**Sixth Form: Discovering Epigenetics – building a model**

Approximate timing: 40 minutes

Required resources: PowerPoint presentation, lesson plan, fact sheet, challenge sheet

This lesson will introduce students to the concept of science communication & public engagement. Using epigenetics as an example, students will have an opportunity to try and translate what they’re learnt and develop a resource that can be used to help teach others about the topic of epigenetics.

The lesson supports:

*AQA GCSE Biology*

4.6.1.4 DNA and the genome

4.6.1.5 DNA structure (biology only)

4.6.2 Variation and evolution

4.6.2.4 Genetic engineering

*EDEXCEL GCSE Biology*

3.4 Describe DNA as a polymer

3.5 Describe the genome as the entire DNA of an organism and a gene as a section of a DNA molecule that codes for a specific protein

3.13 Explain the term: chromosome

*OCR GCSE Biology*

B1.1 What is the genome and what does it do?

B1.2 How is genetic information inherited?

B1.3 How can and should gene technology be used?

*AQA A Level Biology*

3.4.1 DNA, genes and chromosomes

3.4.2 DNA and protein synthesis

*EDEXCEL A Level Biology*

7.2iv Understand that gene expression can be changed by epigenetic modification, including non-coding RNA, histone modification and DNA methylation.

7.2v Know that epigenetic modification is important in ensuring cell differentiation.

*OCR A Level Biology*

5.1.1 Patterns of inheritance

5.1.3 Gene technologies

Links to Babraham Institute research themes:

<https://www.babraham.ac.uk/our-research/healthy-ageing>

<https://www.babraham.ac.uk/our-research/epigenetics>

Links to Babraham Institute scientific services

<https://www.babraham.ac.uk/science-services/bioinformatics>

<https://www.babraham.ac.uk/science-services/sequencing-facility>

Babraham Bioinformatics - <https://www.bioinformatics.babraham.ac.uk/>

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| **Learning outcomes** | |
| All students will: | Be able to explain the purpose of epigenetics |
| Most students will: | Explain histone modifications and how they regulate gene expression |
| Some students will: | Develop a teaching resource to explain epigenetics to a non-science audience |
| Key word/s | Epigenetics, histones, nucleosome, DNA, methylation |

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| **Teaching notes** | **Student learning activities** |
| **Starter or ice-breaker activity** (5 mins)  DNA pop quiz – answers are below, refer to fact sheet for more in depth information   1. 50 trillion; 200 2. Adenine (A), Cytosine (C), Guanine (G), Thymine (T) 3. Epigenetics add marks to help decide whether a portion of DNA (gene) is switched on (expressed) or off (silenced) 4. Transcription; translation   Methyl (methylation is when a methyl group is added to alter gene expression). Acetyl (Acetylation is when an acetyl group is added to alter gene expression) | Slide(s) 2-7  Student actions – answer questions, can discuss in groups. |
| **Development** (10 mins)  Run through slides to give a background on:   * What epigenetics is * Why it is important to understand * How scientists can research epigenetics   The fact sheet is available for extended information; these work also as handouts. | Slide(s) 7-12  Student actions – engage and learn about epigenetics, answer questions where necessary. |
| **Principal Activity** (20 mins)  Explain the notion and the importance of sharing scientific information to non-specialist audiences (slide 13).  Introduce the challenge (slide 14). Students then split into groups or pairs to discuss possible ideas on how to make an epigenetics model. Then allow the students time to develop the model out of class. | Slide(s) 13-14  Students discuss ideas on ways that you could explain epigenetics to a non-science audience. Then use these ideas to develop their own models as homework.  Take home the challenge sheet. |
| Plenary (5 mins)  Ask questions on summary slide to assess learning and determine what objectives have been completed | Students answer question(s) on summary slide 15 to assess learning. |
| **Homework**  Suggested area of research or follow-up activity | Complete the model as homework. Send The models could then be used for a follow up lesson, where students explain how their resource would work.  Making Your Mark  Sweet DNA  [DNA origami](https://www.yourgenome.org/activities/origami-dna)  <https://bbsrc.ukri.org/engagement/schools/keystage3/discovering-dna/>  <https://bbsrc.ukri.org/engagement/schools/> |