

**FROM RESEARCH ACTIVITY TO RESEARCH PARTICIPATION:  
UNIVERSITY OF BELIZE 2<sup>ND</sup> YEAR PHARMACY STUDENTS  
RESEARCH EXPERIENCE.**

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**ABSTRACT**

**Objective:** Students involved in scientific research experience have reported many benefits that improved their overall learning process and research skills. The University of Belize (UB) pharmacy program was recently upgraded from a professional 3-year associate degree to a 5-year bachelors degree. Research methodology course is part of the syllabus for the 5-year bachelors training. This pilot study introduced the 2<sup>nd</sup> year pharmacy students to a course-based grade-bearing research with a view to assessing the student's perception towards conducting future undergraduate research and to explore the benefits of grade-bearing course-based research in reinforcing learning. **Method:**

Mixed research design was utilized for this study. After extensive briefing on research methodology, students were involved in questionnaire design, distribution and collection of data from other students on campus. Students described their research participation experiences using semi-structured questions as guidelines. Results of student's experiences were analyzed and presented. **Result:** All the students reported a high perception of the benefits of conducting or being involved in undergraduate research projects with a low perception of the challenges experienced in conducting the study. Majority of the students reported experiencing personal benefits in conducting research and overall, the reported negative challenges to conducting an actual undergraduate research was low as compared to the benefits experienced. **Conclusion:** The high perception and reported personal benefits of students who participated in credit-bearing undergraduate research can be explored by faculty to reinforce learning at the University of Belize. The inclusion of course-based research in the upgraded bachelors of pharmacy program can be of tremendous to the students as it helps to

reinforce concepts and motivate a life-long learning culture. Participating in experiential credit-bearing course-based research will inspire students to pursue research in pharmacy related practice and various fields of study.

**KEYWORDS:** pharmacy research, pharmacy education, experiential learning, students, Belize.

## INTRODUCTION

In many universities, undergraduate research is incorporated as part of student's learning experience. Though not a new initiative, the Boyer Commission's report (1988) in recent times has greatly influenced institutions of learning to actively incorporate undergraduate research as part of their learning process. Experiential undergraduate research develop students critical thinking and help consolidate students overall academic experience in their various fields of pursuit. Most undergraduate students are motivated to pursue academic goals and look forward to graduate research by reason of experiential undergraduate research (Brame, 2017; Lopatto, 2004; Russell, Hancock, & McCullough, 2007; Desai et al., 2008). Other literature indicated undergraduate student research increases successes in various fields of the student's chosen academic endeavor (Desai et al., 2008; Lopatto, 2003; Silva et al., 2004; Wood, 2003). Several studies have supported various educational initiatives that grants undergraduate students an opportunity for early research experience as part of experiential learning in various fields especially the sciences (Brame, 2017; Healey, 2013; Laursen *et al.*, 2010; Alberts 2009; Karukstis and Elgren, 2007; Lopatto, 2006; Seymour *et al.*, 2004). Students involved in scientific research experiences have reported benefits in general educational skills such as written or oral communications; so also research specific benefits and skills in various research designs, data analysis and presentations (Laursen *et al.*, 2010; Seymour *et al.*, 2004; Lopatto, 2006).

Most recently however, the focus has been on designing credit-bearing educational research experiences to students with a view to motivating students to actively engage in research learning activities. These credit-bearing research efforts have the advantage of increasing the participation and active involvement of students in research as well as encouraging faculty to conduct researches while mentoring undergraduate students (President's Council of Advisors on Science and Technology [PCAST], 2012; Shaffer *et al.*, 2010). The impact of undergraduate research involvement can also be profitable both for teaching faculty and the institutions. For instance, faculty are usually overwhelmed with teaching obligations to the

point that time for research is reduced. With undergraduate involvement in research however, faculty can free some time and can have more time for research when students are involved with experiential research activities. The overall goal with undergraduate research however, is that, students will increase content knowledge, research skills and science literacy.

Scientific credit-bearing research experiences can be introduced to students in many ways but majorly investigations of the literature and incorporation of course-based research experience are usually implored (Brame, 2017). At the University of Belize, there are very few studies on the effect of undergraduates in research participation. Presently, little or no data exists in the department of pharmacy where such study has been conducted in the past. With the upgrade of it's pharmacy program from a 3 year associate degree to a 5 years bachelors degree program, research has been incorporated as a component of the 5 year pharmacy training program. Participating in a research increases the students knowledge on concepts while deepening learning experience. This pilot study was therefore conducted to evaluate the perceptions and experiences of 2<sup>nd</sup> year pharmacy students towards experiential research. The study introduced the students to basic research protocols; provided first hand research data collection experience while assessing the students experience in actual research participation. The research intends to also provide a baseline data in the area of undergraduate research experience at the university of Belize. The result of the pilot study may encourage faculty to involve students in undergraduate research while designing large scale studies in the area of experiential research. Finally, the study seeks to apply experiential learning research results to design innovative instructions for the pharmacy program at university of Belize as it transits from an associate degree to a bachelors degree.

