

The Undergraduate Interdisciplinary Research Experience on Women's Health: Promoting "Learning that Lasts a Lifetime"

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Abstract: The University of South Florida piloted an undergraduate initiative on Women's Health consisting of a 6-week intensive mentored research and two parallel formal courses. Faculty included those from the Colleges of Medicine, Public Health, Nursing, Women's Studies and Honors. The results encourage us to continue and expand the project.

I. RESEARCH AS AN EDUCATIONAL STRATEGY

It has been suggested that academic scientists "who teach the principles of research and evidence-based decision making" should use their knowledge from the laboratory to "improve learning, problem solving, long-term retention and transfer of training as a basis of educational reform and innovation" [1]. Towards these ends, the University of South Florida (USF) embarked on a pilot program the summer of 2007 to address the needs of its diverse community, by offering a unique interdisciplinary research experience for undergraduates, focused on women's health.

The educational strategy involved academic scientists conducting a program in which the students were expected to be "cognitively active" and which provided various venues for learning, including the classroom, the research laboratory, research symposia, national conferences, as well as getting involved in local and university community activities related to women's health.

In order for such a vital and important program to be successful, critical factors, such as the collaboration of multiple departments under the banner of "women's health" needed to be established. This type of approach not only emphasized the value of interdisciplinary research training, but also ensured a firm commitment and a concerted effort from the various constituent departments towards the achievement of a successful outcome of the training program.

With these principles in mind, and in order to ascertain a holistic approach to this gender-sensitive research program, faculty from the Colleges of Medicine, Public Health, Nursing, Arts and Sciences and Honors were engaged to expose the students to a diversity of disciplines and to provide the students with a multidisciplinary pool of research

mentors and projects from which to choose. This approach also confers on the students the capacity to interpret their results in the context of the community, whether on a local, national, or an international scale. The program provided an avenue by which various effective teaching approaches, previously validated by educational research, were utilized in order to impart learning that would be of life-long relevance to the students, namely in Women's Health.

II. WOMEN'S HEALTH AS A RESEARCH THEME

Because issues of Women's Health represent a reliable reflection of the community's health concerns [2, 3], empowering women by promoting their health and well-being directly impacts not only the women themselves, but the community in general. Healthy women play a pivotal role in maintaining the health of their families, contributing to the work force, educating children both inside and outside their home environments, and providing physical, emotional and social support that result in the well-being of the community. The concept of Women's Health has evolved over the past few years from a focus on disorders strictly related to female reproductive organs (cervical, ovarian and breast cancer, as well as childbirth) into a multidisciplinary construct that involves the overall well-being of women. Our undergraduate research program is grounded in the belief that women's health can be advanced by a well-planned educational activity involving classroom instruction, coupled with a direct participation of the learner in research activities that promote gender and cultural sensitivity, and which emphasize the roles of gender, race, culture and class in creating health disparities in a given community [4].

III. OBJECTIVES OF THE PROGRAM

An intensive 6-week research program was designed to offer a concentrated, mentored research experience on interdisciplinary research projects to undergraduates. The curriculum included two parallel courses with multidisciplinary perspectives. The first course, "Disease Processes in Women", introduced topics on the physiopathological

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aspects of “Women’s Health”, including ethical issues related to the protection of human subjects in research. The second course, “The Politics of Women’s Health” encompassed the social and political aspects of women’s health.

The specific objectives of the program included:

1. The Advancement of Literacy on “Women’s Health”

By addressing the cognitive gaps in knowledge, and correcting misconceptions which have been promoted by various interest groups (e.g. media, movies, industry, politicians, etc).

2. The Enhancement of the Students’ Research Skills

By providing advanced training in research design, planning, implementation, data interpretation and presentation.

