

# Handbook of Research on Technoethics

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## Chapter VI

# Education of Ethics of Science and Technology Across Cultures

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### **ABSTRACT**

*This chapter examines some of the cultural variation in the ethical factors associated with the use of science and technology. The issues discussed include access to technology, social justice, professional ethics, and value systems. The appropriate implementation of international standards in ethics of science and technology and bioethics is considered. There is global agreement that persons should be taught the ethics of science and technology, and discussion of new materials and methods is made. The goals of ethics education as explained in the Action Plan for Bioethics Education developed at the 2006 UNESCO Asia-Pacific Conference on Bioethics Education include knowledge, skills and personal moral development. The International Bioethics Education Network was initiated in 2004, and the creation of networks linking research into policy is a cornerstone of efforts for education of ethics at all levels, from local to regional. In the future the use of principles as expressed in the UNESCO Universal Declaration on Bioethics and Human Rights (2005) will also be analyzed to broaden the description of bioethical reasoning. There needs to be extension of the evaluation methods and tools.*

### **ETHICS OF SCIENCE AND TECHNOLOGY**

At the beginning of this chapter we can ask, is there something unique about ethics of science and technology as opposed to ethics itself? All societies use technology, for clothing, housing, food, energy, health, and most other aspects of

life. The history and development of humankind is interwoven with the use of technology. Access to technology to advance quality of life is a long standing ethical issue, not distinct to social justice in general. The technical knowledge of a profession does however convey professional ethical duties upon the members of a profession and these are recognized such as medical ethics or engineering ethics.

Science, the quest for objective knowledge of our universe, and the method of intellectual inquiry, experimentation and falsification is a more recent phenomenon. Are there some types of knowledge that are dangerous for humankind to learn? The knowledge of gunpowder, dynamite or atomic weapons is not something that we would want everyone to apply, and all have been misused to kill and destroy people and the environment. The knowledge of psychiatry, physiology, chemistry or even educational methodology can also be misused. Therefore there are also scientific ethical issues in the use and consequences of choices regarding science. Thus ethics for scientists again can fall into the realm of professional ethics, and the way that professionals relate to those who lack that particular form of knowledge.

This chapter will not focus on the deeper questions that remain on whether humans should pursue knowledge about everything, but having a training in science ethics will make practitioners of science aware of some of these dilemmas to consider in their occupation. If we look at the way that societies have faced ethical dilemmas arising in medicine and technology we can see several important elements in their evolution. When many countries opened their doors (or their doors were involuntarily opened) to Western society in the 19th century, it led to the introduction of a newly emerging scientific paradigm, only part of the fabric of Western society. The ethical values of Western society were also imported in some aspects, including with Christian missionaries and democracies, however while there were different receptions to these value systems the pursuit of science and technology and economic growth were adopted. However, the ethics of use of science and technology are not intrinsically different to the ethics of use of technical knowledge that existed everywhere, in basic life support services such as housing, food, medicines and information sharing. Each country in the world today imports ideas and goods from other countries, and there is evolution of ethical reflection through the grow-

ing involvement of the public in discussion and development of the indigenous diversity of ethical traditions. As cultures evolve, it becomes impossible to separate which aspects were introduced from the different sources at what time.

## **GLOBAL CALLS FOR ETHICS EDUCATION**

In addition to the need for professional ethics, citizens of all ages need to make ethical decisions on how they use science and technology and its products. Opinion surveys in every country they have been conducted to show global agreement for the inclusion of more ethical and social issues associated with science and technology to be taught to students. Member states of UNESCO (the United Nations Educational, Scientific and Cultural Organization) in the Universal Declaration on the Protection of the Human Genome and Human Rights (1997) declared such an educational need, and every member country of the United Nations endorsed this in 1998. This call was repeated by all member states when adopting the 2005 Universal Declaration on Bioethics and Human Rights. These calls follow numerous academic works also calling for this (Reiss, 1999; Ratcliffe & Grace, 2003).

There is global agreement that persons should be taught the ethics of science and technology, but there are not global methods. UNESCO has taken up some of the challenges of how to translate this global call for bioethics debate and discussion in culturally appropriate manners. The appropriate implementation of international standards in ethics of science and technology and bioethics is important, and there have been a range of responses by states to the three International Declarations on Bioethics unanimously accepted by UNESCO General Conference (Universal Declaration on the Human Genome and Human Rights, 1997; International Declaration on Human Genetic Data, 2001; Universal Declaration on Bioethics

and Human Rights, 2005). Although bioethics education was called for by all states that signed the 1997 Universal Declaration on the Human Genome and Human Rights, in article 20, it is still to be realized:

“20. States should take appropriate measures to promote the principles set out in the Declaration, through education and relevant means, inter alia through the conduct of research and training in interdisciplinary fields and through the promotion of education in bioethics, at all levels, in particular for those responsible for science policies.”

