

Meet the Gene Machine

CPD Pack For Presenters

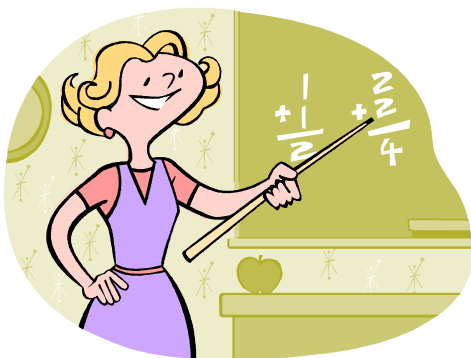


Meet the Gene Machine – CPD Pack for Presenters

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SECTION 1 – The CPD Workshop in Context (background information)

1.1 ABOUT THE TEACHERS



Different teachers will hold certain attitudes and opinions, formed by their previous experience and their differing ways of working. You should take these into consideration:

- ❑ For science teachers, September 2006 has seen a major shift in emphasis toward a curriculum that stresses the relevance of science to young people's lives. There have been a series of initiatives over the last 30+ years, and some teachers are weary of more change. However, many teachers regard discussion about moral issues a challenge, and will be grateful for some useful advice.
- ❑ Contemporary science needs clarifying. In the past, teachers have emphasised facts and learning, but with little recognition for opinions and implications.
- ❑ There may be a tendency, amongst some teachers, to approach this sort of work as an instructor rather than facilitator. Support is needed through this CPD to emphasise the role of the teacher in allowing children to express and discuss their own ideas, and to come to their own conclusions without being indoctrinated or cajoled into a specific way of thinking.
- ❑ Teachers will need to be aware that they have their own views and opinions and that they must suppress these in any discussion, often playing the 'devil's advocate'.
- ❑ The main consideration for trainers is that teachers will need reassuring that they can do this with their children. There is a tendency for teachers to imagine that their school/pupils would not be able to do these activities, or that they would become disruptive. Good planning and careful guidance through the activities will ensure success.
- ❑ Teachers should approach this work with a pilot group first, possibly starting with their 'best' group.

- ❑ Few teachers are used to working with others from different disciplines, e.g. Science teachers working with English teachers etc. Working with another teacher, not necessarily from their own department, will enable them to exchange ideas and compare methods that worked well.

In the event of comments from the teachers that 'this sort of work will just lead to disruption', or 'they won't learn anything', tell them that research (Solomon J. 2001) has shown that better standards occur when:

- ❑ Well-planned lessons offer challenging tasks that engage pupils.
- ❑ Oral and mental work is used to develop pupil's knowledge and understanding.
- ❑ Pupils are taught about the uncertainty of scientific evidence.
- ❑ The posing of non-routine problems encourages pupils to think for themselves.

The main learning objectives for this work are:

- ❑ To encourage thinking and making decisions based on discussion of the facts.
- ❑ To develop good listening and communicating skills.
- ❑ To be aware that there are alternative viewpoints and that it is acceptable to hold conflicting opinions.
- ❑ To work together in collaborative and competitive group talk.

SECTION 1 – The CPD Workshop in Context (background information)

1.2 About the Curriculum



The National Curriculum applies in all secondary schools in England, with compulsory elements throughout the 11-16 phase.

In **English** and **Drama** the aim is to encourage speaking, writing, and performance.

There have been major changes in the **science** curriculum recently. These changes are very relevant to this project. In the past, Science has been seen as a content laden, fact orientated subject, with little opportunity for discussions of topical or controversial issues. Teachers who did engage in this interesting approach recognised that they did so at the expense of preparation for the exams where factual information would be tested.

Since September 2006, the Programme of Study for Science has changed dramatically, with a greater emphasis on the *relevance* of science, the role of science in citizenship areas and implications of scientific discovery.

Perhaps the greatest challenge for teachers is in this area:

Applications and implications of science

Pupils should be taught:

- a. about the use of contemporary scientific and technological developments
- b. and their benefits, drawbacks and risks
- c. to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions
- d. How uncertainties in scientific knowledge and scientific ideas change over time and about the role of the scientific community in validating *these changes*.

As far as delivery is concerned, there are three 'exam boards' namely Edexcel, OCR and AQA that manage the different specifications (these used to be called syllabuses).

