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1. REPORT DATE (DD-MM-YYYY) 24-05-2023	2. REPORT TYPE Final Report	3. DATES COVERED (From - To) 15-May-2021 - 14-Aug-2022
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4. TITLE AND SUBTITLE Final Report: Equipment and Instrumentation to Enhance the Undergraduate Research Experience of STEM Majors at Bennett College in Microbiological Research and Data Analytics	5a. CONTRACT NUMBER W911NF-21-1-0215
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER 060122

6. AUTHORS	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES Bennett College 900 E. Market St Greensboro, NC 27401 -3249	8. PERFORMING ORGANIZATION REPORT NUMBER
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9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES) U.S. Army Research Office P.O. Box 12211 Research Triangle Park, NC 27709-2211	10. SPONSOR/MONITOR'S ACRONYM(S) ARO
	11. SPONSOR/MONITOR'S REPORT NUMBER(S) 78030-BB-REP.1

12. DISTRIBUTION AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.
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13. SUPPLEMENTARY NOTES The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Candice Young
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU			19b. TELEPHONE NUMBER 336-517-2296

RPPR Final Report
as of 24-May-2023

Agency Code: 21XD

Proposal Number: 78030BBREP

Agreement Number: W911NF-21-1-0215

INVESTIGATOR(S):

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DUNS Number: 067439489

EIN: 56-0532296

Report Date: 14-Nov-2022

Date Received: 24-May-2023

Final Report for Period Beginning 15-May-2021 and Ending 14-Aug-2022

Title: Equipment and Instrumentation to Enhance the Undergraduate Research Experience of STEM Majors at Bennett College in Microbiological Research and Data Analytics

Begin Performance Period: 15-May-2021

End Performance Period: 14-Aug-2022

Report Term: 0-Other

Submitted By: M.S. Candice Young

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees:

STEM Participants:

Major Goals: The intent of this funding is to create a fundamental research laboratory equipped for student training and faculty research in microbiology and to establish a computer lab for experimental and computational analysis.

Accomplishments: Equipment was purchased (see attached).

Training Opportunities: Nothing to Report

Results Dissemination: Nothing to Report

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

RPPR Final Report
as of 24-May-2023

Partners

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I certify that the information in the report is complete and accurate:

Signature: Candice Young

Signature Date: 5/24/23 11:49AM

**Equipment and Instrumentation to Enhance the Undergraduate Research Experience of
STEM Majors at Bennett College in Microbiological Research and Data Analytics**

Final Report

Candice Young, Principal Investigator

Bennett College

Award# W911NF2110215

December 6, 2022

**Equipment and Instrumentation to Enhance the Undergraduate Research Experience of
STEM Majors at Bennett College in Microbiological Research and Data Analytics
Final Report**

The following list of equipment has been acquired under the grant titled, “Equipment and Instrumentation to Enhance the Undergraduate Research Experience of STEM Majors at Bennett College in Microbiological Research and Data Analytics,” Award# W911NF2110215, Candice Young, principal investigator and assistant professor of biology at Bennett College.

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30303-3104

The table below includes the name of the equipment that has been acquired, the manufacturer, and the costs accrued for each item.

Table 1. Bennett College Equipment Acquired under Dod Grant Award # W911NF2110215

Purchase Date	Equipment Item	Vendor Name	Quantity	Amount
1/27/22	MatLab Campus Wide Suite	Mathworks, Inc.		13182.00
6/30/22	Accrue Dell June invs pd 7/15	Dell Service Sales		32562.93
7/12/22	Dell Optiplex Micro All in One Mount	Dell Service Sales		794.92
7/12/22	Ready Image for client PC	Dell Service Sales		402.92
7/12/22	Dell Pro Wireless Keyboard/mouse	Dell Service Sales		108.69
7/12/22	Surge Protector AC 120 Volt	Dell Service Sales		38.76
7/12/22	Dell MS116 Wired Mouse/KB216	Dell Service Sales		811.44
7/12/22	Dell Latitude 5520	Dell Service Sales		3156.60
7/12/22	Optiplex 7000 MFF	Dell Service Sales		27249.60

