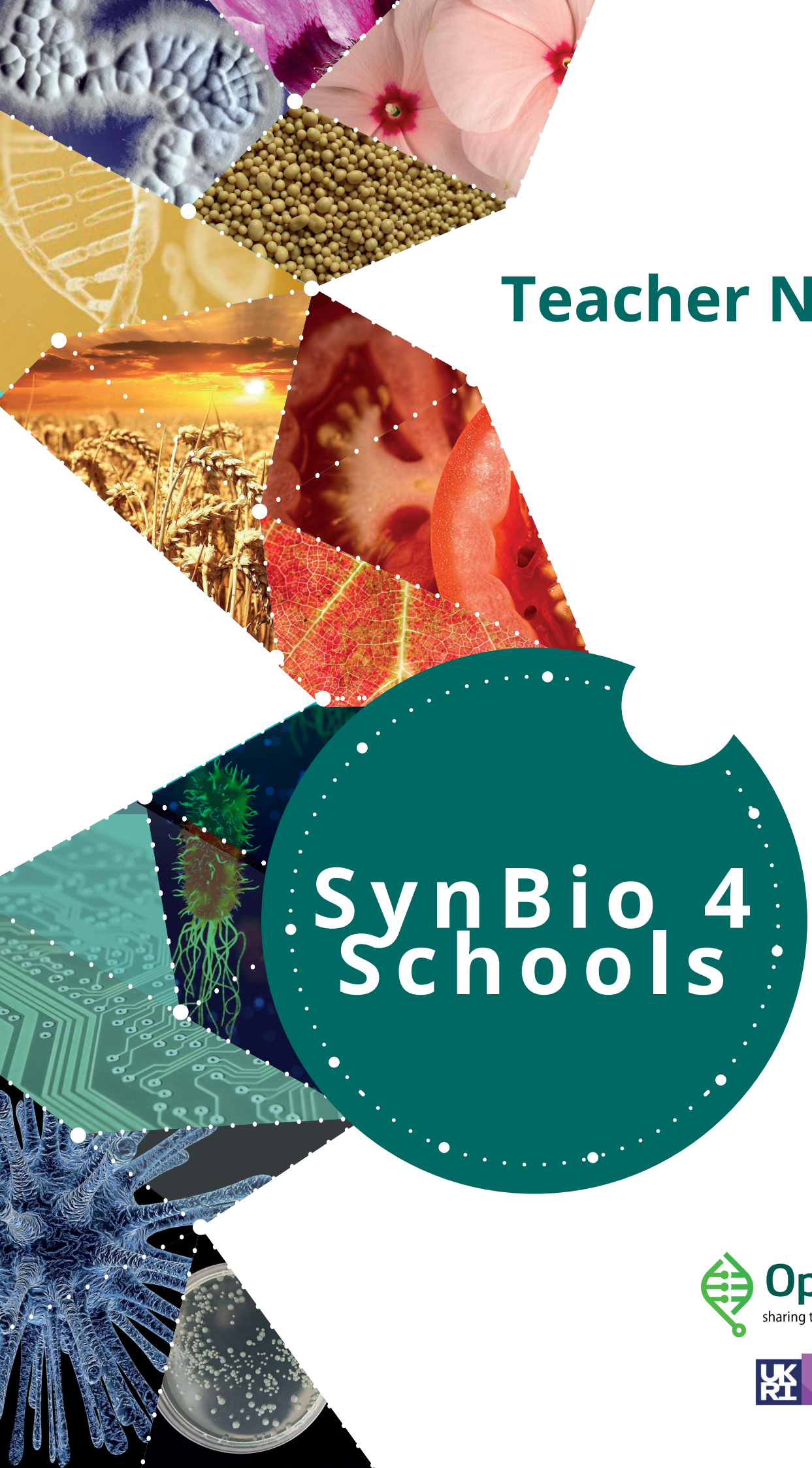

Teacher Notes

SynBio 4 Schools

OpenPlant
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UKRI Biotechnology and Biological Sciences Research Council

SynBio 4 Schools

SynBio 4 Schools is an OpenPlant project that aims to inspire and educate the next generation of biological engineers.

SynBio 4 Schools

Teacher briefing document

Resource age range - years 10 to 13.

Introduction

These resources would be suitable for extension activities for GCSE and post-16 students, but also overlap with some specification content in GCSE and Level 3 qualifications.

