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ORIGINAL RESEARCH

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Training to increase competence in cardiovascular disease research: the Jackson heart study learning community

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ABSTRACT

Background: The Jackson Heart Study (JHS) Graduate Training and Education Center (GTEC) at Jackson State University (JSU), Jackson, MS, United States of America is the first GTEC established as a part of a major research study. GTEC implemented the 2-year Daniel Hale Williams Scholar Program (DHWSP) for graduate students who have completed the Bachelor's degree and are enrolled in either a Master's degree program or a Doctoral degree program. This paper describes the GTEC learning community (LC) that was used to train graduate students in cardiovascular epidemiology. It summarizes the processes that may inform other schools or training programs that aspire to initiate innovative strategies to augment students' academic and professional training and development.

Methods: GTEC implemented a LC, a learning design that promotes academic family-type cooperation and closeness where the GTEC LC students enter a formal program and complete their courses as a cohort. The GTEC DHWSP provides a strong grounding in epidemiology, cardiovascular disease (CVD), health disparities, and professional development to increase the likelihood of African–American graduate students entering careers in biomedical sciences. The DHWSP that began in 2014 successfully trained 22 scholars within four cohorts from two JHS institutions, JSU, and University of Mississippi Medical Center (UMMC). Instruction for the 2014–2018 cohorts was conducted face to face. For the 2018–2023 period, the DHWSP has been expanded to include JSU, UMMC, the University of Southern Mississippi, Mississippi Valley State University, and Alcorn State University. A total of eight graduate students each year will be selected for this new contract period. The revised format also incorporates an on-line instruction format, utilizing Canvas on-line teaching and learning management systems, Webinars (webcast seminars), and Webex on-line conferences.

Results: Scholars begin their DHWSP LC experience with an orientation session, followed by a 1-week long Research Camp that includes lectures in cardiovascular epidemiology, biostatistics, and scientific writing. This is followed by participation in an enrichment curriculum, mentoring by LC advisors and other professional development activities. By the end of the contract period in 2018, 22 scholars, matriculating through four cohorts, had successfully completed the program and received certificates of completion, after completing 30 presentations and 15 publications. A new cohort of eight scholars is currently being prepared for the entry into the program with a revised format.

Conclusion: The GTEC DHWSP has emerged as a singular, comprehensive medium to facilitate increasing the academic proficiency of the DHW scholars and to ensure that scholars can continue to advance their cardiovascular research capabilities. Going forward, the JSU GTEC will continue to afford scholars opportunities to interact with epidemiologists and other biomedical scientists to learn to identify, predict, diagnose, prevent, treat, and expand their understanding of the epidemiology of CVDs using the JHS data.

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Background

The Jackson Heart Study (JHS) is a longitudinal investigation of genetic and environmental risk factors associated with the disproportionate burden of cardiovascular disease (CVD) in African–Americans [1–3]. The JHS Graduate Training and Education Center (GTEC) at Jackson State University (JSU), Jackson, MS, USA is the first GTEC established as a part of a major research study. It was implemented to provide a supplementary pathway for developing and advancing graduate students' skills and expertise, increasing their competence to pursue careers in biomedical and public health research [1]. The graduate students targeted for selection in the GTEC program are students who have completed the Bachelor's degree and are enrolled in either a Master's degree program or a Doctoral degree program.

Supportive of JSU's research focus on education and training, the GTEC is located in the School of Public Health at JSU, a Historically Black College and University (HBCU), the first and only School of Public Health in the state of Mississippi. The GTEC created the Daniel Hale Williams Scholar Program (DHWSP) which was driven by the rising rates of obesity and CVD, growing evidence associating psychosocial and environmental exposures with these conditions, and recognition that current resources and support are inadequate to address the burden caused by the prevalence of CVD in Mississippi, and the shortage of under-represented minority professionals available to work in their own communities. In the state of Mississippi, the prevalence and incidence rates for obesity and CVDs are the highest in the nation [4–9], and in the JHS, the African–American cohort has a prevalence that is even higher than all other groups [10]. Table 1 is a comparison of the obesity prevalence of the JHS cohort, the state of Mississippi, the US, and other countries around the world, as well as heart disease death comparisons.