7/19/22	Icemaker flaker Scotsman	Fisher Scientific		5004.84
7/19/22	TS universal clamp for MaxQ shkr	Fisher Scientific		37.26
8/4/2022	Rack 50MLX12 centrifuge tubes	Fisher Scientific		386.96
8/4/2022	Incubator ORBTL SHKR	Fisher Scientific		6163.61
8/4/2022	Dell 24 Monitor E2422HS	Dell Service Sales		5858.65
8/4/2022	TS Forma FDE Series ultralow temp	Fisher Scientific		13852.62
8/4/2022	ThermoScientific 2000c Nanodrop	Fisher Scientific		17227.01
8/4/2022	TS Barnstead Genpure prowater purifier	Fisher Scientific		8896.95
8/4/2022	Yamato large cap lab sterilizer/dryer	Fisher Scientific		14812.00
5/13/2022	MiniSeq System	Illumina, Inc.		51480.00
6/14/2022	Viable Cell Starting Kit	Logos Biosystems, Inc		609.80
6/14/2022	Microbial Cell Counter	Logos Biosystems, Inc		19950.00

To date, manufacturer specialized equipment training has been provided on Matlab Campus Wide Suite, Illumina MiniSeq System, and the Microbial Cell Counter, which has been facilitated with both students and faculty users. The specified equipment as detailed above, will or has been utilized for research experiences and classroom teaching in the manner as stated in the proposal of the initial application documentation (see below).

Yamato SM-820 Autoclave: The autoclave will be used to autoclave solutions, glassware, any unsterilized tubes or tips, and biohazardous waste. The current Yamato SM-310 autoclave possessed by Bennett College has a small capacity of only 32L; therefore, an autoclave with a higher capacity, such as ~80L, will allow us to sterilize waste more efficiently and the smaller autoclave can still be used for smaller tasks such as in the preparation of reagents or sterilization of small objects.

Thermo Scientific™ MaxQ™ 6000 Incubated/Refrigerated Stackable Shaker Package and Clamps: This package includes a MaxQ™ 6000™ and a universal platform that will allow us to stack the newly acquired incubator with the MaxQ™ 6000™ already in house. One incubator can be used to store cultures for course-based research while the other incubator is used for advanced research projects conducted by faculty and faculty-mentored students. The included clamp kits will allow the incubators to hold flasks and plates of different sizes.

Stuart SI600 Shaking Incubator and Tube Racks: This incubator is will be used to prevent cross-contamination of samples that may result in the killing of multiple bacterial populations. For example, if bacteriophages, viruses that specifically target and kill bacterial cells, are used in the lab, it is necessary to decrease the chances of the bacteriophages from attacking and killing unintended bacterial populations. This small shaking incubator will allow students and faculty to

propagate bacteriophages in a separate environment from other bacterial populations. The stainless-steel tube racks are held to the orbiting platform by magnets allowing various tube sizes (e.g. 15 mL and 50 mL conical tubes) to be held in place properly.

Thermo Scientific/Fisherbrand Laboratory TS Forma FDE Series ultralow temp: One ultralow freezer (~-80oC) used to store temperature-sensitive reagents and biological samples for laboratory areas of the Microbiology Research Lab. The ultra-low temperature (ULT) freezer, with a temperature has a range typically around -80oC, beneficial for the long-term storage of bacterial cells, viruses, and temperature-sensitive reagents needed for experiments.

Icemaker flaker Scotsman: The ice maker will be specifically utilized for this lab space to ensure that students and faculty performing research within this lab space have enough ice to keep temperature-sensitive samples and reagents cold during experiments to avoid the degradation of important materials.

