiment be designed to utilize materials that were found in the home or easily acquired by most students. The activities were also designed so that students could work within the framework of COVID-19 restrictions. The leaf collection, flower collection, and fruit collection required students to take photos (i.e., with their phone), download the images and refer to materials provided by the instructor and other reliable sources to accurately describe their images using proper scientific language and botanical terms.

The Plant Propagation exercise required a plant, a container (e.g., cup, jar, bowl, etc.), and tap water. Students were directed to research their plant species and determine the proper plant propagation technique or methodology to use. Students were required to take photos and keep a lab journal of the propagation process and plant progress.

Results and Discussion

The home-environment exercises were in alignment with the course objectives and learning outcomes of General Botany Laboratory (BIOL 119), General Biology Laboratory (BIOL 111) and Introduction to Biology Laboratory (BIOL 101) courses. Exercises were also designed to enhance on-line instructor-learner interactions, and student-to-student collaborations. The activities helped to ensure learners' success in the achievement of the stated objectives and/or competencies, and provided an opportunity for students to: 1) discover, 2) process, and 3) apply concepts and information. Finally, students were required to write a short scientific report (i.e., lab report) describing the experiment or activity conducted. The lab reports were used to aid in the assessment of learners' progress and mastery of stated learning objectives.

Learning Objectives, Competencies, and Assessments

Leaf Collection: Explain the morphological differences between a monocot and dicot leaf and variations among leaves (e.g., venation, leaf arrangement, etc.).

Flower Collection: Distinguish among the different types of flowers. Explain the function of external features of a flower and ways by which pollinators are attracted to flowers.

Fruit Collection: Distinguish among the three basic types of fruits (simple, multiple, and aggregate). Discuss external and internal features of a fruit.

Plant Propagation: Explain why plant propagation is an important technique for commercial growers and crop science. Perform an asexual propagation experiment and describe the method used. Describe other useful propagation methods and techniques.

Conclusion

Our aim was to teach basic research skills in a safe, interesting, and course-based manner via remote virtual methods. The research activities included: 1) locating, reading, and citing reliable sources, 2) designing, performing, and carrying out a short scientific experiment or activity, and 3) making observations, and producing a written scientific report describing the activity - complete with Purpose, Objectives, Materials and Methods, Results, Discussion, and Reference section. Based on student feed-back and their obvious enthusiasm after completing each activity, we conclude that we have been successful in providing Course-based Undergraduate Research Experiences (CUREs) during the midst of a pandemic.

Future Directions

Now that COVID-19 restrictions are beginning to subside, JSU-CURE activities will be provided under more traditional ways. Students will return to Biology labs to work alongside JSU research faculty as they learn scientific discovery by conducting hands-on research.

CURE scholars will also begin to produce YouTube Videos aimed at teaching science concepts to a younger population. Seeing aspiring scientists will inspire younger students towards STEM fields. Additionally, undergraduate students will be able to use their newly equipped undergraduate research laboratory to carry out their own research on the model plant *Arabidopsis thaliana*.

JSU-CURE will enhance undergraduate academic performances by developing their research skill-sets, stimulating their interests in discovering and understanding the intricacies within the biological sciences, and preparing them for entry into graduate studies and/or STEM workforce. Hence, the JSU-CURE Program will create a supportive and stimulating learning community.



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