Freedom of expression is one of the working methods of critical ethical reflection. Article 19 of the 1948 Universal Declaration of Human Rights, upholds the “freedom to hold opinions without interference.” Article 21 of Universal Declaration on the Human Genome and Human Rights 1997 reads “States should . . . also undertake to facilitate on this subject an open international discussion, ensuring the free expression of various socio-cultural, religious and philosophical opinions.”

We can ask how communities can be involved in discussion of ethics of science and technology. In all societies there is a transition from paternalism to informed consent to informed choice. Unless we can educate citizens the choices they make will not be informed. This transition from paternalism to choice creates the space for discussion in communities of what principles they consider important in making choices. We have to build capacity to ensure that the choices are more informed. We need to consider different life views each of us can have when confronted with moral dilemmas. Some believe that there is a right and a wrong choice to be made for a person’s action in each moral dilemma, and that they can also tell others what is morally right or wrong.

## **GOALS OF ETHICS EDUCATION**

It is important that different nations develop concrete plans for how education in ethics of science

and technology should be incorporated into the long standing value education that is implicit in every human society. We learn how to relate to others as we grow up in families, schools and society (Rest, 1986). There have been different schemes elaborated for how we could define someone as being morally mature. There is agreement that the aim of teaching ethics is to develop the student’s ability to recognize and analyze ethical issues in order to be able to reach decisions on how to act ethically (COMEST, 2004).

In discussions that have occurred in the International Bioethics Education Network in Asia and the Pacific there has been a consensus that the theory of moral development developed by Lawrence Kohlberg, and what has come to be called Kohlberg’s stages of moral development, does not universally apply when teaching bioethics. The problems are not only with non-Western students, but researchers in Australia and New Zealand have also found that it does not serve as a model. Kohlberg’s (1969) theory holds that moral reasoning, which he thought to be the basis for ethical behavior, has developmental stages that are universal. He followed the development of moral judgment beyond the ages originally studied by Jean Piaget looking at moral development throughout life, and created a model based on six identifiable stages of moral development (Scharf, 1978). It is still useful however to describe these stages, while recognizing that in different cultures the order of what we would call the most mature values differs.

Kohlberg’s six stages were grouped into three levels: pre-conventional, conventional, and post-conventional. He claimed it is not possible to regress backwards in stages nor to ‘jump’ stages; each stage provides new perspective and is considered “more comprehensive, differentiated, and integrated than its predecessors.” A brief explanation follows.

### **Level 1: Pre-Conventional**

The pre-conventional level of moral reasoning is especially common in children, and said to be up to the age of 9 in U.S. children he studied, although adults can also exhibit this level of reasoning. Reasoners in the pre-conventional level judge the morality of an action by its direct consequences. The pre-conventional level consists of the first and second stages of moral development, and are purely concerned with the self (egocentric). In stage one (obedience), individuals focus on the direct consequences that their actions will have for themselves. For example, an action is perceived as morally wrong if the person who commits it gets punished. In addition, there is no recognition that others' points of view are any different from one's own view.

Stage two is a self-interest orientation, right behavior being defined by what is in one's own best interest. Stage two reasoning shows a limited interest in the needs of others, but only to a point where it might further one's own interests, such as "you scratch my back, and I'll scratch yours." In stage two, concern for others is not based on loyalty or intrinsic respect. Lacking a perspective of society in the pre-conventional level, this should not be confused with stage 5 (social contract) as all actions are performed to serve one's own needs or interests.

### **Level 2: Conventional**

The conventional level of moral reasoning is typical of adolescents (age 9+ years) and adults. Persons who reason in a conventional way judge the morality of actions by comparing these actions to societal views and expectations. The conventional level consists of the third and fourth stages of moral development. In stage three, the self enters society by filling social roles. Individuals are receptive of approval or disapproval from other people as it reflects society's accordance with the perceived role. They try to be a *good boy* or

*good girl* to live up to these expectations, having learned that there is inherent value in doing so. Stage three reasoning may judge the morality of an action by evaluating its consequences in terms of a person's relationships, which now begin to include things like respect, gratitude and the golden rule. Desire to maintain rules and authority exists only to further support these stereotypical social roles.

In stage four, it is important to obey laws and social conventions because of their importance in maintaining a functioning society. Moral reasoning in stage four is thus beyond the need for approval exhibited in stage three, because the individual believes that society must transcend individual needs. If one person violates a law, perhaps everyone would - thus there is an obligation and a duty to uphold laws and rules. As a cultural observation, this is a very common attitude in Asian and Pacific communities.

### **Level 3: Post-Conventional**

The post-conventional level, also known as the principled level, consists of stages five and six of moral development. Realization that individuals are separate entities from society is important in North American society where Kohlberg developed his theory and so he judged it to be a higher level of morality. In that culture one's own perspective should be viewed before the society's is considered. Interestingly, the post-conventional level, especially stage six, is sometimes mistaken for pre-conventional behaviors. In stage five, individuals are viewed as holding different opinions and values, all of which should be respected and honoured in order to be impartial. However he considered some issues are not relative like life and choice. Laws are regarded as social contracts rather than dictums, and those that do not promote general social welfare should be changed when necessary to meet the greatest good for the greatest number of people (a utilitarian view).

