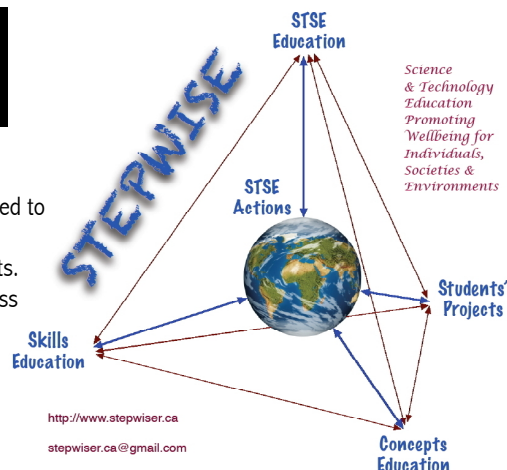


WISE Issues

Introduction

As its name implies, 'STEPWISE' is a framework for science and technology education that is intended to promote *Wellbeing for Individuals, Societies & Environments* (WISE). In Ontario, WISE is related to 'STSE'; that is, relationships among fields of science and technology and societies and environments. Student awareness of such issues can help to motivate and direct actions they might take to address them. However, as indicated by the framework at right, this also can be aided by 'Concepts' Education (e.g., laws & theories) and Skills Education (e.g., about experimentation and conduct of correlational studies) and, related to that, findings from Students' Projects (e.g., that age may affect sugar consumption).

Clearly, the nature of such issues, by definition, is contentious and variable — depending on many conditions over time. The list below is intended, therefore, only to stimulate thought regarding issues that may be important for students/citizens to address.



Some WISE Questions

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|---|---|
| 1. To what extent should governments legislate protection of waterfowl populations? | 23. To what extent should governments regulate questionable trade practices (e.g., sale of out-of-date medications to poor nations)? |
| 2. To what extent should oil and gas extraction be permitted in polar regions? | 24. To what extent should governments regulate international transportation of potentially harmful substances such as petroleum? |
| 3. To what extent should aquatic farming (e.g., of salmon) be controlled? | 25. To what extent should governments take steps to promote public transportation and self-propelled modes of transport (e.g., bicycles) at the expense of private, motorized vehicular transportation? |
| 4. Are toxicity standards for solid waste storage and disposal appropriate? | 26. To what extent should governments and The United Nations regulate food stockpiling in each country to ensure equitable food distribution? |
| 5. Should genetically engineered organisms be introduced into natural ecological systems? | 27. To what extent should governments regulate the balance of energy production by renewable and non-renewable means? |
| 6. To what extent should national parks services allow natural fires to burn within national parks? | 28. To what extent should governments/United Nations regulate production and deployment of weapons of mass destruction? |
| 7. Are natural pest management techniques in agriculture as effective and efficient as petrochemical methods? | 29. What, if anything, should be done about the excessive amount of packaging that is going into landfills? |
| 8. To what extent should governments promote incineration of solid wastes? | 30. To what extent, if at all, should governments levy taxes on the sale of cigarettes? |
| 9. What steps should be taken to address potential Climate Change? | 31. To what extent should people in the richest countries of the world attempt to address diseases (e.g., malaria) affecting people in poorer countries? |
| 10. What should be done to the alleged contributors (e.g. industry, automobile drivers) to acid rain? | 32. What, if anything, should be done to minimize corporate influences on topic choice, methods, outcomes and dissemination of findings in science and technology? |
| 11. What should be done about our apparent drastic reduction in national and global forestation? | 33. Should we encourage genetic modification of food crops? |
| 12. To what extent should we support the nuclear energy industry? | 34. To what extent should governments control additives and nutrient content in commercial foods? |
| 13. Should we continue to allow the development of major northern hydro-electric projects (such as the Quebec James Bay Project)? | 35. Are topics for research and development fairly chosen, in terms of human variety, needs and interests; e.g., regarding sex/gender, race, social class, geographic location, etc? And, if not, what should be done about this? |
| 14. Should we continue to allow foresters to use pesticides, such as those for combating the Gypsy Moth? | 36. What should be done, if anything, about the growing use of commercial advertising in practically every location, instance in time, etc.? |
| 15. Should governments tighten up regulations that govern manipulations of human genetic material (e.g., DNA)? | 37. To what extent should 'lay' members of the public determine topics of investigation/development in professional science and technology? |
| 16. What, if anything, should be done about world population growth? | 38. To what extent should governments invest money in space exploration? |
| 17. To what extent should governments organize mass health protection programmes (e.g., water fluoridation, free condom distribution, etc.)? | 39. To what extent should governments attempt to minimize overall production and consumption of goods and services? |
| 18. To what extent, if any, should we allow human fetal abortion? | 40. Others? |
| 19. To what extent should the medical community maximize efforts to prolong the life of each individual, regardless of the circumstances? | |
| 20. To what extent should governments regulate developments in fields of biotechnology? | |
| 21. Should our governments enshrine a social charter in the constitution? | |
| 22. Should governments measure economic success in terms of '% growth in GDP?' (Gross Domestic Product = the market value of all goods and services produced within a country in a given time period time.) | |

