



## Area of Study

### Skills, sampling

#### Overview

This Transition Unit is based on topical issues of genetics and biotechnology and helps students to relate theory to everyday applications. This in turn helps students to improve their awareness of the various industrial processes in their own locality. Students also enjoy this TU because it enablesthem to increase their level of laboratory skills and gain confidence through extensive practical work.

#### Related learning

Builds on knowledge of micro organisms from Junior Cert Science. Knowledge and skills gained will be useful when taking any LC science subject. Ethical issues link with unit 3 LC RE religion and science. Links with Business Studies with study of large scale biotechnology production. Linkwith Art and construction studies when designing and making DNA model. Link to mathematicswhen analyzing data from investigation. Link to home economics in food technology. Link to chemistry in industrial process. Link to English in preparing for debate.

#### Outline of the unit

- Students are introduced to the concept of genetics and the events that led to the discovery of DNA.
- Students research DNA structure and carry out a DNA extraction.
- Students visit a local biotechnology plant or invite a speaker into the class.
- Students prepare and deliver a presentation on the visit.
- Students design and make a poster to illustrate use of microorganisms used in biotechnology.
- Students carry out a range of biotechnology experiments, e.g. making silage, cheese, yogurt, tissue culturing.
- Students study large-scale biotechnology production.
- Students design and carry out a biotechnological investigation of their own choice.
- Students use news media analysis, web-based tools and dramatic representations to explore contemporary issues related to the biosciences.

## Outline of the unit

- Students research one of the following ethical issues involved in biotechnology and present the case for and against:
  - Stem cell research and use – advantages /disadvantages.
  - Cloning of humans/animals/plants
  - Cloning of humans for spare parts – for transplants.
  - Genetic engineering of seeds
  - Transgenic organisms – GM foods
  - Genetic screening – implications /in vitro/in vivo fertilisation
  - Animal genes in plants – a problem for vegetarians

## Breakdown of the unit (how timetabled)

Class contact time	27 hrs
Field work + research	18 hrs
Total	45 hrs

## Aims

*This transition unit aims to:*

- develop an understanding of genetics and the structure of DNA
- help students to gain proficiency in key lab skills
- provide learners with the opportunity to actively investigate a range of areas of biotechnology
- promote awareness of ethical issues that arise in biotechnology
- engage students in debate on scientific issues, like the applications of genetic technology and ethical issues posed by biomedical research.

## Learning Outcomes

*On completion of this unit learners will be able to:*

- define the term 'biotechnology' and outline reasons for its importance in today's world.
- participate in an informed discussion on some of the ethical issues posed by biomedical research.
- be able to present different perspectives and arguments in an ethical debate.
- design and make a model to illustrate the structure of DNA.
- link their scientific knowledge of genetics with its possible ethical, legal and social implications.

- describe one biotechnology process in detail
- explain the operation of a named biotechnology plant.
- design and carry out an investigation.
- manipulate laboratory apparatus with due regard for safety procedures.

## Key skills

## How evidenced

information processing	Collecting information on trip to plant. Evaluating information for use in presentation. Recording, analyzing and evaluating results from investigations. Using information gained from multimedia resources to support arguments in debate on ethical issues
critical and creative thinking	Designing and planning a biotechnology investigation. Critical analysis of ethical issues.
communicating	Oral presentation to class on visit to biotechnology plant. Presenting an argument in debate on ethical issues. Scientific communication when presenting the results of their investigation. Visual communication by poster presentation
working with others	Students will plan and carry out all practical work and research in small groups. Presentations and debates will be prepared in collaborative working groups.
being personally effective	Students will have to undertake research outside of class time and take responsibility for their learning, both individually and in groups.

## Learning approaches

Activity based learning, group work, discussion, debate, use of ICT, study visit, research, use of multimedia resources.

## Assessment approaches

Evaluation by teacher of lab skills demonstrated during practical work.

Completion of a DNA model.

Peer assessment of biotechnology investigation

Completion of folder of worksheets

Poster evaluation

Participation in and contribution to the class overall

## Evaluation methods

Student questionnaire. Followed by discussion between students and teacher.

## Resources

Teacher devised worksheets (possibly compiled into booklet)

[www.bbc.co.uk/learning](http://www.bbc.co.uk/learning)

[www.biotechnologyIreland.com](http://www.biotechnologyIreland.com)

<http://www3.georgetown.edu/research/nrcbl/hsbioethics/index.html>

[www.thehastingscenter.org](http://www.thehastingscenter.org)

[www.newscientist.com/channel/life/genetics](http://www.newscientist.com/channel/life/genetics)

[www.newbyte.com](http://www.newbyte.com)

[www.eibe.info](http://www.eibe.info)

[www.ista.ie/links](http://www.ista.ie/links)

[www.nal.usda.gov](http://www.nal.usda.gov)

[www.biozone.co.uk/links.html](http://www.biozone.co.uk/links.html)

<http://www.genome.gov/Pages/EducationKit/online.htm>

<http://www.geneticfutures.com/>

- Irish Times science section
- Window on Life CD available free from the Department of Trade and Industry, UK Order from [www.dti.gov.uk/publications](http://www.dti.gov.uk/publications) or from Admail 528, London SW1W8YT or phone 0044 845 015 0010 This has lovely animations for class use
- Science Spin Magazine – order from Science Spin, 5 Serpentine Rd, Ballsbridge Dublin 4
- Slainte magazine – available in shops
- Flashes of Brilliance-The cutting edge of Irish science By Dick Ahlstrom (this book and accompanying DVD highlights current research in Ireland including biotechnology. It will be sent to all schools in September)
- Film: The Race for the Double Helix (alternate title: Life Story) produced and directed for BBC Television by Mick Jackson. Excellent dramatization of the interactions among scientists leading up to the discovery in 1953 of the structure of the DNA molecule.