

Young people's perspectives on socio-scientific issues using film and discussion

Padraig Murphy

BioSciences and Society,

National Institute for Cellular Biotechnology / School of Communications

Dublin City University, Dublin 9, Ireland

Suggested running head: Young people's perspectives on socio-scientific issues using film and discussion

Postal address: Padraig Murphy
School of Communications
Dublin City University
Glasnevin
Dublin 9
Ireland

Phone: +353 1 7007703

Email: padraig.murphy@dcu.ie

Supervisor: Dr. Miriam Judge, Brian Trench

ABSTRACT

Since Darwin, knowledge about biology has, for many, had a diminishing effect on ideas of identity and humanity's place in the world. In recent years biotechnology has raised further public concerns about 'playing God' and 'interfering with life.' School biology curricula however rarely open up the socio-scientific debate to allow students to explore such philosophical issues. This study aimed to identify connections biology students make between current accepted genetic knowledge, biotechnology and philosophical issues of society and identity. One major element of popular culture - film - was used in classrooms to engage students to explore the interfaces of biological knowledge, technology, society and identity. Ninety-seven students across eight schools watched a film about genetic disease exploring pre-implantation genetic diagnosis (PGD), eugenics, individual identity and science in society. Structured classroom debates and discussion were recorded and coded for three categories modified from Driver *et al's* (1996) youth representations of science - content, process and social enterprise. Following discussions, the social enterprise category was broadened further to include cultural perceptions of biology as part of identity and society and coded for five *themes*.

INTRODUCTION

To many people, humanity's relationship with the natural world has long been undermined either by our knowledge of biology or, in recent years, the technological application of this knowledge. Public concerns persist about biotechnology. Stem cell research, reproductive technologies, cloning, and genetically modification invoke perspectives on humanity 'playing God' or 'interfering unnaturally with life', threatening human dignity, rights, identity, and health as well as the environment. Future scientists, policy-makers, and citizens of Europe - the young - need to be aware of the full complexity of these concerns. Discussion models have been developed and studied that allow young biology students to engage in debate and information exchange in order to appreciate opposing viewpoints (Irwin, 2001; Kinchin, 2003; 2004, Millar and Osborne, 1998; Parker, 1998; Solomon, 1999) and issues of biology and identity (Kozoll and Osborne, 2004).

To understand how engagement and dialogue might best be developed for education, it is necessary to explore *what* young people think about biology and biotechnology *before* they engage in public rationalisation or debate. Cobern (1993), Driver *et al* (1996) and Aikenhead

(1996, 2001) have focused on how science students may encounter a different *culture* when entering the science classroom for the first time, and experiences of science very much depends on their worldviews and how the student-science cultures interact. 'Culture' within the context of this work can be described by Phelan *et al's* 'norms, values, beliefs, expectations, and conventional actions of a group' (Aikenhead, 1996, citing Phelan *et al*, 1991). Driver *et al* (1996) proposed three socio-scientific representations of the nature of science as young people may perceive it : (i) *science content*, that is laws, concepts and theories (ii) the *scientific approach to enquiry* - the scientific method - and (iii) *science as a social enterprise* which is the public and private encounters between scientists, the public and policy-makers. These have since become central representations for science-and-society educators, and have been modified by Sjøberg (Ødegaard, 2003). This paper has used young perspectives to broaden (iii) to include how science is intrinsically linked to the cultural and philosophical spheres: *science in nature-identity-society*.

One common way of facilitating discussion about biology in cultural and philosophical spheres is to represent fictional stories through drama (Ødegaard, 2003; Rose, 2003), given fictional media and literature's social influence (Weingart and Pansengrau, 2003). Narrative portrayals of genetic technologies provide a context with values connecting genes and society, and ask questions that academic, scientific and clinical accounts may not (Kalbian, 2003).

AIM

This study aimed to identify philosophical themes that 16-18 year olds construct when linking current genetic knowledge and biotechnology with society and identity issues using film and guided discussion around the drama's central characters.

METHOD

A reflexive method was employed interconnecting data collection and analysis to engage Irish Leaving Certificate biology students with the social and philosophical implications of modern biology. Structured discussion over two double-classes followed the screening of *The Gift* (1999), a film about pre-implantation diagnosis (PGD), combined with written exercises. Structured classroom debates and discussion were recorded and coded for categories modified from Driver

et al's (1996) youth representations of science based on (i) content, (ii) process and (iii) social enterprise as well as categorising (iii) further into five themes representing biology in nature, identity and society. Themes were often based on participants outlining characters' opinions, not necessarily their own. However, sometimes these types of third person responses were more revealing. It was also understood that themes were a reaction to the following: (i) the emotion and scientific content were guided by a film they had just seen; (ii) terminology used during sessions; and (iii) classmates' peer pressure and evolving opinion as the discussion progresses.