WISE Issues

Introduction

Although there is considerable controversy, many people are concerned about possible problems for the 'wellbeing of individuals, societies and environments' (WISE) that relate to fields of science and technology. It can be helpful to think of such issues as stemming from possible negative relationships among fields of science and technology and societies and environments (STSE). To the

extent that the WISE are threatened by such issues, citizens need to be prepared — perhaps through formal education — to address them. Information and resources pertaining to issues in several categories are provided for this purpose.



Possible Problems for the Wellbeing of Individuals, Societies and Environments

Among the many possible WISE problems, there are those in the categories below:

1. **Foods & Beverages:** Many 'manufactured' foods and beverages are the source of significant health problems (e.g., blood-vascular diseases and cancer) for people and, also, for societies responsible for them. Many of these products have excessively high sugar, salt and/or fatty acid content, along with artificial flavours, colours, sweeteners, preservatives, etc. and caffeine. Often, nutritional content is minimized in manufactured foods and beverages. Many people also are concerned with possible adverse effects of genetically-modified foods & beverages. An excellent source of information regarding such issues is the *Centre for Science in the Public Interest* (<http://www.cspinet.org/canada/index.html>).
2. **Drugs:** Although there are numerous benefits, many manufactured and natural chemicals used for altering human cognitive and/or health states often have various negative side-effects. Some people are concerned about adverse effects of various 'mind-altering' drugs, such as marijuana, alcohol, nicotine, cocaine, ecstasy, etc.
3. **Transportation:** Many forms of transportation, while helping to bring people, goods and services together, have various negative side-effects. Of particular concern are energy sources that generate potentially hazardous by-products, including 'smog' and 'Greenhouse Gases' from petroleum products. Production of long-lasting radioactive breakdown products from nuclear fission reactions also is of concern. The *Oil Drum* (http://www.theoil Drum.com/tag/public_transportation), for example, is a website that provides interesting information and perspectives about alternatives to oil use.
4. **Electronics:** People in various places throughout the world often mediate their social relations through various forms of electronic technologies, including cell phones, personal music players and organizers, video games, television, movies, internet, etc. Among various concerns about these and other technologies is that they may carry with them particular 'messages' (often in the form of instructions for or limitations of use) that may surreptitiously govern people's lives. This often is debated through the concepts of techno- and social-determination; e.g., at: http://en.wikipedia.org/wiki/Technological_determinism
5. **Popular Culture & Entertainment:** As described above, various forms of popular culture for entertainment purposes (e.g., television programmes, movies, magazines, etc.) have various potentially problematic socio/techno-deterministic characteristics. Additionally, many of these often have subliminal messages associated with them to promote further consumption of those or other forms of culture. Trends in and issues surrounding subliminal advertizing, for example, are discussed at *Mind Power News* (<http://www.mindpowernews.com/SubliminalAds.htm>). Associated with such advertizing are techniques of data management and mining; e.g., using computer systems to determine consumer purchasing habits and then adjusting advertizing to encourage further consumption. For some ideas relating to this issue, refer to: http://www.democraticmedia.org/current_projects/privacy
6. **Recreation:** Various forms of recreation, while providing many health benefits, for example, can pose WISE problems. Recreation depending on motorized devices (e.g., boats, personal water craft, snowmobiles, etc.) produce various forms of pollution and, in some cases, physical injury due to accidents. Some issues pertaining to personal watercraft, for example, include those at: <http://www.conservationparkva.com/pwi/index.html>
7. **Health & Beauty Aids:** Many people use various products and services (e.g., plastic surgery, cosmetics, vitamins, perfumes & colognes, etc.) to improve their health and/or physical appearance. Certain vitamin supplements, such as Vitamin A, can be helpful — for people living where there are long periods of low sunlight levels, for example. General use of multivitamins is, however, a controversial practice — with some studies indicating health improvements, while others question their benefits (e.g., http://www.canadianliving.com/health/prevention/do_multivitamins_work.php). Similarly, use of cosmetics is not without controversy. Considerable concern has developed about cosmetics that use various anti-bacterial and anti-fungal chemical additives — which may lead to various forms of cancer, for example (<http://www.thinkbeforeyoupink.org/Pages/CosmeticCompanies.html>).