Under this umbrella, the following criteria were emphasized:

- a. Manuscript writing skills: This was approached by getting the students involved in a constructive critical appraisal of a presented material, with the active involvement of the class mentors as well as other trainees as a group, emphasizing the review process, and responding to the comments about the weakness or strength of the discussed paper.
- b. Presentation skills: This involved weekly group meetings dedicated to “work-in-progress” presentation of on-going research. During these presentations, students were given feed back from mentors and peers to enhance their research projects.
- c. Good laboratory practice skills: This was accomplished through the daily interaction of the student with their research mentor, with the end in view of imbibing a proper and responsible conduct in the laboratory.
- d. Proficiency in literature search: Through constant interaction with their mentors, students develop judgment in selecting reference materials for their research topics.

3. The Fostering of a Global Perspective on Women’s Health

By offering a class on the “Politics of Women’s Health”, making available interdisciplinary and community-based research projects, and participating in university-wide and national research flora.

IV. METHODS

1. Selection of Candidates

The Research Experience for Undergraduates (REU) was a collaborative effort between the Office of Undergraduate Research, the Department of Women’s Studies of the College of Arts and Sciences, and the College of Medicine. Student recruitment was initiated by the Office of Undergraduate Research and the Department of Women Studies. The program was housed in the Office of Undergraduate Research which is located at the USF Honors College, which also provided the staff and logistics,

including the recruitment, registration, and evaluation of applicants, processing of travel, disbursement of stipends and arrangements for students to attend and participate in the Governor’s Annual conference on Women’s Health in Florida.

Students from various academic backgrounds who were interested in performing cross-disciplinary research on women’s health were invited to apply. A competitive application process resulted in enrollment of 13 highly qualified undergraduate students (from Women’s Studies, Biomedical Sciences, Sociology and Humanities). Students paid tuition; however, upon completion of the program they each received a \$500 stipend. The participants were from majors spanning the life and physical sciences, women’s studies and international affairs. Although all enrollees to the program were women, we anticipate the participation of male students as the program becomes an annual event.

2. The Nature of the Student Activities

The Pilot Program consisted of 6 weeks in the summer of 2007 devoted to three courses comprising 9 credit hours:

- (a) A three-credit hours course entitled “Disease Processes in Women”, utilizing lectures, discussions, and presentations by faculty members from the health sciences and women’s studies disciplines. Students learned key research problems related to women and cardiovascular disease, cancer, obesity, diabetes, osteoporosis and aging. An integral component of the course was a seminar series on research methods and ethics. This course was meant to address specific objectives #1 and #2 (see above).
- (b) A three-credit hour course entitled “Directed Research”, wherein a student was paired with a selected faculty mentor. This activity was meant to address specific objective #2 (see above).
- (c) A 3-credit hour course on “The Politics of Women’s Health”, which covered the medicalization of health and the role of disparities in the physical, sexual, mental and emotional health of women. Students were encouraged to participate in workshops and social activities sponsored by the Office of Undergraduate Research, the Department of Women’s Studies and the College of Medicine.

Students also had the opportunity to join supervised educational trips, including the Annual Conference on Women’s Health organized by the Florida Department of Health. This course was intended to address specific objective #3 (see above).

3. Teaching Strategies

The Boyer Commission has highlighted the importance of inquiry, investigation and discovery as central to the quality of undergraduate research [5]. A detailed description of the various components of the pilot REU serves to highlight how we attempted to achieve these goals.

REU Component 1

“Disease Processes in Women” Seminar Series

The Disease Processes in Women course consisted of a series of didactic lectures and interactive seminars related to

the students' research projects. The series was designed to provide the cognitive, social and motivational foundation for engaging in research related to gender. Teaching strategies involved a combination of didactic and student-centered learning activities. In the 2007 summer pilot REU, the faculty mentors who taught in the seminar series were also involved with the students' individual projects. The students were introduced to topics on gender-specific medicine provided by faculty educators from different disciplines who are also active researchers in their fields. Because the area of Women's Health includes not only identification of gender-related diseases and their cure, but also helping families and communities to cope with these illnesses, an interdisciplinary approach was appropriate in order to address and manage these health problems using a holistic approach. With the increasing specialization of the medical professions, and the alienation of the social science disciplines from the medical arena, a cross-disciplinary educational experience such as this provides an opportunity to reconnect the various professionals involved in maintaining the health of both patient and community. This is similar to the "inter-professional" teamwork seen in clinical practice which is necessary for such complex patient care areas as palliative care, geriatric medicine and mental health [6]. It has also been suggested that "shared learning" at the earlier educational stages, which in our case is at the undergraduate level, may facilitate future interdisciplinary collaboration. In the past year, examples of topics of education and research included a general review of gender medicine, women and mental health, diabetes in women, women and aging, and women and disability.

