

Design and Professional Practice 2

Engineering Ethics

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Aims and Objectives

The aim of this session is to recap on your previous sessions on ethics and build on your understanding of the role of ethics in engineering design and research.

KEEP OFF MY REAR
I'M EXPLOSIVE!



Intended Learning Outcomes

By the end of this session you should be able to understand and apply the framework of ethics in research.

KEEP OFF MY REAR
IMEXPLOSIVE!



- Issues in bioengineering ethics
- Ethical decision making, behaviour and leadership
- Issues leading to conflict
- Moral principles
- Approaches and tools for ethical decision making
- Codes of conduct (professional societies)



Issues in Bioengineering Ethics

- Research and development practice
 - Human and animal subjects;
 - Benefiting others / doing no harm;
 - Dignified treatment of patients, confidentiality, consent
- “Playing God”
 - Human enhancement;
 - Crossing species boundaries (tissue engineering);
 - Prolonging life vs. quality of life



Issues in Bioengineering Ethics

- Prostheses and implants (mechanical and neural)
 - Human identity and dignity;
 - Materials testing;
 - Individual autonomy (control of cognition and mood)
- Biomedical (diagnostic) imaging
 - Excess diagnoses;
 - Brain imaging and mental states / mind reading?
- Wider implications of emerging technologies
 - AI;
 - Nanotechnology;
 - In vitro meat



- Data and information analysis
- Communication
- Group / team issues
- Critical thinking
- Self-awareness (authentic and consistent)
- Social, environmental and economic awareness



ETHICS EDUCATION

debates, anecdotes, role plays,
moral frameworks, conflict
analysis, group work reflection,
thinking tools

reflection on personal beliefs,
values and motivation, self and
societal understanding, moral
reasoning and
critical thinking

LEADERSHIP DEVELOPMENT

Practice of Authentic
(Group) Leadership



Development of Authentic
(Self-) Leadership



Objective Appraisal of Beliefs
self-awareness
self-beliefs
stereotypes



Issues Leading to Conflict

- Factual understanding
e.g. data, evidence, regulations, laws
- Conceptual understanding
e.g. definitions of confidentiality, safety, risk, bribery
- Moral principles
e.g. different values
- Conflicting goals
e.g. costs vs. benefits, priorities, deadline pressures

Conflict is not bad – so long as you are open to discussion and learn from it



- Producing the most good, i.e. utilitarianism
- Right/wrong is always right/wrong, i.e. universality
- “What if the role was reversed?”, i.e. reversibility
- Giving equal respect to all persons (rights)
- Showing good character as defined by one’s virtues
 - e.g. honesty, loyalty, compassion, generosity
- Fairness and justice
- Adding to the common-good



Recipe for ethical decision making

1. Clarity on:
 - Facts and concepts
 - Conflicting goals / motivations
 - Professional codes / statements;
 - Regulations / legislation
 - Moral principle(s) being applied / compromised



Recipe for ethical decision making

2. Tools and approaches:

- Relevant case studies / analogies
- Wider consultation
- Problem reversal
- Paradigm cases (change thinking on an issue)
- Creative middle-way
- Design-like approach
- Ethical matrix



Recipe for ethical decision making

Respect for:	Wellbeing	Autonomy	Justice
Treated Organism	e.g., Animal welfare	e.g., Behavioural freedom	Intrinsic value
Producers (e.g., farmers)	Adequate income and working conditions	Freedom to adopt or not adopt	Fair treatment in trade and law
Consumers	Availability of safe food; acceptability	Consumer choice, e.g., labelling	Universal affordability of food
Biota (fauna and flora)	Protection of the biota	Maintenance of biodiversity	Sustainability of biotic populations

- Ethical matrix



Recipe for ethical decision making

The ultimate check

Are you confident about your ethical stance?

- being able to justify your position in an objective way
- being able to live with a decision that doesn't lead to a positive or expected outcome



- Applying these concepts to research work, i.e. devising a framework for responsible research conduct.
- Using such a framework as guidance in the completion of application forms to research ethics committees.



Six domains of research ethics

For any research product, project or proposal start by considering 3 basic questions:

- A. Is it (will it be) true?
- B. Is it (will it be) fair?
- C. Is it wise?

Each can be expanded to yield a total of 6 domains for consideration and care by the researcher.



A. Is it true?

Domain 1 – Scientific Integrity

Relationship between research and the truth

- Technical competence (experimental design)
- Data acquisition and manipulation
- Statistical methods
- Falsification; fabrication; unintentional bias



Domain 2 – Collegiality

Relationships among researchers

- Authorship
- Data sharing and timely publication
- Peer review
- Confidentiality
- Open and honest (candour)
- Plagiarism



Domain 3 – Protection of Human Subjects

Relationships between researchers and human subjects

- Protection from harm; respect; autonomy;
- Beneficence (welfare of participant); justice
- Access to treatments / technology
- Informed consent and assent (approval)
- Confidentiality and anonymity
- Research risks
- Withdrawal
- Debriefing
- Deceit



Domain 4 – Animal Welfare

Relationships between researchers and animal subjects

- The 3 R's:
 - replacement,
 - reduction,
 - refinement
- Animal rights?



Domain 5 – Institutional Integrity

Relationships between researchers and their sponsors, funding agencies and government

- conflict of interest
- conflict of commitment
- regulatory compliance
- data retention
- institutional demands and support



Domain 6 – Social Responsibility

Relationship between research and the common good

- Research priorities
- Fiscal responsibility
- Public service
- Public education
- Environmental impact
- Advocacy by researchers (gaining public support)



Six domains model:

a comprehensive framework for research conduct that covers aspects of experimental design, methodology, data collection and handling, dissemination and wider social responsibility