8. **Resource Extraction:** Primarily related to humans' needs and interests in terms of production and consumption of goods and services, various forms of resource extraction (mining, forestry, fishing, etc.), although important for human survival and quality of life, appear to be contributing to significant habitat destruction and consequent species losses. An excellent summary of issues relating to this is *The Story of Stuff* (<http://www.storyofstuff.com/>).
9. **Biotechnology:** In about the last three decades, there has been a 'revolution' in 'biotechnology'; i.e., engineering of living things. Although many of these products — such as genetically-modified seeds that can grow in new, formally less-suitable, soils — may have various benefits, there are various issues associated with such technologies. That they can be patented made reproductively inert, for example, often means that their use is limited to those who can afford to pay for them. Various issues relating to biotechnologies are discussed at *ActionBioscience* (<http://www.actionbioscience.org/biotech/>).
10. **Education:** Education often is seen as a public service, aiming to educate everyone to the maximum of their abilities. Such a service would, in principle, improve the wellbeing of disadvantaged students, effectively narrowing the gap between rich and poor, and enable the society to be transformed in ways partly determined by disadvantaged people. In practice, however, education tends to reproduce traditional class groupings. Many subject areas, such as school science, tend to focus on identifying and prioritizing education of the relatively small fraction of students who may pursue careers in the discipline. In doing so, the education of other students often is compromised — and, as a consequence, education tends to perpetuate and augment a society prioritizing individual competitiveness and specialization of work/careers. Ideas about these and other related issues are located at *Globalization and Education* (<http://globalizationandeducation.ed.uiuc.edu/Concepts/>).
11. **Labour:** An undeniable aspect of human life is the need for labour — to sustain life and, in many cases, to improve it. Many people struggle, however, with a healthy balance between labour and leisure. Indeed, apparently due to a highly individualized competitive economic environment in many countries, the work-leisure ratio has steadily declined in about the last one-hundred years (<http://www.nber.org/digest/feb07/w12264.html>).
12. **Financial Services:** In many parts of the world, people conduct financial exchanges through services provided by various private enterprises. Credit and bank cards, for example, allow people to make cashless transactions. Although such services make purchase and sale of goods and services more convenient, their existence may lead some people to spend more than they actually possess in savings. Refer to this site for some ideas about this issue: <http://www.pcbs.org/credit-cards-can-encourage-overspending/>

WISE Issues Stemming from Societal Influences on Fields of Science & Technology

Reasons for the many potential WISE problems described above are, undoubtedly, complex and uncertain. However, there is considerable support for the contention that many of them may have some connection — however distant or weak — with characteristics of fields of science and technology. On the one hand, it is clear that many of the problems outlined above involve products — such as drugs, automobiles, manufactured foods, etc. — of fields of science and technology. Given that the conduct of science and technology, like any human endeavour, may be subject to error, personal biases, etc., it is perhaps unsurprising that products of their work may lead to issues. On the other hand, the nature and severity of some issues — has led some analysts to suggest that problems stemming from fields of science and technology and their products arises largely due to influences outside those fields. For many societies, particularly those rapidly generating products and services using fields of science and technology, a dominating influence appears to be *capitalism*. Given the utility of science and technology for production and consumption of for-profit goods and services, there can be enormous pressure on scientists and engineers to assist in the pursuit of profit. Such pressures can, moreover, lead some scientists and engineers to compromise the integrity of their work. One way to evaluate such compromises is through analyses using Robert Merton's norms of practice in the sciences. Briefly, Merton suggested that science should, to defend itself against outside influences, endeavour to be *communal* (e.g., collaborative), *universal* (e.g., inclusive), *disinterested* (e.g., unbiased), *original* (e.g., creative) and *skeptical* (e.g., critical). Although such psychological-emotional factors as desires for peer and public recognition can lead some scientists and engineers to compromise such norms of practice, significant orientation towards profit generation can degrade adherence to them in worrisome ways. In the pharmaceutical industry, for example, Communalism can be compromised when results are exclusively-held by private research companies, Universalism may be compromised when conflicts-of-interest in regulatory agencies privilege certain investigators' claims, Disinterestedness may be compromised when 'finders fees' bias drug trials, Originality may be compromised when 'new' drugs are, actually, minor variations of existing ones and Skepticism may be compromised when some refereed journal articles reporting drug trials are 'ghost written.' Scientists also sometimes compromise methods to ensure validity and reliability. For example, drug companies — often through research companies employed by them — frequently use small sample sizes, younger, healthier [less susceptible to negative side-effects] subjects, lower doses than to be prescribed, and brief drug trials in order to maximize probability of drug approval.

Compromises to the integrity of work associated with an excessive for-profit production and consumption orientation appears to affect many branches of science and technology. Such adverse effects have, for example, been common in the biomedical sciences (including fields of biotechnology). An excellent source of information about such compromises is *Corrupted Science* (<http://www.tufts.edu/~skrimsky/corrupted-science.htm>).