In the second week, the students were transported to the Tampa Convention Center, where they attended the "State of Florida Conference on Women's Health", allowing them the opportunity to interact with top scientists, activists, and health care figures in the field. The conference represented a unique experience for the students who were thrown into a rich interactive environment, benefiting not only from the cognitive aspect of learning by being exposed to new topics, techniques and career pathways, but also from the chance to reexamine and rethink their own health habits and lifestyles, taking into consideration the health parameters and risks related to disease. This was followed by a second series of seminars which included a review of the research status of several physiological systems, such as cardiovascular health, mental health and the immune system in women. A panel discussion followed, where women in leadership positions and top researchers in women's health and ethics presented various aspects of conducting research in the area of women's health, including the procedures of the "Institutional Review Board", issues of cardiovascular research in women, and regulatory issues in research.

The third component of the course involved even more active participation on the part of the students, as it required them to discuss their own ongoing research projects and to give a final presentation of their data. This learning process was intended to train students in research planning and methods, literature review, data analysis, tabulation of data, manuscript writing, and thus to gain competency in conducting a project from conception to presentation.

REU Component 2

The Mentored Research Project

"Producing information; whether it is information to be learned or the reproduction of information that has already been learned, is a powerful method of learning" [7].

By its very nature, the mentored research project was intended to provide a dynamic dimension to the learning experience through active information gathering and generation. The mentored research project interfaced with the two parallel courses (REU components 1 and 3). Apart from the opportunity of actively contributing to the database of scientific knowledge in gender health, the mentored research experience put the theoretical knowledge acquired from the two other courses into practice, thus contributing overall to the effective processing of new information. Because in this part of the program the students were not just "observers" of the research process, but were actually participants, learning included learning and applying the theory, as well as "absorbing and being absorbed into the culture of such a community" [8], with all the rigors and philosophy of scientific research. This activity consisted of 3 credit hours of an intensive research under the guidance of a USF faculty member, and workplace activities were appropriate to their stage of training. Prior to the formal start of the summer REU, a list of faculty members including their contact information and a brief description of their areas of research, were provided to the students. The program directors then met individually with the students and entertained questions on the program faculty, and after the students had chosen their mentors based on their research interest, a meeting was arranged for the students with their prospective mentors.

Prior to the REU, faculty and students met jointly to develop their research plans and articulate the objectives of the research project. The resources needed to complete this research plan were defined. Most of the students who elected to conduct research projects within the College of Medicine started working on their projects as soon as they were paired with their selected mentors. The research projects were designed with the understanding that the students would be allowed ample time for other classes and activities related to the REU. The projects were flexible and allowed for a continuously evolving research plan and continuous revisions [9]. The detailed research planning was included in regular meeting times of the students with their mentors. The level of the students' knowledge of the subject and their prior research experience were taken into account. The students learned hands-on the rudiments of research, including the formulation of a testable hypothesis, the selection of an appropriate and feasible experimental design, ordering of supplies, interaction with graduate students, fellows and other research personnel, data collection and analysis, reading, writing and editing manuscripts, and preparation of manuscripts for publication or for oral/poster presentations. For this pilot REU, research mentors provided the budget for laboratory supplies and all associated incidental expenses.