Each resource constitutes one significant main activity with additional support materials and reading. It would work best if students were given the pre-reading to do prior to the lesson or session. In some of the sessions significant technical support is required for the practical element. The time required for each session will depend on the students, the amount of pre-set up undertaken and the teacher input. The times given are indicative only.

Key Outcomes

- To understand better the emerging and important field of Synthetic Biology.
- To appreciate the multidisciplinary approach required in this field.
- To know some of the key outcomes of the use of Synthetic Biology.
- To be able to explain how Synthetic Biology improves current processes and systems.

Materials

The SynBio 4 Schools booklet gives extensive details on material requirements for each session.
Some copying is required, and all resources needed are at the rear of the booklet (Supplementary Materials - catalogue page 27).
There are extensive practical requirements for one session that will need preparation and sourcing (Generating Electricity from Plants - catalogue page 8).

Links to example qualification specification

Key Stage 4

AQA GCSE Combined Science: Synergy
4.6 Inheritance, Variation and Evolution 4.6.2.4 (4.6.2.5 in Biology Single Science Spec).
OCR Gateway Combined Science A
B6 Global Challenges B6.2b, c & d (B6.2a-g in Biology Single Science Spec).
Edexcel GCSE Combined Science
Biology Topic 4 Natural Selection and Genetic Modification 4.10, 4.11 & 4.14 (4.9, 4.12 & 4.13 in Biology Single Science Spec).

Post - 16 relevant qualifications

AQA A Level Biology 3.8 The control of gene expression: 3.8.1, 3.8.2, 3.8.3, 3.8.4.
OCR A Level Biology Module 6 Genetics, evolution and ecosystems: 6.1.3, 6.2.
These resources would also provide excellent extension activities to any lesson related to the structure and function of DNA, electrical circuits, or to viruses and their structure and form.

Teacher notes for specific sessions

Building DNA Circuits
- construct gene circuits to solve problems (page 8)

Aim: To learn how standard DNA components can be used to build circuits with applications in industry and biotechnology.
Time: 1hr (time can be reduced if more pre-prep done for students).
Delivery: Practically simple, but students may need support in understanding the DNA circuit principle.
Notes: Pieces could be pre-cut and laminated for re-use. Teachers could run through one example to help students understand the principle.

Generating Electricity From Plants
- build a plant microbial fuel cell (pMFC) (page 12)

This practical also overlaps with aspects of the GCSE and A-Level Physics and Chemistry specifications e.g. Circuits, Energy Production and Electrode Potentials.

Aim: To demonstrate the principles of how plant microbial fuel cells (pMFC) can be used to generate electricity.
Time: 1- 1.5hrs to build the pMFC if all materials pre-prepared. (Follow up experiments could take 1hr to undertake).
Delivery: Set up of the equipment will require technician support. Follow up investigations on built pMFCs would be easier to run as a group practical.
Notes: This would be a good activity for students as part of a longer-term STEM Club or group. Pre-built pMFCs would be ideal for classroom activities relating to curriculum areas.

What Can Viruses Do For You?
- build virus structures (page 17)

Aim: To show how virus structures are being harnessed in research and industry for various applications.
Time: 1 hr for the full activity, although this could be reduced if students had to undertake research before the lesson or session.
Delivery: Students from a range of year groups should be able to engage with this task as it requires them to problem-solve rather than have extensive biological knowledge of virus structure.
Notes: Range of craft materials required, students can be given specific briefs or allowed choice in the problem they are working on.

Natural Product Synthesis
- match organisms with natural products (page 21)

Aim: To understand what synthetic biology is and how it can be used for natural product synthesis.
Time: 15-60mins This could be done as a full lesson, or students could be asked to do it as an extension activity or homework and their responses could be discussed in lessons.
Delivery: Accessible to most GCSE Single Science and post-16 students, scaffolding of task can be adjusted as needed. Limited resource requirements.
Notes: Access to a computer room or the internet would allow further research as part of this task. It could be extended by asking students to present on one example each.

Additional links and resources for all sessions are published in the SynBio 4 Schools booklet. These are correct at the time of publication of the resources but should be checked prior to sharing with students to ensure they are still active and current.

Biotechnology and Biological Sciences Research Council

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OpenPlant would like to thank all those who contributed to the production of the SynBio 4 Schools booklet. Special thanks to Miss Camilla Stanton who played a key role in the production of this booklet.

saw
science art writing

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