The 2013 award of a 5-year contract to establish the GTEC at JSU demonstrates the value the National Heart, Lung, and Blood Institute (NHLBI), of the National Institutes of Health (NIH), placed in increasing the pool of future scientists, while launching a long-term initiative to combat health disparities. GTEC proceeded to take action to prepare public health investigators by establishing a learning community (LC) to forge a changing educational landscape [11]. The efforts of the JSU GTEC promises to expand the pool of highly qualified underrepresented minority graduate students by enriching the educational experiences and skills of these graduate students, thereby ensuring that they are equipped for future careers in academics, industry, and government research settings [12] in an effective learning environment where they feel a connection with all the stakeholders (students, LC advisors, instructors, mentors, and GTEC staff) [13].

This paper describes the GTEC LC that was used in the JHS to train graduate students in cardiovascular epidemiology beginning in 2013. This paper summarizes the processes that may inform other schools or training programs that aspire to initiate innovative strategies to augment

Table 1. Obesity and heart disease in JHS cohort, Mississippi, USA, and selected world locations.

Location	Obesity Percent	Coronary Heart Disease per 100,000
JHS African–American Cohort*	53.0*	
Mississippi**	37.0**	263.2[+]
US	33.7	196.6[+]
New Zealand	29.2	72.3
Australia	28.6	54.1
Mexico	28.1	90.2
United Kingdom	28.1	57.3
Canada	28.0	55.36
Sweden	20.5	75.30
Germany	20.1	83.78
Denmark	19.3	44.76
Malaysia	13.3	137.02
China	6.9	98.33
Pakistan	5.4	246.84
India	4.9	146.11

Data adapted from the following sources: (1) World Rankings: Obesity Rates by Country (July 2017) Available via https://renewbariatrics.com/obesity-rank-by-countries/; (2) World Health Rankings—Available via https://www.worldlifeexpectancy.com/world-health-rankings

*(3) Dubbert et al. (2010).

(4) Associated Press. Report: Mississippi has 2nd-highest adult obesity rate in US**.** September 13, 2018. (5) Available via https://wreg.com/2018/09/13/report-mississippi-has-2nd-highest-adult-obesity-rate-in-us/

[+]Adapted from National Vital Statistics Reports, Vol. 67, No. 5, July 26, 2018—Available via https://www.cdc.gov/nchs/data/nvsr/nvsr67/nvsr67_05.pdf

students' academic and professional training and development.

Methods

Framework for the GTEC Scholars Program: Learning communities

GTEC designed the DHWS Program using the GTEC LC. The LC is an effective learning design that promotes academic family-type cooperation and closeness between the stakeholders, comprised of the scholars, instructors, LC advisors, mentors, and the GTEC staff [14]. In higher education, LCs are the classes that are linked or clustered during a defined period of time, often around an interdisciplinary theme [15]. This design is an emerging trend in higher education and professional development, and has been touted as an effective strategy to increase student success and retention [16,17]. In LCs, students enter a formal program and complete their courses as a cohort. Hallmarks include sharing of a common purpose, social interaction, and pursuit of individual and group learning opportunities. As proposed by Berry, Johnson, and Montgomery, learning communities that foster academic programs also serve as a collaborative structure for shared decision-making between faculty and students, while providing a safe learning environment for trust-building where students and faculty serve as collaborative partners in the instructional process [18].

