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Stage 6 Science: Investigating Science

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ABE Master Teacher Fellowship Program

AMGEN® Biotech Experience

Scientific Discovery for the Classroom

The curriculum projects designed by the 2020–21 ABE Master Teacher Fellows are a compilation of curricula and materials that are aligned with the Amgen Biotech Experience (ABE) and prepare students further in their biotechnology education. These projects were created over the course of a 1-year Fellowship in an area of each Fellow's own interest. Each is unique and can be adapted to fit the needs of your individual classroom. Objectives and goals are provided, along with expected outcomes. Projects can be used in conjunction with your current ABE curriculum or as an extension.

As a condition of the Fellowship, these classroom resources may be downloaded and used by other teachers for free. The projects are not edited or revised by the ABE Program Office (for content, clarity, or language) except to ensure safety protocols have been clearly included where appropriate. We are grateful to the ABE Master Teacher Fellows for sharing their work with the ABE community.

If you have questions about any of the curriculum pieces, please reach out to us at ABEInfo@edc.org. We will be happy to connect you with the author and provide any assistance needed.

AMGEN Curriculum Project: Aidan Johnson
Stage 6 Science: Investigating Science

Module 6 & 8 Technologies, Science & Society | **Stage 6** |

Duration: 5 weeks

Unit Overview

Context

Humans' desire to solve problems and answer questions about the world leads us to create and develop technologies to remedy our lack of understanding about phenomena.

Science has played an important role in developing new technologies and consequently influencing social developments such as agriculture, medicine, industries, and communications. Creating and developing technologies follows a cycle. The scientific understanding of the physical, chemical, and biological worlds enhances technological developments, while at the same time new technologies deepen the knowledge and understanding of concepts and principles that rule phenomena.

The interdependence between science and technology helps us develop tools to improve the wellbeing of humans and creates a more sustainable future.

Content Focus

The rapid development of new technologies has enhanced industrial and agricultural processes, medical applications, and communications. Students explore the dynamic relationship between science and technology where the continuing advancement of science is dependent on the development of new tools and materials. They also examine how advances in science inform the development of new technologies and so reflect the interdependence of science and technology.

Those who pursue the study of science have created processes, tools, and products that challenge and influence society and some of its belief systems, ethics, and societal norms. In response, society debates and regulates science in order to prevent harmful developments and unacceptable outcomes, and to allow for new and beneficial products, processes, and ideas. Science also can be affected by society as well as governments, industry, economic interests, and cultural perspectives. Students explore the impacts of ethical, social, economic, and political influences on science and its research.

Teaching, Learning, and Assessment (with Embedded Resources)

Topic: A Continuous Cycle

Inquiry question 1: How have developments in technology led to advances in scientific theories and laws that, in turn, drive the need for further developments in technology?

	Stage 6
Knowledge and Understanding:	• Using examples, assess the impact that developments in technologies have had on the accumulation of evidence for scientific theories, laws, and models, including: – X-ray diffraction and the discovery of the structure of deoxyribonucleic acid (DNA) • Using examples, assess the impact that developments in scientific theories, laws, and models have had on the development of new technologies, including: – The discovery of the structure of DNA and the development of biotechnologies to genetically modify organisms
Learning Intention:	**I am learning** how technology has played an important role in scientific understanding, and vice versa. **I can** assess the impact that science and technology have had on our society.
Success Criteria:	**I can...** • Outline a number of technologies that have led to scientific discoveries • Outline a number of scientific principles that have allowed for the development of new technologies • Explain the cyclic relationship between science and technology • Assess the impact that science and technology have had on each other and on society

Students Engage:
Students take a stand. Students are presented with a series of scenarios (Slides 2–8), and they need to decide if they consider the scenarios to be safe or unsafe.

Students Explore:
Students explore X-ray crystallography using laser and wire models (Modelling Photo 51).

Students Explain:
Students work through the "X-ray crystallography to DNA" scrollable on LabXchange.

Students Elaborate:
Students create a scaled timeline of biotechnology developments (both technology and scientific knowledge).
(X-ray crystallography→Structure of DNA→Human genome project→Genetic sequences of diseases→CRISPR-Cas9→Treatment of genetic diseases)

Students Evaluate (AOL, AAL, AFL):
Students assess the impacts of science and technology (use the scaffold on Slide 34).

Additional resources and activities

Students watch The Secret of Life (49:01 Available on Clickview), which explores the journey of the discovery of DNA.
Additional reading for teachers (or students): The Black Box of Biology by Michel Morange