

A TEACHER-TRAINING WORKSHOP TO PROMOTE INQUIRY IN HIGH SCHOOL SCIENCE EDUCATION IN GHANA

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Science and technology are driving forces of every nation and as such the development of a nation will depend largely on a scientifically literate and competent society. For this reason, children, right from the basic school, have to be properly trained in science. Science also has to be experimental in order to stimulate and sustain students' interest and enhance understanding of key concepts. This helps to develop a sense of curiosity and a desire for research among the students. Most students in Ghana however are deprived of such privileges due to lack of hand-on resources required to facilitate this training. Many high school teachers lack the necessary skills and know-how to develop, design and undertake age-appropriate inquiry-based practical science lessons for their students. This compels teachers to focus entirely on the theoretical aspects of science, sometimes leaving students confused and creating the erroneous impression that science is difficult and abstract. This eventually culminates in negative implications on the students' interest in science careers, possibly contributing to low scientist-to-population ratio in Ghana.

To begin to address this challenge, an interactive two-day workshop was organised for science



teachers in all public junior high schools (JHS) in Kumasi, Ghana's second largest city. This workshop, organised in partnership with the Ghana Education Service (the national regulator of

Figure 1 Participating teachers

education), focused on theoretical and practical aspects of important topics in the approved JHS science syllabus. To enable practical science teaching in resource-limited settings, the workshop focused on training teachers to become conversant with simple, low-budget resources in setting up science experiments, hence employing inexpensive materials to provide much-needed hands-on science education.

The first day of the workshop started with a key note address from a technical instructor on the importance of science education in national development and the need for experiment-based science education in basic schools. The speaker mentioned that every nation should invest appropriately in science to support innovative idea generation for development and that high school students must be given the maximum attention if this is to be realised. He further pointed out that science education is an active process and should be “minds-on” and “hands-on”. This, he said, would excite students’ interest in studying their environment and develop their inquiry, problem solving and creativity skills.



Figure 2 A demonstration of pH determination

Later that day, the teachers undertook simple but stimulating hands-on experiments on basic science concepts including DNA extraction (from banana), density determination, investigating how tooth decay, osmosis and diffusion and microbial cultures. This interactive session was led by trained undergraduate students from our university.



Figure 3 A student observing onion cells under the microscope

On the second day, a lecture was held on *The Cell*, followed by practical sessions on plant and animal tissue dissection and microscopic investigations. Teachers were also trained on using a home-built breathing model which provides a physical demonstration of diaphragm movement during inhalation and exhalation. Other experiments focused on preparing sodium chloride by neutralisation method, preparing pH indicators from pigmented flowers, salivary amylase detection, capillary rise measurement, and tests for reducing sugars.

Subsequent to the workshop, follow-up outreach activities were organised to selected schools to support teachers integrate the new knowledge into their teaching. This enabled over 300 students to obtain hands-on experience in the topics treated. This also provided an opportunity for our trained undergraduate outreach leaders to interact with high school students, answering questions and motivating the students about further education and university life.

Feedback from teachers and students showed that they found the outreach activities simple and easy to design in their schools. The beneficiaries further advised that the scientist-school partnerships should be continued and expanded to provide longer-term in-service training for science teachers. Teachers most especially were appreciative of the knowledge we had shared with them and hoped for more of it in the future. We believe that this successful programme will signal the beginning of new and innovative ways to improve upon practical science education at the high school level in Ghana.



Figure 4. The programme leaders with teachers and students of Maakro Junior High School in Kumasi, Ghana



Figure 6. Beneficiary students and their instructors



Figure 8 Tooth decay experiment



Figure 5. Program leaders and participating teachers of workshop



Figure 7. Poster presentation of our outreach programme at a conference



Figure 9. DNA isolation from banana