There are varying definitions and applications of LCs; however, they universally share five essential characteristics: (1) integrated and interdisciplinary curriculum; (2) increased level of faculty collaboration and participation in all aspects of the program; (3) collaborative and active learning; (4) continuous assessments and communication in student outcomes and program results; and (5) consistency of the LC program with the mission, structure, processes, and culture of the larger institution(s) (Table 2). Participants are responsible for the growth and well-being of every member of their LC [19]. This underlying philosophy is congruent with the collectivist culture inherent in African–American communities, which stresses the priority of group goals and the importance of cohesion within social groups. Table 2 summarizes how GTEC applies the essential characteristics of LCs to the DHW Scholars Program.

The GTEC DHWSP is designed to provide a strong grounding in epidemiology, CVD, health disparities, and professional development to increase the likelihood of African–American graduate students entering careers in Biomedical Sciences. A certificate of completion is awarded to all scholars who complete all of the prescribed activities of the GTEC program.

The GTEC LC is composed of the following six elements:

1. An enrichment curriculum that was created to train students to: (1) design, analyze, and evaluate epidemiologic and related biomedical research; (2) develop an understanding of and ability to apply biostatistical and other appropriate quantitative research and evaluation methods; and (3) apply current research methods in CVD epidemiology.
2. Development and implementation of a strategy for recruiting and retaining graduate level students.
3. Program activities operating during the academic year and the summer to include a didactic program in CVD epidemiology with hands-on field training integrating all aspects of the JHS.
4. Access to internship and/or summer opportunities for students to accelerate exposure to public health, epidemiology, biostatistics, and/or genetic epidemiology.
5. Providing career guidance in the public health sciences (mentoring) to the students in the DHWSP.
6. Participating and presenting research findings at the GTEC annual Research Day.

Table 2. Characteristics of LCs and application in the DHWSP.

Essential Characteristics of LCs	Application in the DHW Scholars Program
Integrated and interdisciplinary curriculum	Enrichment curriculum in graduate programs
Increased level of faculty collaboration and participation	Faculty serving as LC Advisers
Collaborative and active learning	Use of simulations and interactive activities
Continuous assessments and communication	Evaluation of all program components and use of student feedback in training/education programs
Consistency of the LCs with institutional mission, culture	Emphasis on teaching, a primary mission of JSU

The programs of the first edition of the DHWSP that began in 2014 successfully trained 22 scholars within four cohorts. These scholars were recruited from two JHS institutions, JSU and University of Mississippi Medical Center (UMMC). Instruction for the 2014–2018 cohorts was conducted face to face in a classroom setting in the School of Public Health, JSU, Jackson, MS. The successes of the first GTEC contract period (2013–2018) led to a contract renewal for JSU GTEC by the NHLBI (2018–2023). For the 2018–2023 period, the DHWSP has been expanded to include full-time students enrolled in the JSU Science, Technology, Engineering, and Mathematics (STEM), Psychology, Sociology, and Public Health graduate programs; UMMC Medicine, Nursing, Pharmacy, and Dentistry schools; University of Southern Mississippi (USM), Mississippi Valley State University (MVSU), and Alcorn State University (ASU) Psychology, Sociology, Nursing and Public Health graduates programs (Table 3). A total of eight graduate students each year will be selected as DHW scholars for this new contract period. This revised format will expand opportunities for a larger pool of students and expand the availability of mentors and LC advisors. Additionally, it will increase opportunities for research development through collaboration between public health and biomedical sciences, thereby increasing opportunities for collaboration across disciplines and departments. The revised format engages scholars using multimedia forms, incorporating an on-line instruction format, utilizing Canvas on-line teaching and learning management systems, Webinars (webcast seminars), and Webex on-line conferences. JSU GTEC concluded that using technology in the DHWSP can positively impact scholar retention, expand accessibility of resources to scholars, open additional outlets to enhance and increase scholars' success, and build the skills the DHW scholars need to be successful in their careers in biomedical and public health research.

Numerous studies have demonstrated the benefits of LCs with undergraduate students [15,17]; however, few such studies have been conducted with graduate students [20]. The dearth of studies examining the effectiveness of LCs with graduate students will enable us to contribute to the literature as well as provide a description of a unique training model.

