

Students' Worksheet – Arguments in Science

Activity 1

Use the resource listed below to search evidence for and against 'genetically modified (GM) food being safe for humans to eat'. Take your side according to the evidence drawn. You will be required to present your argument to your group.

<http://www.beeep.ac.uk/content/392.0.html>

- What kind of evidence can be used to support an argument?
- Does all evidence support one point of view only?
- How can you prevent your argument from easily overthrown by your group members?
- What are the components of an argument?

Activity 2

(a) You may work in pairs to identify each of the following claims in worksheet A as in favor or against GM crops. Label them as for or against respectively.

(b) In addition, you should consider each of the following claims from the perspectives concerning with human health, environment or economics. Label them as HH, ENT, ECON respectively.

(c) Select evidence from worksheet B to support the relevant claim. There will be more than one piece of evidence for most of the arguments.

Activity 3

The class would be divided into 3 groups - supporters and opponents of GM crops as well as the adjudicators. The group in support of GM crops will present their claims and the corresponding evidences first. Then the opposition group may challenge the claims and the evidences. The supporter group can rebut. Then the whole process will go through once more with the opposition group. The adjudicators would comment on the performance of the supporter group and the opposition group and finally decide whether they would be supporters or opponents of GM crops.

Instructions

Pick up your role (group of supporters, opponents and adjudicators) in debate. Discuss with your group members to produce an agreed list. You may find some evidence not shown in worksheet B.

Each group of supporters or opponents will have 15 minutes to present their claims and evidences, and 5 minutes to rebut.

Adjudicators rate debaters' performance according to the following table. You will have 10 minutes to explain your rating and make your decision at the end of the debate.

Rate the evidence using a scale from 1 to 5.

1	2	3	4	5
very weak	weak	adequate	strong	very strong
need more evidence				adequate evidence

Worksheet A

Claims	For/ Against	Type
1. GM food is likely to cause human health problems.		
2. GM food is safe for humans.		
3. GM food will improve human health.		
4. The risk to the ecosystem is unclear so the precautionary principle should be used and GM banned until far more research is carried out.		
5. Introduced genes will cause serious damage to food chains and the ecosystem.		
6. GM will benefit the environment as less herbicide and insecticide need to be used on GM plants.		
7. We have an obligation to use GM to increase food supply and nutrition in poorer countries.		
8. Farmers will be able to make more money and sell cheaper food, therefore they should be allowed to use GM.		
9. GM technology gives too much control over the food supply to a few large multinational companies and should be publicly funded.		
10. GM has risks and benefits. Careful regulation is needed otherwise the environment will bear all risks and GM companies gain all the benefits.		

Worksheet B

Evidences	Type
A. No evidence of harm to human health from eating GM food exists	
B. In the US more than half of all soya and maize is GM	
C. Rats fed on potatoes which had been genetically modified to contain a plant toxin became ill	
D. GM rice has been developed to contain vitamin A	
E. Laboratory studies showed that Monarch butterflies had a lower survival rate when fed on GM plants	
F. Yields of GM cotton containing insecticide are greater than yields of non-GM cotton in the same conditions	
G. The cost of insecticide is the main expense for cotton farmers	
H. Insects gradually become resistant to most widely used insecticides	
I. Fields with GM plants that are herbicide resistant need less frequent herbicide spraying	
J. In the UK extensive trials have shown that herbicide-tolerant maize causes less damage to the environment than normal maize	
K. Trials for food safety of GM crops are usually carried out by the companies that have developed them, not by an independent body	
L. There is some evidence that GM food may be allergenic to some sensitive people	
M. Cows fed on GM soya and maize showed no GM genes in their milk	
N. It will be possible to develop GM plants that give better yields in arid or poor soil	
O. GM companies have decided not to market any GM crops in the UK at present	
P. Farmers will be able to spray fields with herbicide more often without damage to their crops	
Q. Plant pollen can travel large distances	
R. Almost no research has been done on developing GM plants that give better yields in arid or salty soil	
S. It is unclear whether wild plants which have crossed with GM crops will have an advantage or a disadvantage in the wild	
T. Large multinational companies have been given patents on many plant genes	
U. The GM variety of many crops gives an increased yield	
V. In the UK trials of GM crops showed that growing herbicide tolerant grapes and beet reduces the number of butterflies and bees in the area	
W. Insecticide spray always affects the areas surrounding the crops and runs off into rivers causing further damage	
X. The interdependence of all species of living organisms in an ecosystem means that the results of changes in one species may have unpredictable consequences	
Y. GM companies have been buying seed producing firms in Europe and in India	
Z. It is known that genes can spread from crops to related wild plants	

Credit: Angela Melamed, The Nuffield Foundation (2005) (Worksheet A and B)