In stage six, moral reasoning is based on abstract reasoning using universal ethical principles. Decisions are made in an absolute way rather than in a conditional way. In addition, laws are valid only insofar as they are grounded in justice, and that a commitment to justice carries with it an obligation to disobey unjust laws. While Kohlberg insisted that stage six exists, he had difficulty finding participants who use it.

### **Implications**

After Kohlberg's stage 4, the transition from stage four to stage five, people have become disaffected with the arbitrary nature of *law and order* reasoning and he said they become moral relativists. This transition stage may result in either progress to stage five or in regression to stage four. As has become clear during the bioethics education project, there is such a range of cultural, family and school value systems across the world, that students of one age in one country will most likely be in different stages at different times, even if all persons did follow this progression from stage 1 to stage 6 in moral reasoning, and not revert back to other levels. Stage six would correspond to a person that followed the textbook bioethics of Beauchamp and Childress (1995), or the longer list of principles found in the Universal Declaration on Bioethics and Human Rights (UNESCO, 2005). Macer (1998) has argued that bioethics is love of life, and that principlism based on following the standard ethical principles alone is not sufficient as an explanation of why people behave the way they do. The role of religious values is also obviously important, as concepts like karma and removal of oneself from the matters of the world do affect the values systems people use when approaching moral dilemmas.

### **BIOETHICAL MATURITY**

The goals are linked to the methods and criteria that will be used to evaluate the materials and

student responses, and evaluation is discussed below. One concept that has been used by Macer is whether students demonstrate "bioethical maturity" in some way. "Bioethical maturity assumes a certain level of recognition of weighing up the different arguments that can be used to discuss an issue, the different ethical frameworks that can be used, and comparisons and balancing of the benefits and risks of the dilemmas" (Macer, 2002). This process also gives an indication as to how many different ideas people have, and the way they understand the dilemmas, and methods to study this are developing in the behaviourome project (Macer, 2002; 2004b). Prior to considering other issues, setting the goals is central.

A detailed listing of goals that are common between many educators is found in the Action Plan for Bioethics Education developed at the 2006 UNESCO Asia-Pacific Conference on Bioethics Education (RUSHSAP, 2006). There has been significant research that has shown that there are a number of goals of ethics education including those listed here:

- a. **Knowledge**
  - Development of trans-disciplinary content knowledge*
  - Understanding the advanced scientific concepts*
  - Being able to integrate the use of scientific knowledge, facts and ethical principles and argumentation in discussing cases involving moral dilemmas;*
  - Understanding the breadth of questions that are posed by advanced science and technology*
  - Understanding cultural values*
- b. **Skills** (*capacity building in skill acquiring should be multi faceted or many sided, and the goals include*)
  - Balancing benefits and risks of Science and Technology*
  - Being able to undertake a risk/benefit analysis*

*Develop critical thinking and decision making skills and reflective processes*

*Develop creative thinking skills*

*Develop foresight ability to evade possible risks of science and technology*

*Skills for developing “informed choice”*

*The required skills to detect bias in scientific method, interpretation and presentation of research results*

c. **Personal moral development**

*Understanding better the diversity of views of different persons*

*Increasing respect for all forms of life*

*Elicit a sense of moral obligation and values including honesty and responsibility*

*Being able to take different viewpoints to issues including both biocentric and ecocentric worldviews rather than only anthropocentric perspectives.*

*Increasing respect for different people and culture, and their values*

*Developing scientific attitudes, reflective processes, and an ability for holistic appraisal, while not ignoring the value for reductionist analysis.*

*Knowledge about bias in the interpretation and presentation of research results, benefits and risks of technology and bioethical issues, and how to detect bias*

*Exploration of morals/values (values clarification)*

*Values analysis and value based utilization of our scarce natural resources. (RUSHSAP, 2006)*

Many of these goals apply to ethics education and (education) development of critical thinking in general. Descriptive ethics is to describe the way people view life, their moral interactions and responsibilities. If we attempt to understand the way we as human beings think, then we must look at the views of all in a society – not just an elite of the “philosophers” or “politicians”, to have ethics for the people by the people. The evolution

of considerations of ethics has witnessed increasing importance being placed on descriptive ethics approaches, as societies become more democratic. As persons realize that ethical concepts have ancient roots in all cultures of the world, and that many persons have interesting views on the questions, the field has become richer, and there is still a lot of human knowledge that can be applied to assist in discussing modern technology.

Interactive ethics is discussion and debate between people about descriptive and prescriptive/normative ethics. Consensus is possible after recognition of the relationships between different persons, to try to preserve social harmony. This consensus building is seen even in countries that have structured paternalism affecting relationships between persons. Public discussion of the ethics of science and technology in many societies aided by the media. Participation of the public in the societal decision-making process regarding new technology is essential. Community engagement is not only a question of knowing what is going on, but for a new technology to be accepted by the public, it is crucial to perceive the choice and influence.