Synopsis of *The Gift*

The Gift is a film following three generations of the same family who have a genetic predisposition towards Friedreich's ataxia, a rare disease that causes progressive deterioration of the nervous system. Using flashback techniques and parallel narrative, the story intertwines the years 1998, 2012 and 2028 showing how 16-year-old Annie develops symptoms of the disease, how her 15-year old brother Ryan fights for the right to be tested, and the implications for Mark, Ryan's son, following the screening of his embryo by Ryan for the absence of Friedreich's ataxia and genetic selection for sporting abilities. The film raises issues such as eugenics, failing health, and identity, as well as traditional dramatic themes like jealousy, betrayal, and sibling rivalry.

Data collection and analysis

For data collection, each pilot school was presented with the following:

- *The Gift* video: this was shown in class with general discussion of the issues.
- Video written exercise: students were given five questions on reactions to the video.
- Video discussion activity: participants were asked to support characters' viewpoints from *The Gift* by standing anywhere across an imaginary line corresponding to how much they agreed or disagreed with a statement called out by the researcher, where one side was 'Strongly agree' and the other 'Strongly disagree.' Individual students were asked to argue their case in a fair and non-threatening environment. They were then asked to develop their perspectives linking the technological details with philosophical approaches to life, humanity and society. All discussions were recorded on MiniDisc.

Using the phenomenological process of eliciting meanings from discussions based on participants' sense of their own set of experiences bracketed from current scientific knowledge

(Kozoll and Osborne, 2004), transcripts were analysed and twelve themes were organised under the following three categories:

- science content (reproductive and genetic biology)
- scientific process
- philosophical awareness of being part of both biology and a social system, here labelled *science in nature-identity-society*.

Settings and participants

Schools were selected over the province of Leinster, in Dublin, Kildare, Carlow and Louth based on a mix of gender, socio-economic group, and Roman Catholic ethos. Nine teachers participated across ten classes in eight schools. One class contained 6th year students, six had 5th years, two contained transition years (TY) and one was a combination of 5th years and transition years.

Transition year is the bridging year between the first year of Irish Leaving Certificate studies and the final year. This year is designed to encourage students to break out from usual school work and participate in project-orientated work. Six teachers were female and five were male. One teacher had responsibility for two classes and two classes were combined in a single session. 97 student participated in the schools pilot programme overall ranging in age from 16-18 years.

PRELIMINARY FINDINGS AND DISCUSSION: CATEGORIES AND THEMES

Categories 1 and 2: Biology as 'science content' and 'science process'

Science *content* included use of terminology and stated knowledge of laws, facts and biological processes either accepted by the scientific establishment or alternative descriptions. This theme was an important acknowledgement of science participants already knew, even if separate to any social or ethical points. Here was an example of a 'factually accurate' description of stem cell research:

"You take cells from an embryo and you try to grow other cellsand you try to grow organs out of it." (Female, MD 1/WD-2 [008 01.25])

There was also scope here to assess self-appraisal of knowledge gained. A very common written response was: "Everything was clear" or "It explained the science clearly." The scientific rationale of what actually takes place in PGD was often intertwined with the moral argument. This exchange shows respondents correcting each other about what happens when an embryo is selected:

[Girl:] "People say 'I wouldn't change my kids for the world' and he did it." A couple of boys reply: "He didn't change [anything]" (Males, MD/WD-1 [017 19.50])

Science process was defined in this study as the scientific method applied to the acquiring of biology knowledge. Biotechnology is the application of biology content and process for use in society. A common (mis?) representation of this was the use of the term 'genetics' as a technology rather than a field of science: "Diseases can be cured in the future through *genetics*." Therefore, categories of content and process were often intertwined or no distinction was made.

Although *The Gift* explained the process of embryo selection and the implications it has for whether a person is born or not, some participants seemed confused about how the procedure was used to select Mark. Three different concepts of embryo selection were represented:

as a means of preventing disease in the same, pre-destined person. Mark would have been born anyway, just with different traits.

equivalent to the removal of genes from the same, pre-destined person.

as a means of preventing disease leading to the birth of any one of a number of individual people.

The third option is the accepted scientific representation. There also appeared to be a misunderstanding for some that the future technology portrayed in the film was an existing technology rather than science fiction, which has implications for science in fiction.

Category 3: Biology in nature-identity-society

1) Natural order

This theme was mostly prompted by the video activity question dealing with one of the characters (Jennifer) wanting to "Let nature take it's course" rather than use PGD to eliminate the possibility of her child having Friedreich's ataxia. It was a very common opinion, particularly among females but it also had male support. A few written responses had the view "that nature shouldn't be interfered with." In discussions, there was an argument of (biological) tradition: "She just wanted a natural birth." There was a teleological argument of nature: "Things happen for a reason and it's natural." But one girl in particular questioned the need to always see things as being natural:

"People ...say you should follow ...natural causes. Most of the time, nowadays you don't follow it. Different things that we do are not natural, but we do it because it's beneficial to our health and our whole general state of being." (Female, MD1/ WD-2 [014 07.46])

This revealed a philosophical sense of the worth of certain medical practices that might go against others' conventional view of 'nature.'