Some examples of research topics undertaken this year were:

- a. **“Medicalization of Childbirth and how the current system of childbirth practices affect women”.** Students engaged in this topic undertook a literature review related to alternative childbirth options (midwifery, home births), as opposed to the traditional hospital setting.
- b. **“Women of Haiti and the effects of Infant Mortality on their lives: The Silence, the Sorrows. The Saga Continues”.** Immersion of the student in this community-based project led to a better understanding of the daily accounts that affect the well-being and health of the women in Haiti and their offspring.
- c. **“Stem Cells and Regeneration”.** Students engaged in this bench-work research focused on identifying gender differences in adult stem cells, and comparing the regenerative capacity of both male and female stem cells, and the potential applications of these to the area of regenerative and reparative medicine.
- d. **“Women and Menopause”.** Students who elected this topic were asked to perform a literature review on topics related to how biologic changes in women, such as menopause, exert a broader impact on their family and workplace.

By introducing the undergraduates to these projects, our goal is to achieve over the long term the expansion of research activities and careers related to “Women’s Health”, by building a core of researchers who are technically and socially equipped to pursue such an undertaking, and who are impassioned with a desire for life-long learning in gender health.

REU Component 3

Politics of Women’s Health Class

Elaborative interrogation, whether individually or in a group, is said to produce deep processing, thus facilitating memory [7]. Discourse processing, requiring complex questioning and deep reasoning, is said to result in higher levels of learning, such as synthesis, integration and practical application to problems in the “real world”[10]. The “Politics of Women’s Health” course utilized directed readings, active discourse, intense retrospection and elaborative interrogation as teaching strategies. The readings focused on how race/ethnicity and class affect women’s health and access to health information and health care, the factors which influence women’s wellness over their life cycle, the history of women and health, such as the role of women as healers, as well as the effects of the contemporary “Women’s Health Movement”. Several dimensions of women’s health were explored, with an overall context of health and wholeness: taking care of ourselves, our communities, and our planet.

The students were engaged in an intense self discovery, responding to questions such as, “How do we make and keep ourselves whole?”

“What are the many factors which militate against health?”

Student engagement was promoted through active discourse on the underlying meanings of women’s health and how health issues, such as gender, race, ethnicity, socio-

economic background, access to health care, access to health care coverage, health status, genetics, religion, spirituality, technology, stressors (environment, sanitation, security, political climate, etc.), interact and affect health and create health disparities.

The course also explored current issues and concerns in the conceptualization and delivery of health information and health care, with a special emphasis on ways in which our “knowledge” is shaped. The syllabus addressed political questions about knowledge, power and control in an effort to further our understanding and creation of the connections between the personal and the political.

Because key concepts were put in multiple contexts, and because deep-probing questions often resulted in explanations which challenged one’s beliefs and prior convictions, student participation was vigorous. Critical appraisal and reflective questioning of the various health issues pertaining to women’s health is said to generate a deeper understanding of cultural differences, create a less fragmented, more integrated picture of the current knowledge base, and facilitate future inter-professional interaction among the various disciplines involved in Women’s Health. Our understanding is that the exercise resulted in deeper comprehension, quicker assimilation and longer retention of the new information.

4. Student Assessment

REU Component 1

Each student completed a research proposal and presented a report at the REU’s concluding colloquium in July, 2007. Students’ grades were based on attendance, class participation and quality of the oral and written research proposal. In addition, students were encouraged to present their findings at the university-community symposium organized by the USF Collaborative for Children, Families and Communities (http://usfcollab_fmhi.usf.edu), or at USF’s Annual Undergraduate Research Symposium, to be held April 2, 2008.

REU Component 2

Based on their performance in the mentored research project, students were given a Pass or Fail grade.

REU Component 3

The students were required to choose one of two personal health projects: either to write a cross-cultural research essay exploring a health-related topic as it affects women in regions other than the U.S. possibly including the U.S. as a comparative point of reference, or to write a research essay, including a literature review, on a topic in women’s health.

Program Assessment

A quantitative evaluation of the program revealed that more than 80% of the students rated the program courses as excellent with the remaining students 20 % rating it as good, suggesting that learner satisfaction was high. Participants were generally satisfied with the program objectives, the content and conduct of the program. If grades are to be used as the yardstick by which to measure the level of cognition attained through the courses, then this objective was attained, as all the students obtained grades of 3 or higher. All the

students were highly motivated and completed the requirements of the courses, including submission of papers and presentation of their research findings in the final week of class. Students expressed that the knowledge they gained about their own health from this research experience was much more than from any other health class on campus, a sentiment which was unanimously shared despite the significant diversity of the ethnic and educational backgrounds among the REU students. As far as assessing the extent to which this learning exercise will influence their post-learning behavior (performance improvement), the majority of the students indicated that they will continue to pursue careers in women's health, in health care, in academia, research and politics, which, if true, would probably be the best indicator of the success of the program.

