

Integrating Research Experiences Into Public Health Curricula: Effects on Undergraduate Students' Knowledge of Neighborhood Inequalities, Perception of Research, and Motivation to Talk About Health Issues

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Pedagogy in Health Promotion: The Scholarship of Teaching and Learning 2020, Vol. 6(2) 113–118

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DOI: 10.1177/2373379919881469

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Abstract

Undergraduate research is defined as an inquiry or investigation conducted by an undergraduate student in collaboration with a faculty member that makes an intellectual or creative contribution to the discipline. This study assessed the impact of integrating undergraduate research experiences into public health curricula on students' knowledge of neighborhood inequalities, perception of research, and motivation to talk about health issues. The sample consisted of 132 undergraduate students from two groups (intervention and comparison). The intervention group ($n = 71$) conducted a structured social observation in various zip codes to characterize assets and liabilities of the local built environment. Self-reported questionnaires assessing the key study variables were administered to the students at baseline and at postintervention. Compared with those in the comparison group, improvements were noted in knowledge among those in the intervention group from pretest to posttest. Participants in the intervention group were also more motivated to talk about health issues compared with those in the comparison group. Perception of research among those in the intervention group also improved over time when participants were divided into two research confidence level groups (confident and nonconfident). The evaluation of this intervention demonstrates the positive impact integrating undergraduate research experiences can have on a sample of students.

Keywords

undergraduate research, public health curricula, structured social observation tool

Introduction

The Council on Undergraduate Research (CUR) is a membership organization that supports and promotes undergraduate student–faculty collaborative research and scholarship. The Council defines undergraduate research as an inquiry or investigation conducted by an undergraduate student in collaboration with a faculty member that makes an intellectual or creative contribution to the discipline (CUR, 2011). This definition reflects the research missions of many universities and incorporates many of the elements inherent in traditional research. For instance, traditional research involves collaboration between researchers and graduate students in the discovery of new information. Undergraduate research is similar to traditional research in that it involves a collaboration to discover new information, with the ultimate goal of

presenting these findings at conferences and publishing them in peer-reviewed journals (CUR, 2011).

There are numerous benefits associated with undergraduate research. For instance, undergraduate research experiences can provide opportunities for students to understand published work, to learn how to balance collaborative and individual work, to determine an area of interest, and to discover a potential interest in attending graduate school (Madan & Teitge, 2013). Faculty mentors

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also benefit from the undergraduate research process in that they can initiate or continue a productive research agenda while at a teaching university (CUR, 2011). Undergraduate research experiences can also assist in enhancing the research productivity of universities (Morales, Grineski, & Collins, 2017). Furthermore, the scientific community also recognizes the value of undergraduate research. For instance, in the United States, the National Science Foundation, the National Institutes of Health, and the Howard Hughes Undergraduate Research Fellows program have all identified funding specifically in support of undergraduate research (Hughes Undergraduate Research Fellows Program, 2008; National Institutes of Health, 2008; National Science Foundation, 2008).

A number of authors have conducted studies on the benefits of undergraduate research. Lapatto (2014) identified four spheres associated with students engaging in undergraduate research: skills acquisition, personal development, professional development, and professional advancement. Mabrouk and Peters (2000) found increased technical ability, the development of problem-solving skills, and acquired professional experience as some of the most valued outcomes of undergraduate research in a study of 320 undergraduate students from universities and colleges across the country. Additionally, Buckley, Korkmaz, and Kuh (2008) studied the relationship between undergraduate research and student-faculty interaction using the National Survey of Student Engagement dataset, which is an annual survey consisting of items pertaining undergraduate research participation and student-faculty interaction. These authors found differences in student perception of the research experience according to discipline. For instance, students majoring in humanities, business, and education reported gains in their ability to synthesize and organize information, while students majoring in Science and Social Science reported gains in their ability to understand the process of research. Additionally, students majoring in engineering reported gains in their ability to think critically and analyze data. Craney et al. (2011) examined perceptions of the research experience among 465 summer undergraduate researchers at Occidental College, which is a college in Southern California, and found the majority reported knowledge about the topic (92%), improving their resume (86%), learning how to do research (84%), and preparation for graduate school (78%) as top priorities associated with participating in undergraduate research.