Learning community advisors

Six faculty members (two from JSU and one from each participating university) serve as LC advisors and are assigned to the LC. JSU GTEC selected experienced faculty members who have strong research backgrounds in epidemiology, health disparities and public health, and extensive experience in working with graduate students and the JHS. Each LC advisor has three main responsibilities: (1) work with their assigned mentees and provide guidance

Table 3. Collaborating institutions in GTEC LC.

Contract period 2013–2018	Students' course of study	Contract period 2018–2023 with additional institutions	Students' course of study
JSU, Jackson, MS	Psychology, Public Health, Social Work, Sociology,	ASU, Lorman, MS, USA	Nursing, STEM, sociology, or psychology
UMMC, Jackson, MS	Dentistry, Medicine, Nursing, and Pharmacy	JSU, Jackson, MS, USA	JSU STEM program, public health, sociology, or psychology graduate degree programs (master and doctoral programs)
Instruction Type (2014–2018)		MVSU	
Classroom-Face to Face		UMMC, Jackson, MS	Dentistry, Medicine, Nursing,k and Pharmacy
		USM, Hattiesburg, MS	Nursing, STEM, sociology, public health, or psychology
		Instruction type (2018–2023)	
		On-line—CANVAS, Webinar/ Webex	

with their research projects; (2) provide group mentoring to the students in their LC; and (3) work with their assigned mentees to publish one manuscript associated with their ongoing research projects, using data from the JHS.

DHW scholars are assigned to one of six LC advisors: two LC advisors serve graduate students from social, behavioral, biomedical, and public health at JSU; one LC advisor serves clinical students from the UMMC's Schools of Medicine, Nursing, Dentistry, and/or Pharmacy; one from USM; one from MVSU; and one from Alcorn. Despite this separation, these students benefit from an interdisciplinary experience with colleagues representing other clinical fields. Therefore, we periodically bring all of them together for program delivery, seminars, Brown Bag luncheons, and DHW scholars' meetings.

Results

Orientation meeting

The GTEC LC program began training DHW scholars in 2014, and by the end of the contract period in 2018, 22 scholars, matriculating through four cohorts, had successfully completed the program and received certificates of completion. Of those, 22 DHW scholars with a mean age of 24-year old, 15 were females and 7 were males. A new cohort of eight scholars is currently being prepared for entry into the program with a revised format. Scholars begin their DHWSP LC experience with an orientation session. Table 4 presents the agenda items for the opening event of the DHWSP and the beginning of the GTEC LC activities.

JHS GTEC research camp

The JHS GTEC Research Camp immediately follows the Orientation of the scholars and consists of a 1-week intensive program focused on enhancing DHW scholars' overall quality of research, knowledge about academic research, and oral and written communication skills. Entitled, *Reading*, *Writing*, *Surviving*, and *Thriving*, this annual research camp utilizes didactic and interactive approaches targeting first year scholars (Table 5). Lectures and exercises include:

1) Addressing how to read and critique the scientific literature
2) Enhancing skills in scientific writing
3) Enhancing skills in research evaluation, statistics, and design of epidemiological studies

Table 4. DHWSP orientation.

DHWSP 1-day orientation topics	
Introduction to the development of the JHS	Overview Daniel Hale Williams Scholars Program
Introduction of GTEC Scholars and Faculty/Staff	JHS Data Overview
Evaluation	Review and Discussion of Human Metrics Inventory

Table 5. Research camp topics

Topics* covered during initial 1 week GTEC research camp	
Cardiovascular Epidemiology	JHS Epidemiology
Epidemiology & Research Methods	Genetics I—JHS Genetics Data Scientific Sessions-Collection and Storage
Genetics II—**JHS** Findings from Genetics Data	Genetics III—Research Projects
Critiquing Scientific Research Papers I-	Research Writing
Critiquing Scientific Research Papers II	Psychosocial Epidemiology
Public Health and **CVD** Part I	CVD and Risk Factors I
CVD and Risk Factors Part II	Biostatistics I
Biostatistics II	Computer Applications and Laboratory I
Computer Applications and Laboratory II	

*Research Camp topics may vary depending on GTEC priorities and annual agenda.

