

CROSS-CURRICULAR COLLABORATION IN TEACHING SOCIAL ASPECTS OF GENETICS

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ABSTRACT

Science teachers can lack pedagogic skill and confidence in handling multi-faceted socio-scientific issues. This project explored the development, implementation, and evaluation of a 'cross-curricular' day as a suitable vehicle in eight different schools for both engaging 14-16 year old pupils in active consideration of social aspects of genetics and enabling science and humanities teachers to collaborate in planning and delivery. The cross-curricular research team planned a programme of activities, involving volunteer teams of teachers in development. Pupils in participating schools generally found the day stimulating, increasing their understanding of genetics and appreciation of social aspects. However, implementation showed that some teachers missed important learning opportunities as a result of lack of critical scaffolding of pupils' discussions and limited expertise in ethical analysis. Cross-curricular collaboration was successful in presenting pupils with a holistic experience but had limitations in developing teachers' expertise. Continuing professional development for both science and humanities teachers is needed to address socio-scientific issues effectively.

1. BACKGROUND

The research reported here was commissioned and funded by the Wellcome Trust – an independent biomedical research charity which aims to improve human and animal health. A previous Wellcome Trust project found that science teachers addressed social aspects of biomedical science infrequently and with lack of confidence. Although humanities teachers showed greater willingness to engage pupils in such discussion, few teachers of any discipline addressed ethical aspects of scientific advancements (Levinson & Turner, 2001). Levinson and Turner's study recommended that a 'collapsed' or cross-curricular day in which science and humanities teachers collaborate in design and delivery might be an effective way of engaging pupils with socio-scientific issues. This suggestion for a 'collapsed day', including an integrated model of teaching and equal participation by all teachers, arose from a synthesis of teachers' views through interviews but with little empirical basis for its construction and effectiveness. The aim of our project was thus to explore the feasibility and effectiveness of cross-curricular collaboration through the development, implementation, and evaluation of a programme for a 'collapsed day' on a biomedical issue, examining the barriers, opportunities, and outcomes at each stage.

The difficulties of addressing social and ethical implications of advances in scientific research are related to at least three factors: the nature of the socio-scientific issues themselves; the pedagogical strategies adopted by teachers of different disciplines; the compartmentalised nature of the secondary curriculum.

Aspects of genetics were chosen as a focus in this project because these emerged as most popular with teachers in an initial survey. Advances in gene therapy and genetic engineering raise issues of both private and public morality (Warnock, 2001). Of importance in considering, for example, the implications of genetic testing for individuals and society may be understanding of: the underpinning of genetics and the nature of science; the nature of decision-making processes, probability, and cost-benefit analysis; the nature of media-reporting; the social context of the issue; personal and societal value judgements and ethical reasoning. The multi-faceted nature of socio-scientific issues suggests that for individuals to develop an *informed* view on any issue they should have a good understanding of all the aspects (Ratcliffe & Grace, 2003). Each aspect can be explored individually within different subject areas, but this approach runs the risk that full consideration of the issue does not occur. A 'collapsed day' implies a holistic approach in which the different facets of the issue are brought together. Thus, one aspect explored in this project was the extent to which the different facets were addressed and supported.

Socio-scientific issues raise pedagogical challenges for teachers in considering educational purpose and appropriate teaching strategies. There may be a hierarchy of purposes for considering an issue holistically: from sharing individual perspectives on the issue; reaching an understanding of the variety of available subjective responses; making a choice between differing values; to finding a rational resolution of the controversy (Bridges, 1979). Humanities and science teachers canvassed by Levinson and Turner (2001) gave a variety of justifications for teaching social and ethical aspects of biomedical science, with 'sensitivity' and decision-making being the most frequent. These reasons reflect the two extremes of Bridges' (1979) hierarchy of purposes and imply some opportunity for discussion. Members of the research team have encountered many instances where the potential for discussion and analysis of socio-scientific issues has not been fully exploited in science classrooms, resulting in some cases in amorphous discussion or rapid decision-making (Ratcliffe & Grace, 2003). Teachers seem to make limited opportunities for pupils to engage in *critical* analysis of a socio-scientific issue. However, research evidence of innovative practice has provided some understanding of pupils' use of values, beliefs, and scientific knowledge when dealing with socio-scientific issues in science lessons and how these relate to the pedagogical issues (Solomon, 1992; Gayford, 1993; Ratcliffe, 1997 & 1999). Such case study research highlights the need for an emphasis on the *process* of analysis of an issue. The research team considered critical peer group discussion as an important activity within the 'collapsed day' with the need for appropriate support by teachers.

'Collapsed days' give clear opportunities for collaboration between science and humanities teachers in supporting pupils' learning. Throughout this project,