BioSpark Project Report

Project Overview

The BioSpark project, funded by the Biochemical Society's Diversity in Science grant, provided a four-week biochemistry course designed to engage and inspire gifted students from socioeconomically disadvantaged backgrounds. Hosted at Dublin City University (DCU), this program introduced students aged 10-12 to biochemistry through dynamic, hands-on sessions. Each week explored a different foundational topic in biochemistry, such as ecological systems, cell biology, biomolecules, and bioluminescence, fostering both curiosity and understanding in a supportive university environment.

The overarching aim of the program was to address the underrepresentation of disadvantaged students in STEM fields, offering early exposure to biochemistry concepts in an interactive and approachable way. Classes had between 17-20 students in each group all attending from local schools. Students were nominated to attend by teachers from their schools. Teachers were provided with specific criteria to use when identifying students to nominate, which included:

- Living in an area of concentrated disadvantage
- Little or no tradition of educational attainment in family
- Socio-economically underrepresented at third level
- Low family income

Weekly Activities and Learning Outcomes

Week 1: Introduction to Biochemistry and Biomolecules

Students began by learning what biochemistry entails and its importance in understanding life at a molecular level. Activities included exploring atomic structure and bonding, followed by hands-on demonstrations illustrating the functions of carbohydrates, proteins, lipids, and nucleic acids (DNA & RNA). Students extracted DNA from fruits, sparking excitement about molecular science.

Week 2: Photosynthesis, Respiration, and Microscopy

In the second week, students explored the biochemical processes of photosynthesis and cellular respiration, learning how these processes power life on Earth. They examined plant and animal cells under microscopes, comparing key cellular structures. They also learned about chlorophyll and it's role in photosynthesis, and the colours they see in leaves. Outdoor activities included setting up pitfall traps to capture small organisms for observation, connecting biochemistry with ecological studies.

Week 3: Ecological Biochemistry and Symbiotic Relationships

This session focused on biochemistry's role in ecosystems. Students studied the carbon cycle and energy transfer among organisms, examining how biochemical pathways drive ecological balance. Through scavenger hunts and pitfall trap observations, students identified species and discussed how biochemistry underpins symbiotic relationships and conservation efforts. This session reinforced the practical applications of biochemistry in the environment.

Week 4: Bioluminescence and Pyrocystis Fusiformis

The final week showcased biochemistry's captivating potential by introducing bioluminescence. Students observed live *Pyrocystis fusiformis* samples under microscopes, witnessing these organisms emit light—a hands-on demonstration of chemical reactions within bioluminescent organisms. This activity was met with excitement and curiosity as students observed how biochemistry can explain such intriguing natural phenomena. Discussions covered the ecological functions of bioluminescence and its applications, offering a memorable conclusion to the program.

Outcomes and Feedback

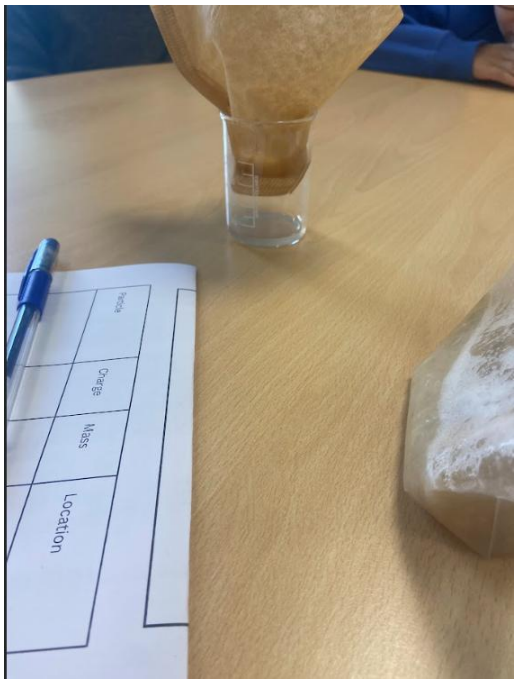
The BioSpark program successfully met its objectives, with feedback indicating significant improvements in student engagement and understanding. Pre- and post-course surveys showed strong increases in knowledge across all biochemistry topics, especially bioluminescence and cell biology. Students gained confidence in describing complex biochemical processes, and many expressed newfound interest in pursuing STEM fields in the future. The feedback from teachers and parents highlighted increased enthusiasm for science, particularly stemming from the hands-on, exploratory approach.

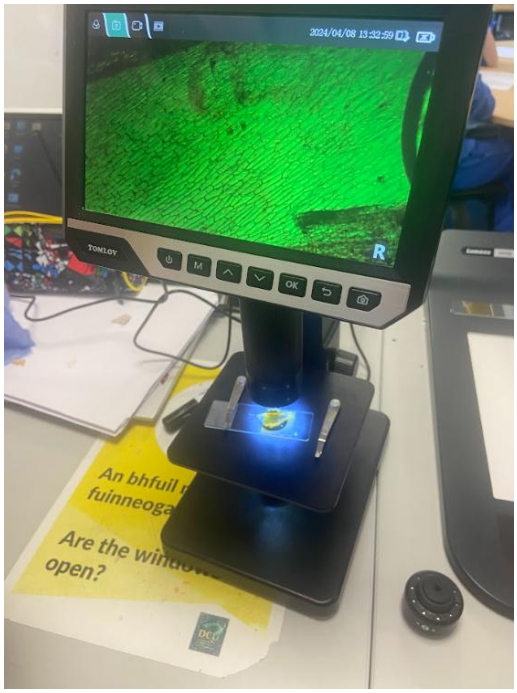
Future Plans

Due to the success of BioSpark, plans are underway to expand the program and reach more schools across Dublin, especially in underserved areas. We aim to develop detailed lesson plans and modules, allowing teachers in participating schools to continue exploring biochemistry topics with their students. We also hope to offer follow-up courses that build on this introductory program, providing students with ongoing exposure to advanced STEM concepts.

This program underscored the impact of accessible, engaging science education for underrepresented students. The Biochemical Society's support has been instrumental in fostering diversity in STEM and enabling us to continue inspiring the next generation of scientists.

Some Images from the Classes

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