## **METHODOLOGY**

Mixed research design was employed for this pilot study. This design allowed for philosophical postulations as well as a method of inquiry (Cresswell et al., 2011). The research was conducted among 2<sup>nd</sup> year pharmacy students at the University of Belize, Central America. The study was divided into 3 phases.

In the first phase of the study, students were trained on the basics of research methodology. Emphasis was placed on different types of research, data collection methods and challenges involved in data collection. Opportunities were given for interaction between the students and researchers. Questions by the students and areas of difficulties were adequately addressed to help students become comfortable with research process.

In the second phase of the study, data was first collected from the 2<sup>nd</sup> year pharmacy students on their perception towards conducting an actual research. The students were then involved in designing the questionnaire and in carrying out a pilot study. Thereafter, students also collected actual data using a maximum of 20 questionnaires in a pharmacy related research topic. Non-probability, convenient sampling technique was adopted by the students for data collection. Data was collected from other students on the campuses of university of Belize. The pharmacy students kept a journal of their experiences during the entire process of data collection.

In the third phase of the study, the 2<sup>nd</sup> year pharmacy students described their research experiences using semi-structured questions. Using thematic analysis, data was identified, analyzed and recurrent themes relevant to the study reported. The focus of the study was to present the experiences of the 2<sup>nd</sup> year pharmacy students in actual research participation and not to present the research data collected from other students. All the sixteen (16) students enrolled in the pharmacology class participated in the study conducted between March to May 2017. Although the research was a grade-bearing research and students were encouraged to participate, participation was still voluntary and students had the option to withdraw from participation at any point. An alternative grade-bearing activity was available for students who did not wish to participate.

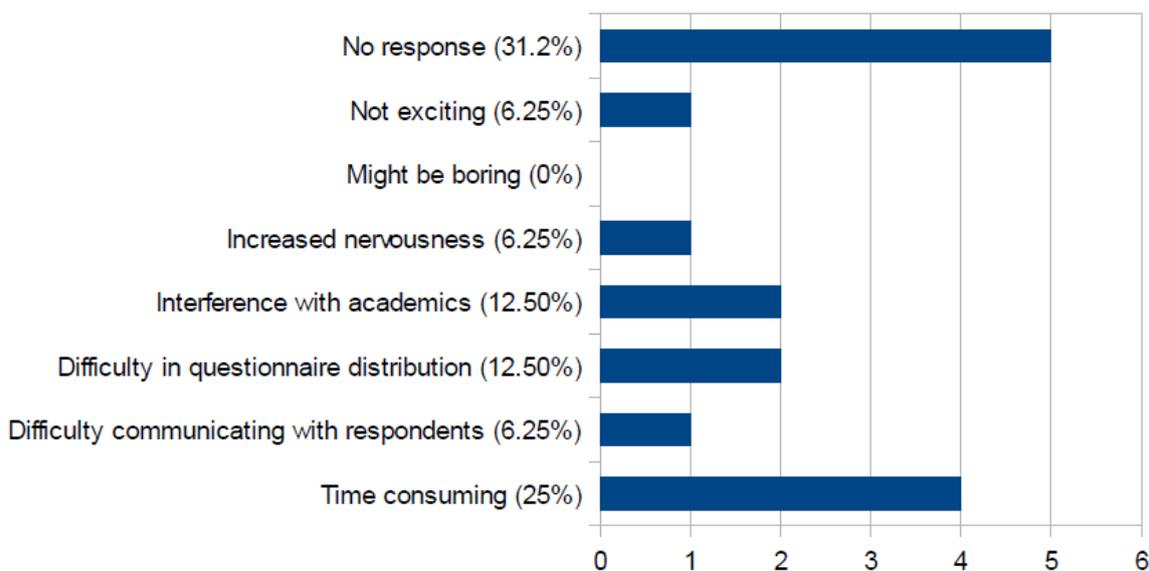
## RESULTS

81.5% of the students were between the age range of 18 – 24 while 18.8% fall between ages 25 – 34. All the students reported carrying out research activities such as, literature searches for class work, assignments or quizzes. None of the students conducted an actual research or participated in one before.