QUANTOM Tx™ Microbial Cell Counter: This image-based, automated cell counter can detect individual bacterial cells. The Quantum Tx cell counter cuts down on the use of reagents and materials used to count colonies or measure turbidity and in turn, cuts down on the amount of waste generated during laboratory experiments. Additionally, this machine will be used to help to save time during experiments. Culturing bacterial cells to count colonies requires days as opposed to using the QUANTOM Tx™ Microbial Cell Counter, in minutes. The cell counter also cuts down on the use of incubator space, which is often a commodity in microbiology research labs. Therefore, this piece of equipment will be utilized to aid in obtaining rapid, accurate, preliminary results.

Thermo Scientific™ Barnstead™ GenPure™ Pro Water Purification System: Water is the most commonly used solvent in the laboratory. Consistently high quality water is imperative to ensure reliable experimental results; therefore, the GenPure Pro Water Purification system, which produces type I ultrapure water, is requested to provide high level, quality water for a variety of laboratory needs including cell culture media, reagents, buffers, and other solutions.

Illumina® MiniSeq™ System: The MiniSeq system is a benchtop sequencer that is capable of small whole-genome sequencing, targeted gene sequencing, targeted gene expression profiling, and 16S metagenomic sequencing. This system will allow researchers to perform affordable in-house sequencing of multiple bacterial populations and strains. The 16S metagenomic sequencing, which sets the MiniSeq apart from less expensive Illumina sequencers, will be used for the identification of species while working with samples that contain multiple species. The MiniSeq system also comes with an onboard software suite, for creating sequencing runs, monitoring the run status (~17-32 hours), and analyzing the data. The suite also contains the BaseSpace Sequence Hub which is a cloud environment for next-generation sequencing data management and analysis.

Desktop Computers: Thirty-one Optiplex 7000 MFF Two of the computers are connected to research laboratory equipment (e.g., microbial cell counter, and sequencing machine) and dedicated to research purposes such as data storage, data analysis and graphing, literature review, and problem solving. The remaining twenty-nine computers will be housed in the Data Analysis

Computer Lab and used by students and faculty for the purposes previously mentioned. The computers will allow students involved in course-related research and independent research projects to access and analyze data sets using the MATLAB software. Each computer unit comes equipped with a micro-form factor processor, monitor, mount, keyboard, and mouse. The specifications for the computers are listed in the table below.

Table 2. Thirty-one Dell Computer Products Detailed from Dell Services Sales Orders in *Table 1*.

DELL Product	Quantity	Unit Price	Subtotal
Eaton Eclipse Personal - Surge protector - AC 120 V - 1800 Watt - output connectors: 6	4	12.00	38.76
Dell Pro Wireless Keyboard & Mouse - KM5221W	3	59.99	108.69
Dell MS116 Wired Mouse and KB216 Keyboard Bundle	28	47.98	811.44
Dell OptiPlex Micro All-in-One Mount for E Series Monitors	28	49.99	794.92
Dell 24 Monitor - E2422HS	35	269.99	5,858.65
Latitude 5520	3	3,032.29	3,156.60
OptiPlex 7000 MFF	28	2,222.85	27,652.52

Subtotal: \$38,421.58

Shipping &/or Handling: \$0.00

Estimated Tax: \$2,593.46

Total (USD): \$41,015.04

Matrix Laboratory (MATLAB) License: MATLAB® (The MathWorks, Inc.) is a general-purpose technical computing language and development environment that is widely used in scientific and engineering applications. A campus-wide license with unlimited access to ALL eligible MathWorks products (over ninety tools) by students, faculty, and staff is requested. This license includes: unlimited access to online resources such as MATLAB Online and MATLAB Drive; unlimited access to MATLAB Academy which provides an unlimited access to 16 online self-paced training classes; customer service support to aid in curriculum development; and unlimited access to MATLAB Grader to incorporate MATLAB assignments into your LMS. MATLAB has a plethora of tools including a variety of functions and tools that will enable the students and faculty of Bennett College to perform basic statistical analysis, big data analysis, computational modeling, and predictive modeling.

There have been no specific special circumstances regarding acquisition of any of the equipment.

At the time, students have been gathering preliminary data and performing data analytic methods

with the Dell computers and MatLab software. So far, other aforementioned equipment has been advantageously utilized for training, which has been included by the vendors as part of the initial purchase.

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