How can ethics be central in a dialogue between common cultures of technophiles and technophobes? A person's ethic is developed based on their own and other people's opinions that grows as we face various dilemmas through our life. To have a balanced opinion from the community, it is important to hear from persons in a range of positions with different occupations. This common social goal has developed hand in hand with the emergence of increased media attention in pluralistic democracies to display the divergent views on science and technology.

## **EMPOWERING EDUCATORS**

The appropriate response to the call for ethics education in science and technology, and to the common goals, demands education of teachers

to apply these culturally. There is a common goal to develop the decision making ability at all levels of society, to develop sound original research appropriate to each culture, and enable more informed policy-makers, so our society can evolve ethically with the demands of the times. All sectors of society are faced with ethical issues in the pursuit of their duties. Critical to building the capacity of society for this open reflection on bioethics are educators. The task of an educator includes empowering their students/learners to develop their maturity as individuals as well as being able to be cooperative members of changing societies. Learners, as we all should be, need to be prepared so they are able to apply knowledge to make good decisions during their life. How can we train educators and sustain their motivation to take upon this task? How can we create communities that are able to consider all sides of ethical debates? Practicality is essential if teachers are expected to continue teaching, and students will continue their interest in the matter.

The turbulent times of today have challenged some of the traditional structures in the relationships between human beings within their society, with nature and God. How can we empower citizens to make a special contribution in the wider context of constructing a mature society? Mature means a person, or a society that can balance the benefits and risks of alternative options, and make well-considered decisions, and talk about it. A mature society is one that has developed some of the social and behavioural tools to balance these bioethical principles, and apply them to new situations raised by technology.

Despite a growing interest in education of ethics, one of the major concerns that teachers have is the lack of suitable teaching materials for ethics education. Integration of scientific facts is also important in moral reasoning. Science educators discovered during the last few decades that the most efficient way to educate science is to discuss the science together with examples of technology and put the facts into the social con-

text. The science, technology and society (STS) approach to education, was developed based on research which found students learn more science when the science is placed in its social context (Yager, 1990; Ramsey, 1993). Advances in biology and medicine have led to another pressure upon educators, namely how students can be prepared to face the ethical dilemmas that the technology often raises. The ethical issues associated with biology are generally grouped under the phrase "bioethics."

Bioethics is one part of the approach of STS, and a survey of bioethics teaching is also one method to measure the extent that society issues are included (Macer et al., 1996; Macer, 1999). In general there are less teachers using STS approaches in Asia than in the USA (Kumano, 1991), and Australasia (Asada et al. 1996), but it is growing still. Even within one country, such as the USA, there are a diversity of views on how to deliver efficient education of social issues and even the science itself (Waks & Barchi, 1992). STS approaches are integrated into a broad participatory paradigm of education across all subjects.

UNESCO is attempting to generate sustainable ethics teaching and promotion programmes, supported by developing comprehensive databases of experts, existing professional networks, international legal instruments, national legislation, codes of ethics, institutions, and current teaching curriculum and research activities in bioethics (ten Have, 2006). Networking partners in the development of ethics teaching in the region is ongoing, and the UNESCO Asia-Pacific School of Ethics was founded in 2006 to bring together many active institutions and individuals who are collaborating to develop research on ethics of science and technologies from a wide range of cultures. Half of the members are actively involved in bioethics education, including ethics of science and technology, environmental ethics and medical ethics. The assembly and maintenance of on-line free access teaching resources, adaptations and translations into different languages, and links to all regional

laws and guidelines related to professional ethics, including environmental ethics, ethics of sustainable development, bioethics, science ethics and cyber ethics have been made at RUSHSAP. The lessons learnt provide some key areas for future attention and priority setting.

There have been different materials produced for teaching ethics (Jarvis et al. 1998; Levinson and Reiss, 2003). A growing compilation of open access teaching materials in different languages is available (Macer, 2004a; Macer, 2006). There are a wide range of materials to teach ethics, and diversity is to be applauded from a cultural perspective. Even before calls for inclusion of ethics of science and technology made by UNESCO Declarations, in a variety of textbooks in India and Japan we can see numerous ethical issues being included, however, there was little depth to the materials (Bhardwaj and Macer, 1999). The World Commission on the Ethics of Science and Technology (COMEST) (2004) suggested that there be some core essentials including making students familiar with the structure of normative argumentation, basic ethical norms and principles, types of ethical theories, ethical issues arising in different fields of science and technology, and especially related to the expected profession of the students in the case they are pursuing a profession such as engineering ethics (Chachra, 2005), or medicine. It is also important to teach about research ethics, and in some countries that is compulsory for graduate students (Eisen & Parker, 2004), or for students using animals for example. There are also a range of levels at which ethics can be taught, with many countries requiring some ethics in high school science classes. For example already in 1993 it was found that ethics of science was being widely taught in science classes in Australia, Japan and New Zealand (Asada et al. 1996; Macer et al. 1996), India (Pandian and Macer, 1998), and in 1997 in Singapore chemistry classes (Macer and Ong, 1999). Universities are also introducing ethics subjects to varying degrees, from general courses to specialized

courses (Zaikowshi & Garrett, 2004). COMEST (2004) recommended that all universities introduce ethics teaching as elementary ethics for all students, advanced courses for specific subjects in postgraduate education, and courses that lead to postgraduate degrees in ethics. In the future we will also have consensus on the core values to be included in courses for professional ethics.