**Figure 1: General perception of students on benefits of conducting undergraduate research.**

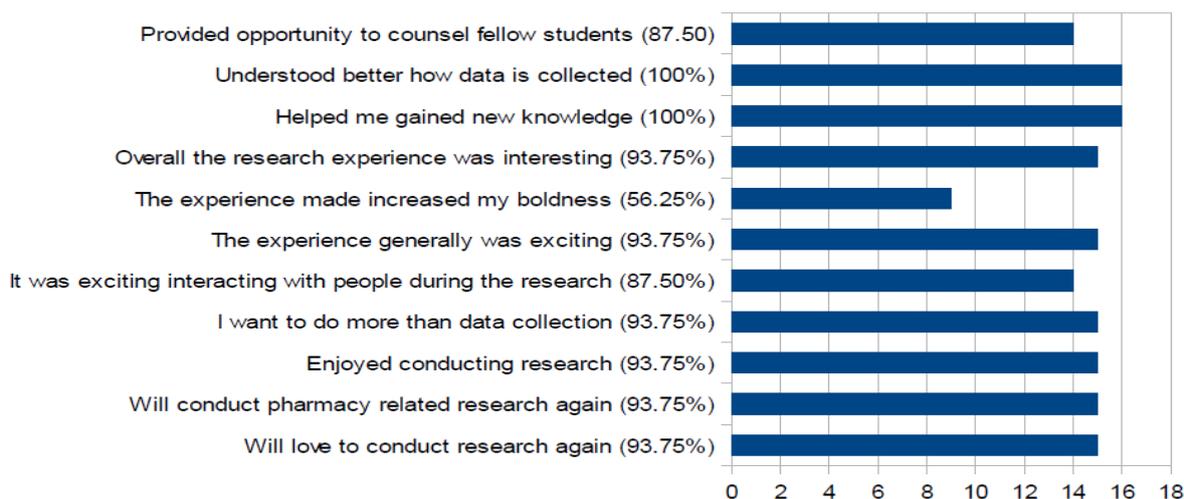
Figure 1 showed the general perception of university of Belize 2<sup>nd</sup> year pharmacy students towards conducting an actual research. The entire students reported a high perception of benefits for conducting or being involved in undergraduate research. This result was obtained before students could undertake the actual research.



**Figure 2. General perception of challenges in conducting undergrad research.**

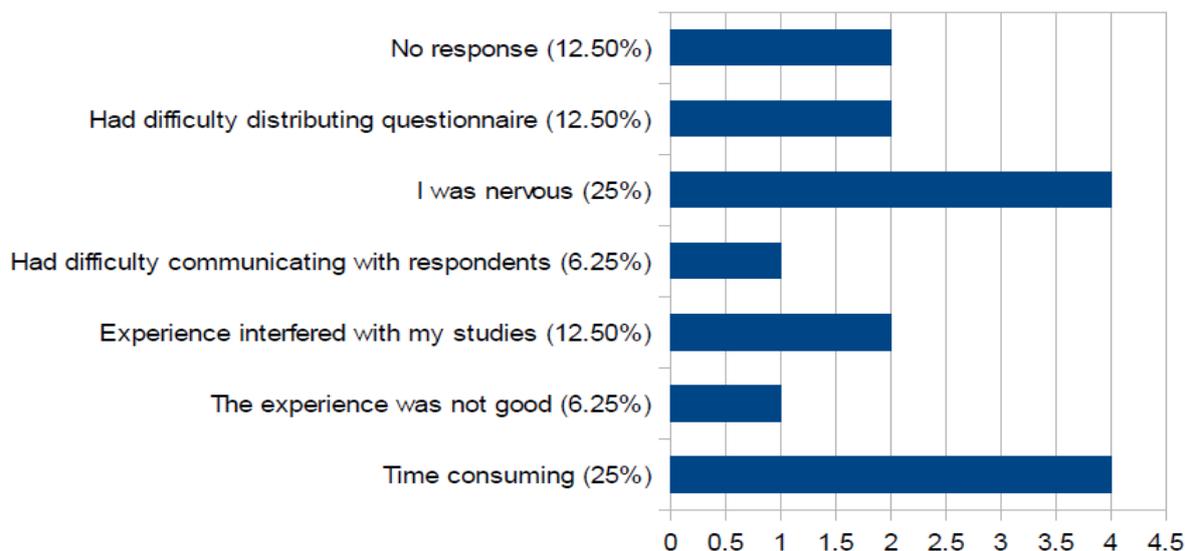
The general perception of challenges in conducting undergraduate research was presented in figure 2. 25% of the students indicated that conducting undergraduate studies might be time consuming. All other students reported a low perception to the challenges that could could be

experienced in conducting undergraduate research. 31.2% of the students did not respond to any of the questions.



**Figure 3. Positive feedback from students after research participation.**

Table 3 showed the positive responses reported by students after conducting the actual research. Majority of the students reported experiencing higher personal benefits in conducting research.



