

Bridging the gap: introducing neuroscience to Ghana

Biochemical Society-funded outreach activities inspire students in Ghana into molecular bioscience careers.

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Although recent advances in neuroscience are helping to advance many areas of human life, there exists a tremendous disparity in neuroscience education and research between Africa and more developed continents including Europe and North America. This is perhaps partly due to underdeveloped student interests and the lack of local training opportunities in many parts of the African continent, examples of which can be found in Ghana. Ghana lacks competences in fundamental neuroscience education and research, and neurological health care. There is currently no neuroscience degree programme offered in the country, meaning that talented students have no local avenues to be trained in brain sciences. These shortcomings present serious challenges to the West African nation.

To establish the beginnings of addressing these challenges, we organised interactive and thought-provoking outreach activities for learners at all rungs of the educational ladder – from primary school, through high school to the university. During these events, lower primary school pupils were engaged with songs and poems about the brain, and fun-filled brain activity books which they coloured with pencils and crayons. The purpose of these activities was to encourage the children to start to learn about the brain, its functions, how it works, and how to protect it.



Figure 1. An instructor leading an outreach activity.

Upper primary and junior high school students also explored how some everyday activities (such as learning and memory) are controlled by the brain (Figure 1). For some classes, additional hands-on experiments were held to introduce students to the neuron, information transfer in the brain, and how to make brain models out of simple everyday materials in the environment. Brain models and a live brain were made available for illustrations (Figure 2). Copies of a “*Simple Neuroscience Demonstrations*” booklet were also donated to beneficiary schools and teachers to promote inquiry in high school biology classes in resource-limited settings. The booklet contains about a dozen simple but insightful experiments that introduce students to important neuroscience concepts, using basic tools and materials without the need for sophisticated laboratory equipment. Reading materials on brain health were also donated to school libraries for future use (Figure 3).



Figure 2. Memories from the neuroscience outreach in Ghana. (A) An outreach instructor with face partly hidden behind a teaching model. (B) The outreach team poses for the camera with a group of beneficiary teachers and pupils. (C) A pupil learning about brain functions in a workbook. (D) The presence of a live mammalian brain was a major focal point at the outreach events. (E) An instructor explains brain functions to participants.

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Additionally, senior high school students were engaged with interactive discussions about important brain functions such as learning and memory, the neuronal effects of aging, and late-life brain disorders. Students enjoyed the discussions, and asked very interesting questions. For example, a student wanted to know the possible link between menopause and dementia, because to him, forgetfulness in old age is often blamed solely on menopause. Others sought to understand whether being a scientist makes one learn “too

hard” and become antisocial in the process. We made attempts to demystify such myths and beliefs.

At the university, we were fortunate enough to gather undergraduate students in biochemistry and other biological sciences from four different universities at one event! Because neuroscience is full of career opportunities for students with bioscience backgrounds, we took advantage of this opportunity to introduce students to prospects in neuroscience and related molecular biosciences across academia, industry and health. Leaflets on neuroscience careers were given to participants. Beneficiaries were enthused about the presentations; especially the aspects that explained the branches of neuroscience that bioscience graduates could pursue further studies in.



Figure 3. Donation of outreach materials to a school headmistress.

Importantly, to ascertain the impact of the outreach visits, we asked high school and upper primary students to answer the same set of questions (developed from the content of the day’s activities) before and after the outreach programme. Interestingly, remarkable improvements in test performance were recorded, suggesting that the outreach activities helped to improve student knowledge and understanding about the brain.

Furthermore, a survey on student attitudes and perceptions about scientists and scientific careers also showed improvements when same questions were asked before and after the events. This outcome indicates that the outreach activities helped to clarify negative perceptions about science, and demonstrated that scientists hold indispensable roles in helping to build better societies. Feedback from the events was overwhelmingly positive. Students, teachers and outreach instructors gave very positive responses about the activities (Figure 4). For example, a teacher said *“We are very impressed with your coming...the students now know effective ways of keeping their brains sharp. We hope this improves their performance.”*

In summary, a first attempt to introduce neuroscience to Ghanaian classrooms helped to enlighten students about the brain, its functions, and careers in neuroscience. As organisers, we were thrilled about the interest, engagement and participation the events enjoyed. From the feedback we have had, we believe that the outreach events demonstrated to beneficiaries that science is fun and full of amazing opportunities: it is neither boring nor “geeky”. In fact, teachers and students insistently requested that we visited often, to help provide them with longer-term support. Through our interactions, we realised that many science teachers lacked competence in practical laboratory skills, which hampered their abilities to effectively facilitate hands-on training for students. We are therefore making future plans to strengthen our outreach partnerships with schools, such as organising workshops to train teachers in basic laboratory and research skills, in order to equip them to handle practical bioscience topics better.



Figure 4. The broad smile on the face of this student clearly signifies her experience.

We are hopeful that the success of this outreach programme will catalyse the development of longer-term planning and support for neuroscience and related sciences in Ghana. Ultimately, we expect these interventions to culminate in helping to improve bioscience education and research in Ghana and possibly across Africa.