## **PARTICIPATION**

Moral dilemmas face every one of us. There have been numerous books written to explain moral theories and how these can be applied to dilemmas we face in medicine, daily life and a range of professions (Scharf, 1978). Interactive ethics classes with experts can be useful (Sass, 1999). Critical thinking capacity is essential for empowering persons to cope with changing times. Participation can promote the creation of ideas and individuality, which we all need in the era of globalization.

Bioethics is not about thinking that we can always find one correct solution to ethical problems. A range of solutions to moral dilemmas are often possible, although there are some inappropriate solutions to moral dilemmas, such as to always believe you are right and others are always wrong. Ethical principles and issues need to be balanced. Many people already attempt to do so unconsciously. The balance varies more between two persons within any one culture than between any two.

We can often hear complaints from teachers that there are too many students in a class so there is no way to let the students talk. While there are different ways to describe the participation of students, in a lecture for 800 students compared to 32 or 10 students, class-size is not an insurmountable barrier to participatory learning. In the case of large classes there are methods that can be used to improve the participation of students such as talking in pairs while sitting in

the class, or working in small groups of three or more persons to discuss particular questions from the text.

While if everything is equal we would prefer less students in a class, a student will probably learn more in a class that has other students than themselves. Interactive responses between students and teachers are important in learning, for not only those asking questions but for all those listening. Some moral exercises provide an opportunity for each person to clarify their thinking on the question being asked. At the end of the exercise the teacher can ask students how their views have developed over the course of the exercise. They also will have been able to listen to others' views. There are many interactive discussion methods that can be used in classes with many persons.

One participatory method that can be used is to get students to stand in a line to form a continuum line based on their view between two extremes along a moral continuum. After some students give their explanations for why they are standing at that point in the line then students may move to the appropriate point in the moral continuum. Then after some time a modified question can be given and the students asked to move along the continuum to their new positions. This can include a transition from an abstract question, such as whether they support the use of reproductive human cloning, to a personal question, such as whether they would use reproductive cloning if that was the only way for them to have a genetically related child. The line could be in a U shape or straight. The U shape allows all students to see each other more easily (and listen to each other) in the case of a larger number of students. A series of examples can also be described on cards and these cards are given to groups of students to discuss and sort into a paper card continuum on their desk, and then explain the rationale to others.

Student debates and presentation of reports can allow more in-depth analysis of issues by students,

whether as individuals or in small groups, and then the debates can occur within the same class, between different classes, institutions or even countries by the use of video conferencing.

## **EVALUATION**

Researchers and educators need to work together to research into appropriate teaching methods for different target groups, to assess the effectiveness and impact (both positive and negative) of ethics education. Generating sustainable ethics teaching and promotion programmes is a method in itself, required by education planners.

Developing evaluation methods for effectiveness of education of ethics of science and technology is urgently required in many dimensions such as: knowledge, skills, and personal values. There is need to be continued research into appropriate assessment methods for the curriculum, as well as research into assessment methods for student learning outcomes, and research on assessment of practices including student, professional and public attitude towards bioethical issues (Van Rooy & Pollard, 2002ab). Evaluation should be authentic, comparative and ongoing to give a better estimate of the way bioethics is received in each group. It is better to use essays and creative writing, or oral debate, as an examination rather than multiple choice response questions that merely test memory. Moral dilemmas also often have more than one correct answer, making it difficult to judge one answer as correct and others as incorrect.

For more than 60 years it has been recorded that both quantitative and qualitative data are important in social science research, as was said by Merton and Kendall (1946), "Social scientists have come to abandon the spurious choice between qualitative and quantitative data: they are concerned rather with the combination of both which makes use of the most valuable features of each. The problem becomes one of the determining at

which points they should adopt the one, and at which the other, approach". Thus an appropriate methodological tool should contain methods to utilize and assess both types of data.

One important goal of teaching about bioethical issues is to get students to critically evaluate the issues (Conner, 2003). In a Mexican case (Rodriguez, 2005), bioethics classes were used as a way to improve the general behaviour and study aptitude of students. Each institution is likely to put a different amount of emphasis on each goal. Also, different activities are likely to enable some goals to be met and not others (Macer, 2004c). Therefore we do not need to assess all the institutional objectives when evaluating the success of the trials. Instead, case studies of how students and teachers responded were also sought to give a wider descriptive account of various approaches.