**Figure 4: Negative feedback from students after research participation.**

“Nervousness” (25%) and “time consuming” (25%) were the highest reported negative feedback from the students after participating in the research. Overall, the reported negative challenges for conducting an actual undergraduate research was low as compared to the reported benefits.

## DISCUSSION

A course in research methodology is part of the 5-year recently upgraded bachelor of pharmacy program at university of Belize. The course was designed with the intention to help students develop individual and collaborative projects that will improve pharmacy practice through research while providing new knowledge about safe, efficient and economical use of drugs in Belize, the wider Central American and Caribbean regions.

In the present pilot study, the students were introduced to credit-bearing course-based research with a view to assessing their perception towards conducting undergraduate research. Majority of the students reported experiencing higher personal benefits in conducting an actual research. Several positive benefits for undergraduate research experiences have been reported. Such reported benefits include among others, finding research exciting; helping students to think more like scientist and graduate career progression in science and related fields (Kardash, 2000; Laursen et al., 2010; Lopatto & Tobias, 2010; Auchincloss et. al., 2014). The results of the current pilot study was in agreement with previously reported studies. In this study, 2<sup>nd</sup> year pharmacy students reported positive benefits to undergraduate research experiences (Fig.3).

The current 5-year bachelor of pharmacy program at university of Belize is designed to provide both theoretical research instructions and additional opportunities for students to participate in research experiences as a credit-bearing research that will foster understanding and discovery of new knowledge. The Course-based Undergraduate Research Experiences Network (CUREnet), defines undergraduate research in a credit-bearing course as an experience that incorporates some indispensable elements such as engagements in various scientific practices. Such engagements and practices include: research design; data collection & analysis; new discovery; leading to generating and testing new hypotheses; scientific work that is relevant and beyond the strength of the course; faculty- students and students-students collaboration and finally, ensuring the reliability and validity of research data findings (Auchincloss et. al., 2014). Although the inclusion of credit-bearing course-based research may foster discovery of new knowledge, the research in addition, will also enhance the students learning process to contribute to a greater understanding of pharmacy practice when it becomes an integral part of the training.

In terms of implementation, The Course-based Undergraduate Research Experiences Network (CUREnet), provided some essential guidelines for both instructors and students

intending to be involved in credit-bearing course-based research. These essential elements included: designing research to be completed within time allotted for class with minimum interruption to students overall performance; the research to focus on a clear defined problem with well-defined goals; students using same research techniques while working on different projects; projects having low or very minimal resource demands and students to collaborate with each other while faculty carefully guide students throughout the duration of the project ensuring students do not deviate from their set objectives and goals (Shaffer et al, 2010; Auchincloss et. al., 2014; Brame, 2017).

Considerations of a credit-bearing course-based research in any institution needs careful considerations to ensure students are not overwhelmed with work from one course at the detriment of other courses registered by the student. For the bachelors pharmacy program at university of Belize to implement a credit-bearing course based research, special considerations must be made since the pharmacy classes are offered from two different campuses. The few negative feedback received from the students in this study might be attributed to this factor. Any credit-bearing course-based research therefore, must be designed around a central theme or location, which allows students to participate while still having sufficient time to attend to other academic pursuit.

From the results of this study therefore, it is actually hoped that faculty will encourage their students to participate in credit-bearing course-based research in a manner that is balanced, enjoyable and exciting so as to reap the benefits of new knowledge discovery while greatly understanding the course of study in an experiential way. In this way, both students, faculty, the university and the nation of Belize will on the long run benefit from achieving the overall goal of academic pursuit that is balanced in terms of theoretical, practical and research based experiences.

## CONCLUSION

Participating in experiential credit-bearing course-based research motivates students to pursue research in pharmacy and other fields of interest. The result of this pilot study provides content to the academic community and practicing pharmacist in respect to the design and integration of credit-bearing course- based research among undergraduate pharmacy students at the University of Belize. With the 5-year bachelor program in pharmacy, the students will benefit from an experience that will foster learning through different approaches. Finally, the result of this pilot study could be used as part of a

foundational data in designing innovative instruction as it applies to undergraduate credit-bearing course-based research for the pharmacy program at the University of Belize as it transits from an associate degree to a bachelors degree.

### **Limitations**

The limitation of this study was the sample size that was not adequate to generate sufficient analytical power for a wider generalization. The number of students admitted in the pharmacy program is usually low due to the facilities available for the training. However, since the objective was to introduce the students to basic credit-bearing course-based undergraduate research, evaluate their general perception while providing a baseline data for use in planning a much larger scale study, we believe this objective has been achieved more so that to the best of our knowledge a similar study has not been conducted among pharmacy students in Belize. This therefore, makes the study unique and hence it's strength.

### **Conflict of interest**

None declared.

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