2) *Human nature versus genetic make-up*

Evidence of an expression of human identity besides genetic explanation was also looked for, or a psychological distinction between nature and nurture and between a human *essence* and a biological/ genetic basis of humanity. The rationale here was to explore the philosophical relationship between mind / body when perceiving personhood (or allusion to a Cartesian mind-body divide), as well as distinguishing the internal world of genetic structure from physical appearance or behaviour. At times the distinction is clear between mind and genetic make-up of the body:

'I think there's a difference between physical and mental. You can pick physical [genes] but mental is all to do with the brain that you're given and .. how you develop it.' (Male, MD 5/SD 002 08.38])

In other instances, the distinction was less clear, yet identity seemed to be threatened by pre-selection/ genetic manipulation:

"I think Mark thinks his abilities might be fake. [That] it's not really him that's doing it, it's his genes."(Male, MD 4/ND-1 [14 1.00])

In *The Gift*, Mark is upset at the end because he realises that an attempt was made to control his destiny by pre-selecting his embryo. This may well have presented a new phenomenon to most students - a distinction made between genetic make-up and a person's own feeling of identity. Although many professed to understanding why identity would be threatened by PGD, the majority at the beginning of this programme activity question usually could not see Mark's problem. This was the general feeling, until some made a distinction between nature and identity, a realisation of an individual intrinsic essence present *outside* the genes. For some participants (mostly boys) this still appeared to be ingratitude - why would Mark complain, if he was given this 'gift'? Did he not want to be born? This observation demonstrates a certain consequentialism

(Hayry, 1998) and correlates with males' increased likelihood of accepting genetic technologies as described by Whitelegg (1998).

3) *Religion/ teleology/destiny*

Without prompting, a very dominant phrase used to describe technologies associated with controlling characteristics or PGD was "playing God.". A teleological argument taken against PGD was "what's meant to be is meant to be". Sometimes there was an overt religious connection. At other times, despite the presence of a God, chance also took a large part:

"I was thinking about chance. Maybe fate is another part of the process. Maybe it is, y'know. Maybe it's all God's will. And this guys goes in and picks this screen [to pick an embryo - a scene from *The Gift*]. Maybe that's all it is." (Female, MD 5/SD [002 10.30])

There was a feeling that an individual should have the power over his or her own destiny:

"Every parent wants what's best for their children, so it's [the father]'s right to say he wants what he thinks is best. [But] it's not his right to say 'this is exactly what I want you to be' (Female, MD 2/WD-2 [017 19.50])

Moral judgements and value judgements are being made. In theme 2) above, 'acquired' genetic traits feel 'fake'; if you are genetically engineered, it is not the real *you* performing the task for which you were 'programmed.' However the idea of *living potential* is enough to draw a moral line under it, to preserve it. In the following passage, the interchange between a male and a female reveals widely different worldviews on the humanity of the embryo:

Male: "When do you start saying that [an embryo] is a life?"

Female: "Since fertilisation."

Male: "What about since birth? Because your birthday is not on your fertilisation." [laughter] [017 16.46]

4) *Ethics/morality /identification with others*

Written responses organised under this theme showed a realisation that there are ethical issues or different perspectives to embryonic technologies, and some identified what those issues might be. Individual concerns were explored in sub-themes of personal ethics for a character in the film - or an instinctual value judgement in the plot on a technology or concept - which showed deontological views. A participant may have said "that's just wrong," without a logical explanation why. In the written exercises, prompted by a question, sympathy was shown for characters' situations. Discrimination and rights were brought up frequently:

"I don't agree with hand-picking your child and if you give leeway for disease, if you can say your child can't have a disease, well eventually it'd

be exploited [for] height and eye colour and stuff like that. I think it's discriminating against your own children." (Female, MD 2/ WD-2 [011 00.09])

"He wanted to know [if he had the genetic predisposition for a disease]. That was his right." (Male, MD 4/ ND-1 [012 06.40])

Males, in general, tended to see Ryan's point of view in choosing what he thought was the 'best' embryo genetically because he was only doing what was best for Mark and had the history of watching his sister suffer from the disease. However, many thought that by pre-selecting Mark to not only to be free of Freidriech's ataxia, but also to have sporting ability was an infringement of Mark's right as an individual person. This was based on the view that Marks' father, Ryan, could not know what was *right for Mark*.