The demand for undergraduate research is increasing across disciplines, and to accommodate this demand, faculty members are finding ways to offer research experiences to a broader population of students by integrating them into the course curriculum (Healey & Jenkins,

2009). These undergraduate research experiences can involve conducting research with all students enrolled in the class (Russell et al., 2015). The purpose of this study was to assess the impact of integrating undergraduate research experiences into public health curricula on students' knowledge of neighborhood inequalities, their perception of research, and their motivation to talk about health issues.

Method

Study Design

We used a quasi-experimental pretest-posttest design to assess intervention outcomes. This study consisted of four undergraduate public health classes divided into two groups (Fall 2015 and Spring 2016), with each group consisting of an intervention and a comparison class. The intervention classes participated in a research experience, which involved conducting structured social observations in various zip codes to characterize assets (e.g., bus stops/routes, sidewalks, food outlets) and liabilities (e.g., neighborhood foreclosure rates, density of condemned properties, high-speed surface traffic) of the local built environment. The comparison classes did not participate in the research experience and only received the pretest and posttest assessments. Baseline measurements of knowledge, perception of research, and motivation to talk about health issues were collected from students in the first group during the fall semester of 2015 at Week 1. Post measurements for this group were collected at Week 6. For group 2, baseline measurements were collected from students in the intervention class at Week 1 and in the comparison class at Week 3 during the spring semester of 2016. Post measurements were collected for both groups (intervention and comparison) at Week 12.

Sample

Four sections of an undergraduate public health class at a highly diverse, urban, 4-year public university were selected for this study ($n = 179$). The class was titled, "Principles of Health Education," and addressed the foundations, theories, systems, and principles of health education. In addition, the class included an analysis of social, medical, and environmental factors on health-related behaviors. Two of the four sections were designated as intervention groups while the other two sections were designated as comparison groups. A total of 132 students (response rate: 74%) agreed to participate in the study. Out of the 132 participants, 71 were in the intervention group and 61 were in the comparison group. All participants received an informed consent form at the

beginning of the study. University institutional review board approval was granted prior to the administration of the assessments.

Data Collection

The entire study was implemented from November 2015 to May 2016. The four classes were staggered over this period of time into two groups, with each group consisting of an intervention group and a comparison group. For the first group, pretests were administered to both classes (intervention and comparison) during the first week. The intervention group participated in the research experience during Weeks 2 through 5. During the sixth week, posttests were administered to both classes to assess the immediate effects of the intervention on the three study variables: (1) knowledge of neighborhood inequalities, (2) perception of research, and (3) and motivation to talk about health issues. For the second group, pretests were administered to the intervention class during Week 1 and to the comparison class during Week 3. The intervention group participated in the research experience during Weeks 2 through 11. During the 12th week, posttests were administered to both classes to assess the immediate effects of the intervention on the three study variables.

Measures

We developed a self-administered 28-item questionnaire, using items and scales from validated questionnaires as well as a newly developed item, to measure the three outcome variables: (1) knowledge of neighborhood inequalities, (2) perception of research, (3) and motivation to talk about health issues. A survey developed by the California Newsreel, and based in part on a quiz created by Stephen Bezurchka of the University of Washington Population Health Forum, assessed knowledge of neighborhood inequalities. This survey included 14 items with multiple-choice response items. Scores were expressed as a mean of correct responses. For perception of research, we used nine items from the Jackson Attitudes toward Research Survey (v0.50), which included a 5-point Likert-type scale (1 = *strongly disagree*; 5 = *strongly agree*). The questions included the following: (1) I believe I can conduct good research; (2) The skills I have developed by conducting research won't be very valuable in my future career; (3) I think collaboration is important for the research process; (4) I don't really want to conduct research (related to my present major or not) in the future; (5) I don't think anyone in my field will read about my research; (6) I am excited when concepts I previously did not understand seem to "click" in my research; (7) My research has helped enhance my

Table 1. Demographics of Students in the College of Health and Human Services, Fall 2015.

| | |
|-----------------------|---------------|
| Gender | |
| Female | 3,453 (71.4%) |
| Male | 1,385 (28.6%) |
| Ethnicity | |
| African American | 206 (4.3%) |
| American Indian | 13 (0.3%) |
| Asian | 927 (19.2%) |
| Hispanic | 2,274 (47.0%) |
| Pacific Islander | 6 (0.1%) |
| White | 957 (19.8%) |
| Other/unknown | 455 (9.4%) |
| International student | 35 (0.7%) |

reading and writing skills; (8) I enjoyed conducting my most recent research project; and (9) I feel comfortable searching for references related to my research. A mean score was calculated for this variable. Motivation to talk about health issues was assessed with the following multiple-choice question: "Do you feel motivated to talk with others to solve issues and challenges facing people in your neighborhood." The response items included: "yes," "no," and "not sure."

