



# A Unique Opportunity for Undergraduate Chemistry Researchers to have International Impact in Science Education

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## ABSTRACT

Dr. Kanu at Winston-Salem State University (WSSU) has been working with a team of students and scientists to develop inexpensive microchemistry kits for science education in developing nations where resources are currently very limited. The ultimate goal is to provide laboratory kits to high school and first-year university students in Sierra Leone by training teachers to use the kits in their classrooms. In addition to standard labs that will help students understand basic chemical concepts, the experiments developed for this project will focus on the application of chemistry applicable towards practical knowledge relevant to the lives of ordinary people in developing nations. We are in the process of assembling sixteen lab activity kits ready for use in 2020. We have designed all lab activities to meet the West African Examination Council's (WAEC) curriculum standards for chemistry. To implement this project, Dr. Kanu has developed and introduced a maximum of six credit hours study abroad course (Study Abroad in Chemistry, CHE 2020) at WSSU. We will offer this course for the first time in spring 2020. Enrolled students will have the opportunity to travel to Sierra Leone and lead a workshop to train teachers who will in turn use the kits to teach in their classrooms. In addition, students will learn about the politics, history, and culture of Sierra Leone. Upon implementation of the project, we anticipate the kits to service between 200-500 teachers and students, covering approximately 50 schools in Sierra Leone annually. Successful implementation of the program will allow us to expand it to other English and/or Spanish speaking countries. We anticipate this service learning research will attract students from underrepresented groups and influence their engagement in STEM activities at WSSU and the broader community. This project aligns with the 2016-2021 WSSU Strategic Plan, Strengthening of Liberal Education in objective 1.6.

## CHEMISTS WITHOUT BORDERS MISSION

To solve humanitarian problems by mobilizing the resources and expertise of the global chemistry community and its networks.



## PROJECT GOALS

The Ongley-Myers Sierra Leone Chemistry Education Project (OMSLCEP) is seeking to provide education in chemistry which people can apply to their daily lives and use to teach others to make improvements in the country in which they live.

## PROJECT OBJECTIVES

- Develop lab experiments that align with the West African Senior Secondary School Certificate and Exam (WASSCE).
- Produce labs that are green, low tech, inexpensive and applicable to the lives of ordinary Sierra Leoneans.
- Develop and produce student and teacher lab manuals.
- Assemble and ship micro chemistry kits to Sierra Leone.
- Collaborate with other Universities in Sierra Leone to conduct a teacher training workshop.
- WSSU students to use experience and develop a new lab experiment from scratch.



## LABORATORY EXPERIMENTS CREATED

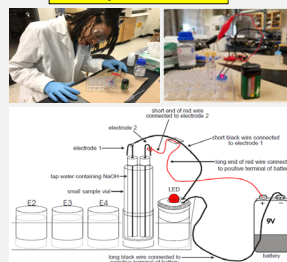
Laboratory Experiments	Example Chemicals/Reagents
Acid-base titration	Vinegar and sodium hydroxide
Column chromatography	Grape drink and isopropanol
Paper chromatography	Water and ink
Saponification	Butter and sodium hydroxide
Double displacement reactions	Several ionic compounds
Electrolysis	Water and sodium hydroxide
Flame spectroscopy	Several metal chlorides
Kinetics	Bleach and food dye
Heats of reactions	
Water turbidity	Mud water
Water treatment	Water, alum, and moringa seeds
Quantitative chemistry	Copper wire and other chemicals
Back titration	
Chemistry of cement	Cement, water, and other chemicals

Winston-Salem State undergraduate researchers has created, test, and/or improve laboratory experiments.

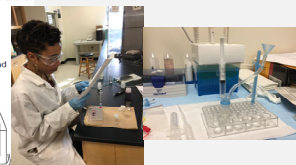
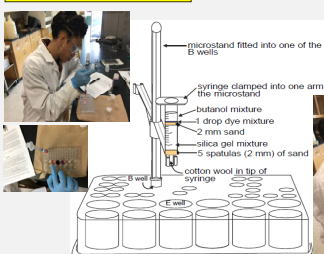
### Performing Titrations



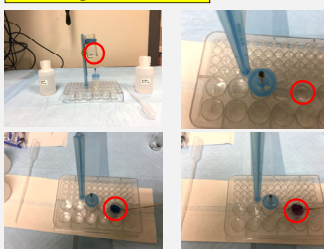
### Electrolysis of Water



### Column Chromatography



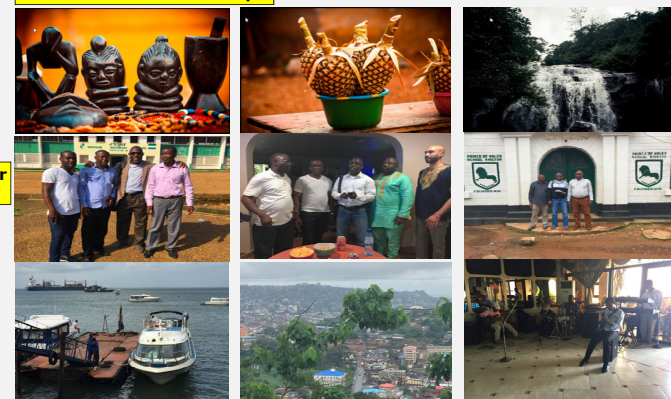
### Performing Back Titration



Winston-Salem State University undergraduate researchers presenting their work at Scholarship Day and ACS Poster Vendor Night, Greensboro.



### Sierra Leone Site Visit Trip.



## CONCLUSIONS

- From 2015 to now, we have written 16 labs that are still undergoing editing. Lab testing will continue in summer 2019 in preparation for CHE 202 in spring 2020.
- We received an international grant from the American Chemical Society (ACS Global Innovation Committee) and specific donations from Hopevale Church in Michigan and other individual donors (Dr. Ronda Grosse). As I already specify earlier, more funding is required for project to continue.
- We have establish a study abroad course for student support of the project. Implementation is on the way.
- This is a service learning research project we have developed for students and we anticipate it will attract students from underrepresented groups and increase their engagement in STEM activities at WSSU and the broader community of scientists

## REFERENCES

- V. Sedwick, R. Grosse, M. de F. Fernandez, J. McMahon, A. B. Kanu. Mobilizing Chemistry Expertise to Solve Humanitarian Problems Volume 2, Chapter 2: Developing Microchemistry Education Kits for Sierra Leone. ACS e-book Series 2017; 1268; 5-19.
- E. T. Tyokumba. Does Science Education in Developing Countries Really Counts? Bulletin of the Ecological Society of America, October 2010, 432-437.

## ACKNOWLEDGEMENTS

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