Each 'Exam Board' has a suite of specifications that offer schools a range of options. They are:

- Science
- Additional Science
- Additional Applied Science
- Applied Science (Double Award)
- Biology, Chemistry, Physics (Single award)

Few aspects of these specifications provide the opportunity to instigate discussion of a controversial and ethical nature, such as the 'Meet the Gene Machine' (MtGM) programme offers.

Generally, those schools that have opted to teach the AQA 21st Century Science suite demonstrate the most adventurous teaching commitment. The OCR scheme in contrast is very traditional.

Note: It would be diplomatic to avoid labelling teachers by curriculum as there is a considerable amount of polarity developing in the profession.

In summary this is what each exam board is providing:

	AQA	EDEXCEL	OCR	WJEC
Science	√	√	√	√
Add. Sci.	√	√	√	√
Add. App. Sci	√		√	
Bio/Chem/Phys	√	√	√	√
App. Sci. (DA)	√		√	√

AQA

The GCSE Criteria for Science requires greater emphasis on 'how science works'. The procedural content in the AQA specifications draws on the work done at the University of Durham on 'Concepts of Evidence' and includes: fundamental ideas about 'how science works'; observing objects, organisms and events; making measurements; designing investigations; presenting data; identifying patterns and relationships in data; societal aspects of scientific evidence.

The GCSE Science specifications (A & B) cover all aspects of a science education: evaluating evidence and the implications of science for society; explaining, theorising and modelling in science; and procedural and technical knowledge of science practice, though with some emphasis on the first aspect.

GCSE Additional Science has a greater emphasis on explaining, theorising and modelling in science whereas GCSE Additional Applied Science emphasizes the procedural and technical knowledge of science practice. The GCSE Biology, GCSE Chemistry and GCSE Physics awards provide extension material and, taken together, include the whole KS4 Programme of study.

GCSE Applied Science (Double Award) would be appropriate for students wanting to specialize in a vocational approach to science from the beginning of KS4. Also offered is an ELC (Entry Level Certificate) Science award for students not yet ready to take GCSE.

EDEXCEL

The design of this suite of specifications is based on all three approaches identified in the new GCSE Science Criteria: evaluating evidence and the implications of science for society; explaining, theorising and modelling in science and procedural and technical knowledge of science.

The suite offers a variety of different assessment models, allowing a flexible approach for centres, in terms of the balance of internal and external assessment.

OCR Gateway

This suite of GCSEs emphasises explanations, theories and modelling in science along with the implications of science for society. Strong emphasis is placed on the active involvement of students in the learning process and the specification encourages a wide range of teaching and learning activities. The suite offers the opportunity for Centres to use a co-ordinated teaching approach by subject specialists in Biology, Chemistry and Physics. The suite allows for staged assessment or for terminal assessment. Coursework is internally marked and externally moderated by OCR.

OCR 21st Century Science suite.

The content is based on a set of 'Science Explanations' and 'Ideas about Science' devised by the University of York Science Education Group as part of a project on Science in the 21st Century.

The suite emphasises the evaluation of evidence and the implications of science for society. The Additional Science, Biology, Chemistry and Physics specifications provide an emphasis on explanations, theories and modelling in science.

The Additional Applied Science specification offers the student a practitioner perspective, by focussing on the procedural and technical knowledge of

science practice. Activities in this suite develop a range of practical competencies in work-related contexts.

OCR Applied Science and Environmental & Land-Based Science

This specification has been designed to form a qualification which provides some of the technical knowledge, understanding and skills that students will need in the workplace or in further education or training.

The specification emphasises the procedural and technical knowledge of science practice. In order to understand the nature of Applied Science, students must actively experience science in a workplace environment. This can be achieved through a variety of approaches including work experience, links with local employers and research establishments, case studies and research.

GCSE Environmental & Land-Based Science is a wholly e-assessed qualification with optional units to be selected by the centre depending on centre location. Expectations are that the specification will cover aspects of agriculture (including animal husbandry), horticulture, land use in rural and urban environments and enterprise.

WJEB

The GCSE science specification provides the basic study of science and incorporates fundamental concepts and ideas whilst also including an understanding of the wider issues of science in society and scientific methods.

The Additional Science specification allows for further development of concepts and ideas, along with the introduction of new material that is fundamental to an ongoing understanding of science. The separate science specifications explore further scientific knowledge and concepts for those students wanting a wider range of knowledge and a more detailed understanding.