Statistical Tests

We performed statistical analyses using the Statistical Package for the Social Sciences (version 18.0) software. The one-between-one-within subjects analysis of variance (ANOVA) was used to determine if there were differences between the two groups (intervention and comparison) for the three study variables over time. Additionally, we used a two-between-one-within subjects ANOVA to determine if there were differences between intervention and comparison groups for the three study variables over time, and to determine if there were differences between students having high confidence in conducting research and students having low confidence.

Results

Demographic data were not collected on the study participants, however; Table 1 provides demographic information for the college at the university in which the public health classes reside. In Fall 2015, the total student population in the college was 4,838. The majority of the population were female (71.4%) and Hispanic (47.0%; Office of Institutional Effectiveness, 2018).

In Table 2, results from one-between-one-within subjects ANOVA are presented for each outcome of interest with the experimental group (intervention, comparison) as the between subjects factor and time as the within

Table 2. Mean and Standard Error Comparing Intervention Group ($n = 70$) versus Comparison Group ($n = 61$).

| Outcome | Group | Pretest | Posttest |
|--|--------------|------------|------------|
| Knowledge* | Comparison | 3.8 (0.2) | 3.9 (0.3) |
| | Intervention | 3.3 (0.2) | 4.6 (0.3) |
| Perception* | Comparison | 3.9 (0.1) | 3.5 (0.1) |
| | Intervention | 4.0 (0.1) | 3.8 (0.1) |
| Question: Do you feel more motivated to talk with others to solve issues and challenges facing people in your neighborhood?*** | Comparison | 2.7 (0.08) | 2.6 (0.07) |
| | Intervention | 2.6 (0.07) | 2.8 (0.07) |

* $p < .01$. ** $p < .05$.

Table 3. Mean and Standard Error by Outcome, Intervention, and Confidence Group.

| Outcome | Experimental Group | Confidence | Pretest | Posttest | |
|--------------|---|--------------|--------------|-----------|-----------|
| Knowledge | Comparison | Confident | 3.9 (0.3) | 3.4 (0.4) | |
| | | Nonconfident | 3.8 (0.3) | 4.4 (0.4) | |
| | Intervention | Confident | 3.6 (0.2) | 4.7 (0.3) | |
| | | Nonconfident | 2.4 (0.4) | 4.3 (0.5) | |
| Perception | Comparison | Confident | 4.2 (0.1) | 3.7 (0.1) | |
| | | Nonconfident | 3.8 (0.1) | 3.4 (0.1) | |
| | Intervention | Confident | 4.1 (0.1) | 3.8 (0.1) | |
| | | Nonconfident | 3.7 (0.1) | 3.8 (0.1) | |
| | Question: Do you feel more motivated to talk with others to solve issues and challenges facing people in your neighborhood? | Comparison | Confident | 2.8 (0.1) | 2.6 (0.1) |
| | | | Nonconfident | 2.5 (0.1) | 2.5 (0.1) |
| Intervention | Confident | 2.8 (0.1) | 2.9 (0.1) | | |
| | Nonconfident | 2.3 (0.1) | 2.7 (0.1) | | |

subject factor. Knowledge of neighborhood inequalities among students in the intervention group significantly improved between pretest and posttest in comparison to the comparison group, $F(1, 129) = 24.09$, $p = .002$. Students' perception of research significantly declined over time, $F(1, 129) = 46.29$, $p < .001$, and among the comparison group, the rate of decline was significantly greater than the intervention group, $F(1, 129) = 8.07$, $p = .005$. When students were asked if they were motivated to talk about issues and challenges facing people in their community, students in the intervention group were more willing to talk about the issues between Time 1 and Time 2 compared to students in the comparison group, $F(1, 128) = 5.58$, $p = .020$.

