

# Report for University Curriculum Advisors

Exeter iGEM 2019

We are a bioengineering research group from the University of Exeter taking part in a ten week research project for the international iGEM (International Genetically Engineered Machine) synthetic biology competition. iGEM encourages multidisciplinary teams from across the world to collaborate and innovate to solve some of the world's biggest challenges. As a team we have agreed that earlier exposure to concepts found in the social sciences would have been extremely beneficial to research such as this. Therefore we would like to encourage the integration of social science into STEM course curricula.

This year the team have been looking to tackle the problem of microplastic pollution in our oceans. Our aim is to develop an enzyme-based microplastic filter that can be integrated into washing machines to trap and degrade plastic fibres that have been released from synthetic clothing during a washing cycle. Microplastic pollution, 35% of which originates from the washing of synthetic fibres, is an issue at the forefront of environmental conservation and protection. Both our food sources and a predicted 80% of drinking water contain microplastics, which are now making their way into the human body. The effects of this are as of yet unknown, but are predicted to play a huge role in the future of medicine.

To better understand the issues that might influence or affect the development and design of our research, emphasis is placed on the importance of the social and environmental context of the project. Within the realm of iGEM this is termed Human Practices. This aims to integrate social science and the governance of science, technology and innovation to gain a better understanding of how our research would be received in society, industry and the wider science community. We have found this part of the project to be incredibly beneficial to us as scientists, to put our research into a more comprehensive context and to think deeply about whether it is beneficial to the world. It has also helped us to analyse societal pressures and influences on science in general; and as such we have found it an interesting and integral part of our research which will be heavily applicable to any future industry we join, whether that be in scientific research or private industry.

Without the iGEM experience, our conventional STEM education programmes have not, thus far, equipped us for the wide-reaching application of science beyond the lab. It has been made clear to us that scientists can be unaware of the context of their work, and can therefore find that potential solutions come across unforeseen barriers, preventing the proliferation of applicable research when it encounters other industries with different motives.

We believe that the integration of social science into STEM subjects is crucial for the development of both students and society as a whole. A greater understanding of the multidisciplinary nature of science will help to tackle the stigma surrounding social sciences, and will highlight its importance and relevance to every research project. The topics we believe are really crucial to the development and integration of science, and should be implemented into STEM courses are:

- Considering the responsibility of different societal groups when designing and implementing solutions for varied world problems
- Analysing the impact of economic value vs social or environmental change
- Highlighting the influence of culture on science and identifying the systemic barriers that prevent the impact of scientific research
- Analysing the potential impacts and consequences of all aspects of research
- Reflecting on the direction or development of scientific solutions through different lenses, e.g. gender, power, economic and political.
- Diversification of scientific research

We have found the social sciences to have an invaluable influence on our research. It has prompted thought-provoking conversations and a deeper understanding of how scientific research best integrates into society. We hope that you will consider equipping your students in this way.