The Applied Science (Double Award) is about the science used by people in a wide variety of jobs. It is also about management of time and resources, working alongside others, and effective and unambiguous communication between scientists and with other people who are not experts.

SECTION 2 – Running Workshops

2.1 GETTING STARTED



What do you need at each session?

- ❑ Room set out in a cafeteria style. (Tables angled towards the front for a central focus, but allowing participants to face each other during the debate).
- ❑ Large screen at the front.
- ❑ Flip chart and pens.
- ❑ Data projector and laptop/PC (If available and easily accessible).
- ❑ A1 sugar paper / flipchart paper and pens for each table.

Things to think about:

There are a number of issues that teachers will need to address, in order to follow up the stimulus of the Gene Machine event.

These issues can be summarised as:

- ❑ Presenting facts on a complex, technical scenario i.e. that of human genetics, DNA and genetic diseases in a way that is relevant to people's lives.
- ❑ Organising successful group discussions in lessons that do not traditionally involve role play, debate or discussion of controversial issues.
- ❑ Dealing with these controversial issues and handling unexpected responses to the facts and opinions.
- ❑ Helping students to make informed decisions based on the information provided and discussed.

Teachers in some areas of the school curriculum are more experienced than others in this form of teaching and learning. There is an advantage, therefore, in allowing teachers from different disciplines to share their expertise and learn from each other.

During the CPD sessions, ask the teachers to work in small groups, ideally comprising science, humanities and English curriculum areas. This will probably be the first time that these groups of teachers have discussed working together on a project so it is essential that you stress the value of such a liaison.

While there will be considerable emphasis on directing the teachers towards a set procedure, it is acknowledged that this area of teaching is highly effective if teachers use their natural talents. The purpose of the CPD therefore will be to build on these skills and provide all participants with a selection of ideas and instructions, which they can take away and use in their own way.

Certain aspects will be standardised, such as the provision of good, accurate and accessible information about Human genetics and genetic disease. This information will take the form of teacher resources, (forming the background to the debate), and student's cards or sheets, that are simple to access but accurate in content. However, this information is not to be seen as the main focus for the activities, but to provide backup materials, for students and teachers to use if necessary.

The **main focus** should be on discussing the moral, ethical and social implications of these scientific discoveries, without being inaccurate or sensational about the content.

What are the main issues raised in 'Meet the Gene Machine'?

- Appreciating the salient details of how scientists would obtain a genetic profile from an individual
- Realising that although the technique is very precise, the 'evidence' from such a profile is still fairly unreliable.
- That there is no such thing as the 'gene machine' but that to profile the entire human genome at present costs £1 million+, with the prospect that this will fall to a mere £1000 in the near future.
- That there are many ethical and moral implications associated with this 'new' biotechnology, such as:
 1. The burden on doctors and parents in knowing the genetic trait of conditions that do not have any treatment.

2. Introducing parents to the dilemma of knowing that their unborn child is likely to develop a 'defect' in later life, and so posing decisions that affect the rights of the child.
3. Who has access to this information other than the parents? Implications to the Health service, insurance and possibly the police authorities amongst others.
4. Scientific discoveries can be very exciting but they carry with them a responsibility to use such knowledge with wisdom.

SECTION 2 – Running Workshops

2.2 THE SESSIONS

The CPD workshop is split into four sessions:

1. Introduction to the CPD session and materials
2. Using the teacher resource pack
3. Running Group Discussions in a classroom
4. Plenary/feedback

Synopses and timings of these sessions are as follows:

Session 1. Introduction to the CPD session and materials (15 minutes)

This session looks briefly at the materials produced for the teacher to explain the processes involved in DNA profiling. The short PowerPoint slide show is designed to provide just the basics without going into too much technical language. Science teachers should be familiar with most of the information on DNA, but the presentation would be vital for non-science teachers.

The PowerPoint slides can be complemented with information provided to you in your presenter resource packs.

The main objectives in showing these slides are;

- To ensure that teachers have the necessary background information to use appropriately in their follow up sessions.
- To enable teachers to see how they would use such information in their sessions.

There can be a short discussion with your group following the slides, to agree how best to use these information slides.

Session 2. Using the Teacher's Resource packs. (30 minutes)

This is the longest session, the aim is to allow teachers to look at and practice the use of the materials in the student's pack. There is insufficient time to use the materials as they would in the classroom. During this session you will carry out one activity from the teacher's pack with the teachers themselves to help them realize the ease of the activities and the fruitful discussions that can develop from them. Make sure to prepare the materials you will need to carry out the activities with your teacher group.