Kohlberg used moral dilemmas to determine which stage of moral reasoning a person uses. The dilemmas were short stories that describe situations in which a person has to make a moral decision, yet they provide no solution. The participant is asked what the right course of action is, as well as an explanation why. This style is still commonly used as case-based ethics teaching. There is a need to develop more cases for dialogues between different cultures and cases in broader issues of technology ethics, although some have been compiled.

A dilemma that Kohlberg used in his original research was the druggist's dilemma:

**Heinz Steals the Drug in Europe.** *A woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to produce. He paid \$200 for the radium and charged \$2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow*

*the money, but he could only get together about \$ 1,000 which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said: "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife. (Kohlberg, 1969)*

Should Heinz break into the laboratory to steal the drug for his wife? Why or why not?

Like many cases of bioethics, from a theoretical point of view, it is not important what the participant thinks that Heinz should do. The above case is quite relevant to global debates going on regarding the interpretation of the Doha Declaration on the compulsory licensing of generic copies of patented medicines, which raises conflicts between countries and the pharmaceutical industry. The point of interest is the justification that the participant offers. Below are examples of possible arguments that belong to the six stages. It is important to keep in mind that these arguments are only examples. It is possible that a participant reaches a completely different conclusion using the same stage of reasoning:

- **Stage one (obedience):** Heinz should not steal the medicine, because he will consequently be put in prison.
- **Stage two (self-interest):** Heinz should steal the medicine, because he will be much happier if he saves his wife, even if he will have to serve a prison sentence.
- **Stage three (conformity):** Heinz should steal the medicine, because his wife expects it.
- **Stage four (law-and-order):** Heinz should not steal the medicine, because the law prohibits stealing.
- **Stage five (human rights):** Heinz should steal the medicine, because everyone has a right to live, regardless of the law. Or: Heinz should not steal the medicine, because the scientist has a right to fair compensation.

- **Stage six** (*universal human ethics*): Heinz should steal the medicine, because saving a human life is a more fundamental value than the property rights of another person. Or: Heinz should not steal the medicine, because that violates the golden rule of honesty and respect.

One criticism of Kohlberg's theory is that it emphasizes justice to the exclusion of other values. As a consequence of this, it may not adequately address the arguments of people who value other moral aspects of actions more highly. His theory was the result of empirical research using only male participants (aged 10, 13, and 16 in Chicago in the 1960s). Gilligan (1993) argued that Kohlberg's theory therefore did not adequately describe the concerns of women. She developed an alternative theory of moral reasoning that is based on the value of care. Among studies of ethics there is a tendency in some studies to find females have higher regard for ethics theories (Ford and Richardson, 1994). Gilligan's theory illustrates that theories on moral development do not need to focus on the value of justice. Other psychologists have challenged the assumption that moral action is primarily reached by formal reasoning. People often make moral judgments without weighing concerns such as fairness, law, human rights and abstract ethical values. If this is true, the arguments that Kohlberg and other rationalist psychologists have analyzed are often no more than *post hoc* rationalizations of intuitive decisions. This would mean that moral reasoning is less relevant to moral action than it seems (Crain, 1985).

In current assessment of students there is a trend from merely making lists of many examples, or listing the positive and negative sides of an argument towards making students exhibit their reasoning as well. One of the common goals of school education is that students can produce a good argument. Stephen Toulmin's model has become popular in development of students'

argumentation skills (Toulmin et al. 1984). To create an argument a person needs to state their claim, then support it with facts (data) that are arranged logically. For each fact, they should give the evidence for the fact (warrant), and for each warrant, state the quality of its validity (backing). Then for each warrant and its backing, people should think of an opposing point of view (rebuttal). They then consider further possible warrants and backing for the rebuttals. At the end then they review, having argued the rebuttals, do they need to qualify their original claim?

The mental mapping project, or human behaviour project (Macer, 1992) identified 9 classes of ideas, and attempts to explain the linkages between ideas in the construction of moral choices by different persons (Macer, 2002). The practical applications of that model are yet to reach a stage at which teachers could simply assess the moral development of their students. The Ideas, Evidence and Argument in Science Education (IDEAS) project of Osborne et al. in the UK [<http://www.kcl.ac.uk/depsta/education/ideas.html>], has as its goal the assistance of teachers in developing their skills to teach about ideas, evidence and argument in science. The materials they wish to develop include worksheets and video clips to enable teachers to teach children to develop and evidence scientific argument. The IDEAS project suggests the following criteria can be used in evaluating students' arguments. Is there a claim? Does the argument have data to support the claim? Does the argument link the data to the claim? Are there further justifications to support the case? Is there any anticipation of a counter argument and how it could be opposed? Case studies have long been used in medical ethics teaching (Doyal et al., 1987).