In Table 3, we present the results from a two-between-one-within subjects ANOVA where experimental group and level of confidence in conducting research (confident, nonconfident) were the two between subjects factors and time was the within subjects factor. Students who were confident in their research ability scored lower than nonconfident students from Time 1 to Time 2, $F(1, 127) = 4.78$, $p = .031$. There was no significant interaction on knowledge between time, experimental group, and level of confidence. Students who were confident in their research ability tended to decrease in their

perception of research compared to nonconfident students, $F(1, 127) = 8.05$, $p = .005$. We found marginal significance in the interaction of perception on time, experimental group, and level of confidence, $F(1, 127) = 2.66$, $p = .106$. All categorized groups tended to decline in their perception of research from Time 1 to Time 2, with the exception of the nonconfident students in the intervention group who improved their perception of research.

Discussion

The purpose of this study was to assess the impact of integrating research experiences into public health curricula on students' knowledge of neighborhood inequalities, perception of research, and motivation to talk about health issues. Compared with those in the comparison group, improvements were noted in knowledge of neighborhood inequalities among those in the intervention group from pretest to posttest. Additionally, while perception of research declined over time in both groups, the rate of decline was significantly greater among those who did not participate in the research experience. Participants in the intervention group also reported being more motivated to talk about health

issues and challenges facing people in their neighborhood compared with those in the comparison group. Furthermore, perception of research among those in the intervention group improved over time when participants were divided into confident and nonconfident groups.

Our study findings are in line with many previous authors that found undergraduate research increases students' knowledge (Collins, 2017; Craney et al., 2011; Olimpo, 2016). Yet our study is unique in that it examined knowledge regarding neighborhood inequalities, whereas other studies tend to focus more on the benefits of undergraduate research. Our study also examined students' motivation to talk about health issues in their neighborhoods, which is especially significant because it suggests the impact these research experiences can have on students' ability to experience a sense of empowerment in applying what they have learned outside the classroom. Additionally, our results are similar to other authors' findings with regard to perception of research with students reporting higher confidence in research skills at posttest (Adedokun et al., 2014; Craney et al., 2011).

The primary limitation associated with this study was nonrandomization of participants to intervention and comparison groups as this poses a threat to the internal validity and the conclusions drawn about the effectiveness of the intervention. Additionally, participants in this study were public health majors; therefore, it is possible they already had greater knowledge of neighborhood inequalities, higher confidence regarding research abilities, and/or a greater likelihood of talking with others about health issues and challenges affecting their neighborhoods. Since we did not statistically control for this variable, this must also be considered as a possible limitation associated with this study. A potential limitation associated with one of our measures must also be considered as it was not possible to determine if all the participants from the comparison groups had research experience to reflect on when asked about their current research experiences in the Jackson Attitudes toward Research Survey. Furthermore, our analyses were very limited. We did not collect information on gender, class level, grade point average, and previous research experiences, which limited us from conducting additional statistical analyses to examine the effect of these variables on our key study variables.

There were several additional limitations associated with this study. The assessment included only one question to measure motivation to talk about health issues, and although this was a significant finding, additional questions measuring this construct may have further strengthened this finding. Although improvements were noted for some of the variables, the test-retest format

does not allow us to draw conclusions regarding the causal effect of the intervention, or whether the improvements seen will be maintained over time. Additionally, the comparison group from Group 2 received their pretest later than the intervention group, which may have also affected our results. Possible respondent effects may have occurred, specifically "helpful subjects effects." It is possible that participants became aware of the aim of the study and answered questions in a favorable manner, especially after the participants received the intervention. Last, experimenter bias may have posed a threat since the first author collected the data and trained the participants in the data collection process.

The primary strength of this study was the use of a comparison group as this ruled out potential biases including maturation, testing, and instrumentation. Additionally, our study contributes to other research that focuses on integrating undergraduate research experiences into public health curricula. For instance, Oberne (2015) supported the development of qualitative research skills through the integration of skill building activities into public health and health promotion courses. Additionally, the social determinants of health have been integrated into public health courses through various modalities, including peer led discussions and student-led group work (Garnett, 2017). Our study also reiterates the benefits of providing research opportunities to all students, including those at the undergraduate level, which reinforces efforts made by many national organizations to increase such opportunities.

While this study provided a foundation, additional studies, broader in scope and power, are needed in order to truly understand the impact of integrating research experiences in the public health curricula. Future research including an examination of additional variables, such as the level of interest in graduate school that resulted from the undergraduate research experience and/or the ability of the undergraduate research experience to provide clarity around a chosen career, would also be of value. Future research efforts might also include tracking the students over a longer period of time to assess whether improvements seen are maintained over time.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: National Institutes of Environmental Health Sciences/ Environmental Protection Agency (RD 8354350).

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