Session 3. Running group discussions in classrooms. (25 minutes)

This session will use the joint wisdom of the participants and the advice in the pack, to enable teachers to decide on their preferred methods of grouping children together and organising various forms of discussions and role play situations in their classrooms. You will try out one of the group discussion strategies that is recommended in the teachers pack and then allow feedback and discussion on its usefulness and adaptability to other topics and learning objectives.

Science teachers are becoming more experienced in this form of lesson organisation, but their colleagues in Humanities and English departments will have much more valuable experience to share. This session provides opportunity for teachers to support each other.

Session 4. Plenary (20 minutes)

This session seeks actualisation of the information provided during the session and feedback on the session. Allow teachers time to come up with 3 examples where they might use specific activities. Feedback from the group is essential; it's an opportunity to share recommendations and suggestions for any additional approaches. It is important to end the session with a form of positive summary (on Flipchart) of these comments, which may be collated and sent to schools after the event. Teachers should be sent away with the confidence that this will work well with their children.

SESSION 1: Introduction to CPD session and materials

Resources Required:

- ❑ PC/laptop with PowerPoint slide presentation available from: <http://www.uwe.ac.uk/fas/graphicscience/projects/genemachine/>
- ❑ Data projector and screen
- ❑ Trainer notes for slides.
- ❑ Handout of slides for teachers.
- ❑ Paper and pen/pencils for teachers

Objectives of the session:

This short session should provide teachers with an overview of the issues involved with genetic screening, testing and profiling. It is not intended that this session will be a teaching session in itself, but a brief exploration into what teachers already know, and what they need to know. It is important that teachers are reassured that they are NOT expected to be experts in this field, and that their role is one of directing discussions and creating the conditions that will enable their students to make informed decisions.

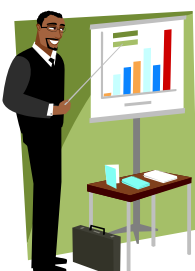
In the training/teaching pack, there are 4 forms of information that the teacher can make use of:

1. Suggestions for activities that teachers can adapt for their own classes. These activities are based on well-tested teaching methods, and fully support current school initiatives such as Citizenship and Assessment for Learning.
2. Information on curriculum links for each activity and the learning objectives for each activity.
3. Information files and suggested resources for each activity and a glossary of genetics terms they can refer back to whenever needed.
4. Tips on leading group discussion in classrooms.

Introducing the session:

1. Start the session with an overview of what is in the pack and briefly how it should be used.
2. Show (briefly) the PowerPoint presentation which is made available for presenter and teachers on the Meet the Gene Machine website: <http://www.uwe.ac.uk/fas/graphicscience/projects/events/meetthegenemachine.htm>.

NOTE ON SLIDES:



These slides contain useful background information. Teachers may find them useful for use in their own classrooms or for students to access; they are welcome to do so. The information here can be used directly as a preparation for the debate or other activities, or can be available for students to interact with as they discuss ideas.

SESSION 2: Using the Teachers CPD Packs

Resources Required:

- ❑ Copies of 'Ballot Box – Saviour Siblings' resource material (found in Teachers' Resource Pack, p27-32)
- ❑ Copies of Ballot Sheets (found in Teachers' Resource Pack, p33-34)
- ❑ A box to use as a 'ballot box'
- ❑ Pens for teachers
- ❑ Flipchart and pens

Objectives of the session:

This session will use the joint wisdom of the participants and the advice in the pack, to enable teachers to decide their preferred methods of grouping children and organising various forms of discussions.

How to run the session:

1. Start off by running a Ballot Box task. (See Teachers' Resource Pack p27 for details).
 - a) Get them to read the 'Saviour Siblings' resource sheet (p32 of Teachers' Resource Pack) and the 'background information sheet' (p31 of Teachers' Resource Pack).
 - b) Get them to discuss the questions at the bottom of the resource sheet in their groups.
 - c) Cut out the ballot sheets and hand them out (ensure each person has a different question to at least the other members of their group).
 - d) Instruct them to answer the question, fold the paper and pop it in the ballot box
 - e) Pull out the ballots and stick some answers up i.e. around the room or write them on the flipchart.
 - f) Ask how much of what they heard surprised them and ask them to express any ideas that were not voiced about the issues in the article. Are there some things there that they are not sure of?
 - g) Put these opinions, impressions and comments on the flip chart. Do not comment or correct anything at this stage.