4) Guidance on career navigation

During the initial GTEC phase, four scholars were selected for each cohort (2014–2018). During the subsequent contract period 2018–2023, the number of scholars per cohort was increased to eight scholars per cohort. The period of engagement for the scholars for both contract periods (2013–2018 and 2018–2023) was 2 years. GTEC's focus on cardiovascular epidemiology and related biomedical research, targets underrepresented minority graduate students and leverages the resources and research opportunities of the JHS. This supports Objective 8 of the NHLBI Strategic Goals and Objectives that "new approaches" are needed to "ensure the continuing development of a diverse scientific workforce equipped with the relevant skills, knowledge, and resources to tackle future heart, lung, blood, and sleep challenges [21].

Table 6. GTEC scholars accomplishments 2014–2018.

DHWS* Presentations Done at National and International Conferences	DHWS Publications	DHWS Internships	DHWSP Manuscripts Proposals	DHWSP Brown Bag Luncheon Presentations
30	15	13	13	18

*DHWS = Daniel Hale Williams Scholars.
Total number of scholars (*N*), representing four cohorts (2014–2018) = 22.

DHWS' presentations at National Conferences/ Scientific Meetings

Daniel Hale Williams (DHW) scholars are expected to do presentations at national meetings (Table 6). There is an annual Research Day, organized by GTEC. This 2-day meeting of interested persons presents new information on a variety of topics related to CVD, chronic disease and risk factors, health disparities, health education, and health promotion. DHW scholars also present updates on their selected areas of research to other scholars, instructors, mentors, and other investigators at a GTEC selected venue and at official JHS events.

DHWS scientific productivity/accomplishments

DHW scholars are expected to prepare manuscripts for publication in journals etc, using JHS data (Table 6). The plans for data collection, publication development, composition of the scholars' manuscript writing team, selection of appropriate journals, and decisions related to GTEC scholars' scientific productivity are developed, approved, and managed by the GTEC Program Director and/or designated GTEC staff, who oversee the GTEC Publications and Presentations (P&P) Committee to facilitate JHS data acquisition for the DHW scholars.

Conclusions

It is widely recognized that, nationwide, there is a dearth of underrepresented minorities in biomedical and public health research, as well as a very low percentage of underrepresented minorities, especially, African–Americans, who are awarded research grants compared to their white counterparts. Historically, Black Colleges and Universities, like JSU, are positioned to address the shortage of underrepresented minorities and the growing demand and need for a diverse public health workforce, especially in Mississippi. In an effort to alleviate these concerns, the programs developed by GTEC (initiation of the LC and the implementation of the DHWSP) help to initiate some diversification of the pipeline of future health disparities researchers from disadvantaged backgrounds to increase the number of underrepresented minority researchers and grant awardees, thereby helping to ease the shortage that exists and supporting one of the objectives of the NIH.

The need to increase the number and quality of minority biomedical researchers has received substantial national attention, most notably from the "Working Group on Diversity in the Biomedical Workforce" [22]. Numerous studies have shown that minority scholars tend to conduct the majority of minority-related research; therefore, expanding the pool of well-trained minority investigators is essential to improving overall health disparities, which will translate to an elevation of the health status of minority populations and communities. The GTEC DHWSP is a singular, comprehensive medium to facilitate increasing the academic proficiency of the DHW scholars and to ensure that scholars can continue to advance their cardiovascular research capabilities by their involvement in the GTEC LC. Going forward, the JSU GTEC will continue to afford scholars opportunities to interact with epidemiologists and other biomedical scientists to learn to identify, predict, diagnose, prevent, treat, and expand their understanding of the epidemiology of CVDs using the JHS data.

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