5) *Negative or positive outlook for future humanity*

Although individual ethics versus societal ethics were never fully resolved (despite probing on how controls could be implemented for PGD), there were a range of different views on the implications for society. Doing *what is best* for a child was often accompanied by belief in progress by genetic selection techniques. Again, males were more willing to accept the technologies than females as "scientists are trying to rid the world of disease." For some, there were positive outcomes: "Help the human race in its evolutionary cycle." For others the outlook was negative. Issues of identity and human dignity were linked here, with lives reduced to consumerism or uniformity:

"I want that baby [and] I want *that* one. It's like going into a shop and saying I want that dress, I want *that* one... I think its wrong." (Female, MD 1/WD-1 [014 08.29])."

"Everyone would be the same."

(Female, MD 5/SD [002 13.04])

Identification of an individual-societal conflict was also seen:

"We've gone thousands and thousands of years without having to do [PGD]so why do it now....If you're thinking about all humans, and everything is going to be perfect, its going to make a huge imbalance in society. If you [have a baby] by chance and not think about yourself and your life - obviously its going to be horrible if its you - but if you think of it on a bigger scale..." (Female, MD 5/SD [002 13.50])

Jerome, in the film *Gattaca* (1994), like Mark in *The Gift*, realised the philosophical and social consequences of knowing your biological destiny. For him, society has lost its humanity because it has lost that element of surprise and wonder, and also lost a certain free will. The responses in

this study demonstrate that, although there are sophisticated and reasoned connections made between biotechnology, health, society and identity, there is still a concern about allowing humanity to have control over societal and individual destiny.

REFERENCES

- Aikenhead, G. (1996). Border crossings into the subculture of science. *Studies in Science Education*, 27:1-52.
- Aikenhead, G. (2001). Science communication with the public: a cross-cultural event. In Bryant, C., Gore, M., and Stocklmayer, S. (Eds.), *Science Communication in Theory and Practice*. Kluwer Academic Publishers, The Netherlands, pp23-45.
- Cobern, W. W. (1993). World view, metaphysics, and epistemology. [Online]. Paper presented at the 1993 meeting of the National Association for Research in Science Teaching (NARST), Atlanta, GA. Available from: <http://www.wmich.edu/slcsp/106.htm>. [Accessed 22 October 2004].
- Driver, R., Leach J., Millar R. and Scott P. (1996). *Young People's Images of Science*. Open University Press, London.
- Gattaca*, (1998). Movie script. [Online] Available from http://www.dailyscript.com/scripts/gattaca_early.html [Accessed 4 August 2004]
- Gift, The*. (1999) [Video: VHS]. Y-Touring Company, London.
- Hayry, H. (1998). Philosophical responses towards biotechnology. IN: European Commission. *Cultural and social attitudes to biotechnology: analysis of the arguments, with special reference to the views of young* ('The BIOCULT Project'),. European Commission, Luxembourg: 19-23.
- Irwin, A. (2001). Constructing the scientific citizen: science and democracy in the biosciences, *Public Understand of Science* 10 (1):1-18.
- Kalbman, A. H. and Shepherd, L. (2003). Narrative portrayals of genes and human flourishing. *The American Journal of Bioethics*. 3 (4):15-21.
- Kinchin, I. M. (2003). Effective teacher student dialogue: a model from biological education. *Journal of Biological Education*. 37 (3): 110-113.
- Kozoll, R.H. and Osborne, M.D. (2004.) Finding meaning in science: lifeworld, identity and self. *Science Education*. 88 (2) :157-181.
- Millar, R. and Osborne, J. (1998). *Beyond 2000: Science education for the future - a report with ten recommendations*, Nuffield Foundation, London.
- Ødegaard, M. (2003). Dramatic science: a critical review of drama in education. *Studies in Science Education*, 39:75-102.
- Phelan, P., Davidson, A., and Cao, H. (1991). Students' multiple worlds: negotiating the boundaries of family, peer, and school cultures. *Anthropology and Education Quarterly*, 22 (3): 224-250.
- Rose, C. (2003). How to teach biology using the movie science of cloning people, resurrecting the dead, and combining flies and humans. *Public Understanding of Science*. 12 (3): 289 - 296.
- Solomon, J. (1999). Meta-scientific criticisms, curriculum innovation, and the propagation of scientific culture. *Journal of Curriculum Studies* 31 (1):1-15
- Weingart, P. and Pansegrau, P. (2003). Introduction: perception and representation of science in literature and fiction film. *Public Understanding of Science*. 12(3): 227-228.
- Whitelegg, M. (1998). Literature review. IN: European Commission. *Cultural and social attitudes to biotechnology: analysis of the arguments, with special reference to the views of young people* ('The BIOCULT Project'),. European Commission, Luxembourg, pp 59-81.