(N.B. The purpose of this very quick activity is to allow a free expression of what the group already knows and is aware of. It will allow misunderstandings and the lack of knowledge to be shared without a feeling of insecurity!)

2. Stress that as illustrated in the previous exercise, it is clear that there are many interpretations of the facts and their possible implications. How do we get children to discuss this issue? What do we need to provide for them, and how do we organise their activities?
3. Ask the group to share their ideas about the usual ways in which they get groups to discuss issues and the problems they encounter with such methods. Before you run this session it is recommended that you read the sheet 'Common Problems with Group Work' (appendix 1, p17 in this pack) and think of possible solutions because these are some of the dilemmas teachers may express.
4. Ask them to generate a list of 'golden rules' for making group discussions work well. This is a brainstorming session and you can split the teachers into two groups and ask them to jot down their golden rules on a large sheet of sugar paper to share later with the rest of the group.

SESSION 3: Running Group Discussions in a Classroom

Resources Required:

- ❑ Print outs of the scenario page below for 2 or more groups depending on the number of total teachers
- ❑ Pens and paper

Objectives of the session:

The main objective is to allow teachers to practice the use of the group discussion techniques in the 'Tips for Organizing Group Discussion' (page 22 in their teacher's packs). There is insufficient time to use the materials as they would in the classroom. The purpose of this activity is different for the teachers than it would be if running it in their own classes. In this case the aim is to allow some of the teachers to apply new ideas for group discussions, with English teachers inputting their experience, while science teachers for example can help with the scientific terminology.

How to run the session:

1. Refer to 'Tips for Organizing Group Discussion' (page 22 in the teacher's pack)
2. Split the group of teachers into groups of 3 or accordingly, depending on the number of teachers you are working with, and allocate the 'listening triads' strategy to each group.
3. In each group one person takes the role of the talker, one of the questioner and one of the recorder.
4. The talker takes on a form of role playing and must explain the situation given in the scenario below. If asked questions that are not included in the scenario below please let them know they must create their own answers.
5. The questioner must ask questions in order to get the full picture of the scenario and to help the talker find a solution. See appendix 2 (page 18) of this pack for extra prompts.
6. The recorder must record their discussion and then relay the information back to the rest of the group once the activity is finished.
7. Give each group 15 minutes to discuss and then 5 minutes for each group to report back.

SCENARIO:

NOTE: This scenario is not designed to be used with students, only with adults. Teachers must use their own experience and wisdom if they want to use a similar activity in their own classroom.

You are fostering a boy called Gary. Gary has a history of anti-social behaviour and a history of abuse from his father, who is now in prison. His mother has left both the boy and the father and moved to another city. It is possible that Gary has a malfunctioning gene called MAOA. People with a malfunctioning MAOA gene often show violent and reckless tendencies, especially where they have a history of abuse.

There is a possible drug therapy trial starting soon and Gary has been identified as a possible participant if he has a malfunctioning MAOA gene; however this has not been confirmed.

On the other hand people with a malfunctioning MAOA gene, who are brought up in stable environments are less violent than the general population.

You are Gary's guardian, what will you do?

APPENDICES

APPENDIX 1

Problems encountered with group work:

The following problems are often encountered in group work and it is advised that you think and discuss ways of dealing with these sorts of situations before you run the workshop.

1. One or two pupils in each group are not contributing.
2. One group is stuck and looking quite awkward and embarrassed.
3. When you join the groups, they get self-conscious and stop talking.
4. You were hoping for an exploratory discussion of possibilities, but they seem to have reverted to banter and lists of known facts.
5. You have allowed 15 minutes for in-depth discussion, but they ran out of steam once they had aired the obvious issues in the first three minutes.
6. They seem to enjoy talking about the subject but when it comes to feedback, nobody wants to volunteer and you end up making all the running.

APPENDIX 2

Prompts for the Questioner in the Listening Triads activity

- Who is the talker?
- What is his/her family situation?
- What dilemma is she/he faced with?
- How much information does she/he have on the issue?
- How does she/he feel about it?
- How does her/his family feel about it?
- What does she/he still need to find out in order to resolve the dilemma?
- Who else can you refer him/her to? (Genetic Counsellors, local GP, social services etc)