As far as the different components of the program were concerned, the post-course evaluation revealed that students would like to have more lecturers from other disciplines during the "Disease Processes in Women" seminar series. The students were significantly and positively impressed by the two-day "Annual Conference on Women's Health" organized by the "Florida Department of Health". Because of their interaction with national leaders in the field of women's health, many planned on switching career goals. As far as the mentored research component, student satisfaction was very high. Some students who were paired with mentors early in the program completed a pilot study in the 6-week period. However, most of the students found the 6-week period too short to complete a research project in the social or medical sciences. More than 50% of the students continued to work on their research projects with their mentors after the conclusion of the REU. All of the students were satisfied with their mentors' research projects, with the exception of one who switched mentors after the first week of the REU. It therefore appears that student-faculty interaction was almost optimal. With regard to the "Politics of Women's Health" class, 100% of the students rated this class as "outstanding", "amazing" or "excellent". The class met the objectives of understanding how institutionalized factors affect women's health; students were able to explain complex concepts, such as how socio-cultural factors affect a woman's body image and subsequent health issues, and the ethical concerns related to the medicalization of pregnancy, childbirth, menopause and aging. The students also learned respect for diverse cultures and backgrounds.

Thus, our assessment indicates that, from both the faculty and student perspectives, our pilot REU this summer was able to attain the objectives we had set for the program, such as advancing literacy on "Women's Health", both from the biological and the social viewpoints. In effect, this multidisciplinary approach helped promoting competency and skills for research in either the natural or social sciences, and developing a holistic perspective of "Women's Health" as seen from various bio-psycho-social angles. These were achieved by using various teaching/learning modalities, but all primarily directed at expanding research on, and making a personal commitment to "Women's Health".

V. FUTURE DIRECTIONS

Based on our experience this summer, this REU is clearly an important undertaking. However, for the immediate future, we would like to implement the following modifications:

1. Recruitment of Students

In the future, we hope to expand the program to include non-USF students who will be able to enroll as "non degree seeking students", using a simplified application process available to special students attending the USF. This extends the accessibility of the program to the larger educational community of metropolitan Tampa.

2. The "Disease Processes in Women" Series

The course will be expanded to include more details on research foundations topics, including obtaining research funding and publishing. To conduct this aspect of the program, we will tap faculty members who are members of the "Research Council", federally funded principal investigators on women's health, and grant writers. Additional research topics that will be introduced include scientific integrity, community research, grant writing skills, and team building. To motivate students to disseminate their research findings, students who are awarded for outstanding paper or poster presentations will receive a small scholarship to continue their research activities. As per feedback of the students, we also intend to expand our lecturer-pool to include other disciplines related to women's health to give seminars. In the future, we will also explore other teaching strategies, such as requiring portfolios [11], and involving more faculty in the assessment of the quality of student-directed activities. We foresee that a more participatory approach, such as student presentations and critiquing by both peers and content experts, will also make the theoretical aspects of the course more stimulating.

3. The Mentored Research Project

We intend to extend the entire REU program to 9 weeks. This is based on our experience that while two research projects generated enough data for presentation at a local meeting, most of the projects were still in various stages of completion. We also hope to match students with their mentors earlier in order to improve outcome, such as generating higher quality and quantity of data suitable for presentations.

4. The "Politics of Women's Health" Course

In addition to the aforementioned requirements, the students will be asked to work in groups of 3-4 on a common project. The focus of the projects will be "accomplishments and challenges in women's health research", and will be conducted by interviewing USF faculty who are actively engaged in research on women's health. This activity is meant to encourage teamwork and cooperation among students, and to introduce them to the situation in the "real world" and the many challenges that academic researchers face.

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