Ratcliffe and Grace (2003) outline the knowledge, understanding and skills that students studying ethical issues in science acquire and that can be used to design assessment questions. They listed several different levels of knowledge:

- **Conceptual knowledge:** Learners can demonstrate understanding of: underpinning science concepts and the nature of scientific endeavour; probability and risk; the scope of the issue – personal, local, national, global, political and societal context; and environmental sustainability.
- **Procedural knowledge:** Learners can engage successfully in: processes of opinion forming/decision making using a partial and possibly biased information base; cost-benefit analysis; evidence evaluation including media reporting; and ethical reasoning.
- **Attitudes and beliefs:** Learners can: clarify personal and societal values and ideas of responsibility; and recognize how values and beliefs are brought to bear, alongside other factors, in considering socio-scientific issues.

There is a consensus among many Western scholars that the balancing of four main bioethical principles, which are autonomy, justice, beneficence and non-maleficence, is central to making better decisions (Beauchamp and Childress, 1994). Autonomy includes ideas such as respect for privacy, respect for personal choice. Justice is to respect the autonomy of others, and to treat persons equally. Beneficence is to try to do good, and non-maleficence is to avoid harm. When solving or trying to reach a consensus about bioethical problems, these four main principles can be a good guide in balancing which ideas should be mostly weighed. One measure of bioethics education could then be whether students are able to use these principles in decision-making, which was examined by presence of these keywords in discourse (oral or written).

Reaching a good decision is often difficult, which also may not be the same if made in different times and situations. Another approach that is common in education is to teach learners to break down ethical dilemmas into manageable problems, for example, the separation of action,

consequence and motives connected to a moral decision. This separation is reflected on the different bioethical theories. Utilitarianism is an example of a bioethical theory, which looks at the consequences of an action, and is based on the work of Jeremy Bentham and John Stuart Mill. This principle asserts that we ought always to produce the maximal balance of happiness or pleasure over pain, or good over harm, or positive value over disvalue. Utilitarianism can be then broken down into rule utilitarianism, and act utilitarianism. “A rule utilitarian may use moral rules as authoritative instrumental rules, so the morally right action is conformity to a system of rules, and the criterion of the rightness of the rule is the production of as much general happiness as possible” (Macer, 1998a). Act utilitarians on the other hand, look at the particular act only, and object to moral rules to be only an approximate guides, which could be broken if maximal good is not obtained. Another example of a bioethical theory is rights based theories of Immanuel Kant, and human rights law (Beauchamp and Childress, 1994; Macer, 1998a). The use of utilitarian-style logic and rights arguments were also examined among the discourse.

## **NETWORKING**

The International Bioethics Education Network was initiated in 2004, and the creation of networks linking research into policy is a cornerstone of efforts in all levels, from local to regional. List serves function in English for educators and students, and persons from a wide range of countries have tried these resources, and contributed to this project over the past years:

- Education listserve: <<http://groups.yahoo.com/group/Bioethicseducation/>>
- Student listserve: <[http://groups.yahoo.com/group/Bioethics\\_for\\_students/](http://groups.yahoo.com/group/Bioethics_for_students/)>

Networking among teachers interested in ethics of science and technology is essential for improving the quality of the way that ethics is taught, and also strengthening the motivation of teachers who are still often isolated. There are many teachers who will teach ethics of science at early levels, and successful methods for 12 year olds have also been described (Macer et al., 1997). There are considerable challenges in teaching even topics with a long tradition of debate such as the ethics of biotechnology (Hendrix, 1993; Lock and Miles, 1993; Bryce, 2004).

## **FUTURE NEEDS**

In the future the use of principles as expressed in the UNESCO Universal Declaration on Bioethics and Human Rights (2005) will also be analyzed to broaden the description of bioethical reasoning. There will also be identification of other goals from not only modern Western society but other value traditions. As with the above examples of questions that Kohlberg used for the linkage of student arguments to moral stages of development, there are a number of ways that could be developed into evaluation tools for assessment of bioethics education. We need to repeatedly examine criteria that could be used to measure the success of education of ethics, and the effectiveness of different forms of education for making mature citizens.

There needs to be extension of the evaluation methods and tools to look for presence of other concepts such as virtue ethics for example. Classroom observations, audio and video tape recordings, and written essays and homework done by the students can all be collected, but new methods for discourse analysis need to be researched. Text analysis of the reports for keywords was undertaken, extending categorization methods that have been developed (Maekawa & Macer, 2005). This feedback should be used to continually modify the texts and accompanying

questions and materials for teachers. Another way to assess the usefulness of the materials for developing ethical principles in making ethical decisions was to look for key words and concepts in the answers students give to oral questions.

Knowledge that educators want to impart includes knowledge of the science/technology content, knowledge of reflective processes (individual views), exploration of morals/values (values clarification), knowledge about bias and how to detect it (values analysis), knowledge about political agendas, for example (Conner, 2004). Recently, Sadler and Zeidler (2005) showed that tertiary students frequently relied on combinations of rationalistic, emotive and intuitive knowledge as they worked to resolve scenarios about genetic engineering. Persons at all levels do mix ideas in different ways (Macer, 2002) and this was shown in the evaluation report that is an output of this project.

Evaluation must be done ethically (Alderson & Morrow, 2003), and there are a variety of methods in research which can be applied for evaluation depending on the style of class and purpose (Cohen et al., 2003). It is very important to examine the future direction of bioethics education and how this might enable people to question scientific endeavours and what impact their moral decisions will have on them as individuals and upon their societies. The skills that are required to do this involve the ability to identify existing ideas and beliefs, listen to others, be aware of multiple perspectives, find out relevant information and communicate the findings to others. These skills cannot be 'given' to students through a didactic approach to teaching, where the teacher imparts the knowledge. Instead, students need to experience situations that will allow them to develop these skills through interacting with the teacher and with each other. This project allows sharing of cases and experience in a range of cultures as well.

When bioethics is applied to professional behaviour, such as in medical ethics, methods

to evaluate have included the way students conduct a patient examination (<http://wings.buffalo.edu/faculty/research/bioethics/eval.html>). In Buffalo University Bioethics program (Singer et al., 1993), they applied the technology of the objective structured clinical examination (OSCE) (Cohen et al., 1991) using standardized patients to the evaluation of bioethics. Methods to evaluate the clinical-ethical abilities of medical students, post-graduate trainees, and practising physicians that have been used include multiple-choice and true/false questions (Howe and Jones, 1984), case write-ups (Siegler et al, 1982; Doyal et al., 1987; Redmon, 1989; Hebert et al., 1990), audio-taped interviews with standardized patients (Miles et al., 1990), and instruments based on Kohlberg's cognitive moral development theory (Self et al., 1989). Pre and post teaching interventions are also a method that can be used (Oka & Macer, 2000). These can be applied to other professional ethics and research ethics guidelines. There can be monitoring of the behaviour of scientists who have completed courses, and examination of cases of misconduct to assess whether the persons felt they lacked some ethics education.

The reliability and validity of evaluation methods have seldom been examined, and research into these elements also must be developed. Auvinen et al. (2004) applied the use of Kohlberg's stages of moral development to assess ethics teaching in nursing students in Finland, and they found significantly higher ethical maturity when nurses actually had to deal with ethical dilemmas in their practical training in clinics.

## **CONCLUSION**

There are a range of goals of ethics education for science and technology. The goals of ethics range from increasing respect for life; balancing benefits and risks of science and technology; understanding better the diversity of views of different persons; understanding the breadth of questions

that are posed by advanced science and technology; being able to integrate the use of scientific facts and ethical principles and argumentation in discussing cases involving moral dilemmas; and being able to take different viewpoints such as biocentric and ecocentric perspectives. We do not need to achieve all goals to consider a class to be successful, and different persons, professions and communities put a different amount of emphasis on each goal.

It is important at all levels we need to research how to evaluate whether the teaching is having any impact or not. Because investigating ethical issues is complex, the educators need to consider what knowledge needs to be developed in order for students to make sense of moral issues, to be able to critically evaluate them and to take more ethical action based on this knowledge. In experience with trying to get evaluation and feedback however, despite positive comments that teachers may provide in person, very few evaluation reports from student and teacher feedback are returned (Macer, 2006). There is still a need for analysis of reports and discourse in order to gain a greater impression of how student values changed, and a suggested coding frame is made. It can be extended case-by-case to add new keywords and concepts which are important for the specific research goals of the evaluation, as well as topic-specific goals.

Pre and post questionnaire surveys about specific topics relating to the content of the lecture or teaching intervention (Maekawa and Macer, 2004) can be useful to measure change, however, report and discourse analysis may provide a more reliable judgment because the object is to see the use of ethical principles and moral reasoning all the time, and not just being written for tests by students. There are several different ways to assess learning in bioethics. There need to be assessment methods to map to the different goals. A mix of qualitative and quantitative methodology can help in the monitoring of ethical maturity, and qualitative discourse analysis will assist this (Dawson and Taylor, 1997).

The Action Plan for Bioethics Education developed in 2006 in Asia and Pacific (RUSHSAP, 2006) addressed recommendations to educators, researchers, universities and government. There is room at all levels to develop a practical climate for greater education of the ethics of science and technology. In conclusion we can say that despite the overwhelming consensus that education of professional ethics is essential, we still have a long way to go to being confident that ethics education achieves the goals it is conducted for, and more research and trials are necessary in every culture and field of science and technology.

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## **KEY TERMS**

**Bioethics:** This is a field concerned with ethical implications within medicine and medical research.

**Education:** This describes the process and act of acquiring knowledge.

**Ethics of Science and Technology:** This is a field concerned with ethical study of science and technology.

**Evaluation:** This is a set of procedures designed to measure or account for changes in learning or performance.

**Medical Ethics:** This is a field of applied ethics concerned with moral and ethical values in medicine.

**Moral Development:** This concerns changes in individual values that occur during development.

**UNESCO:** UNESCO is a specialised technical intergovernmental agency of the United Nations, focusing on promotion of education, culture, social and natural sciences, and communication and information.