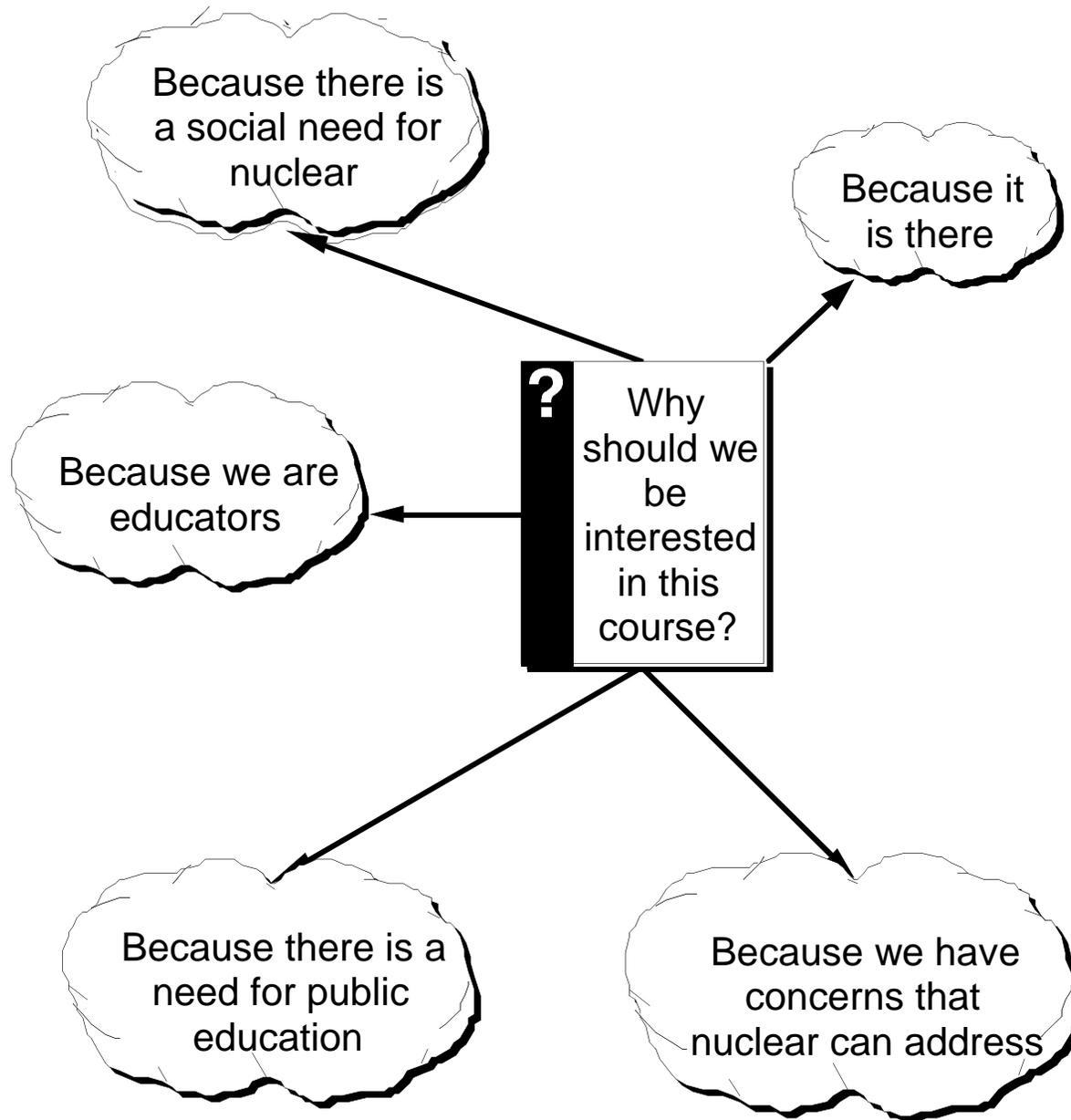
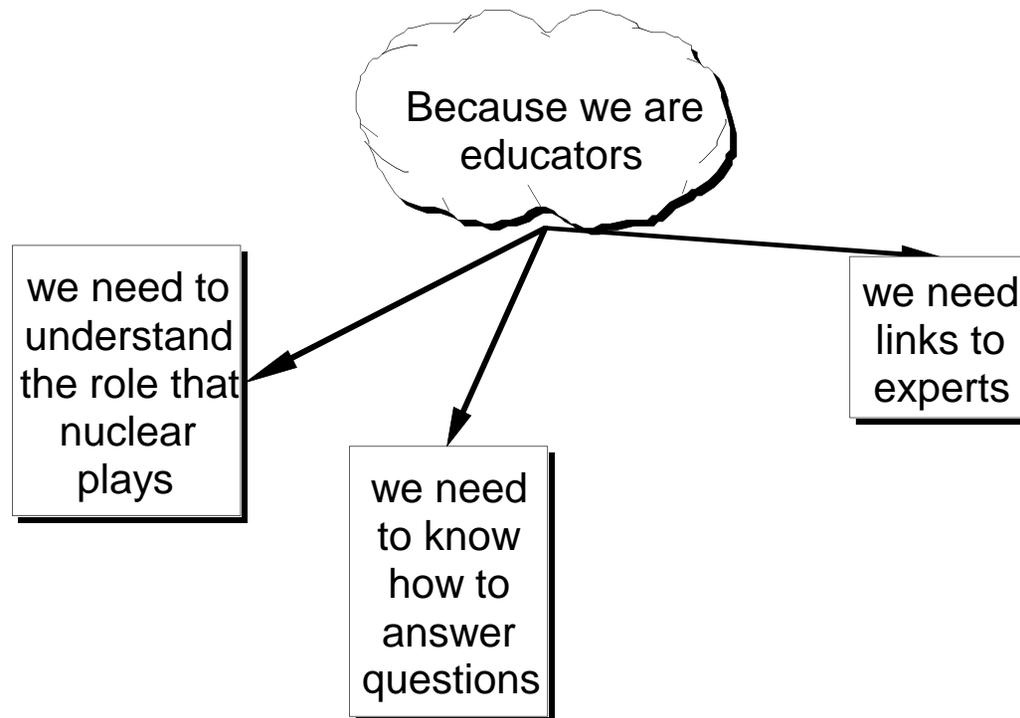
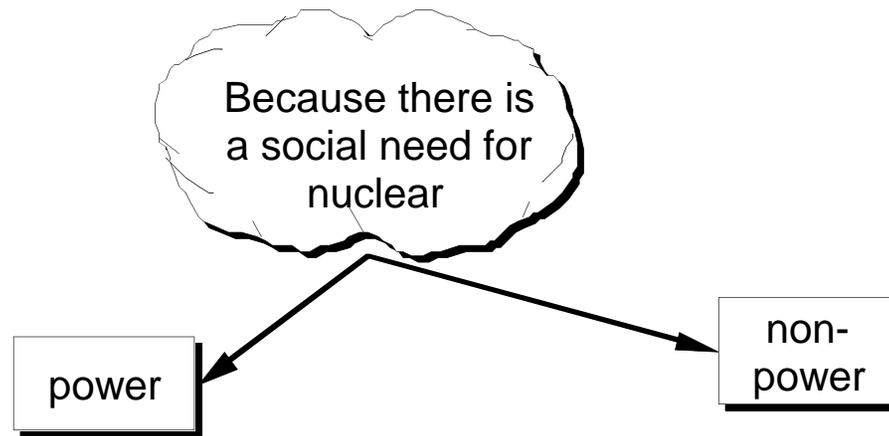
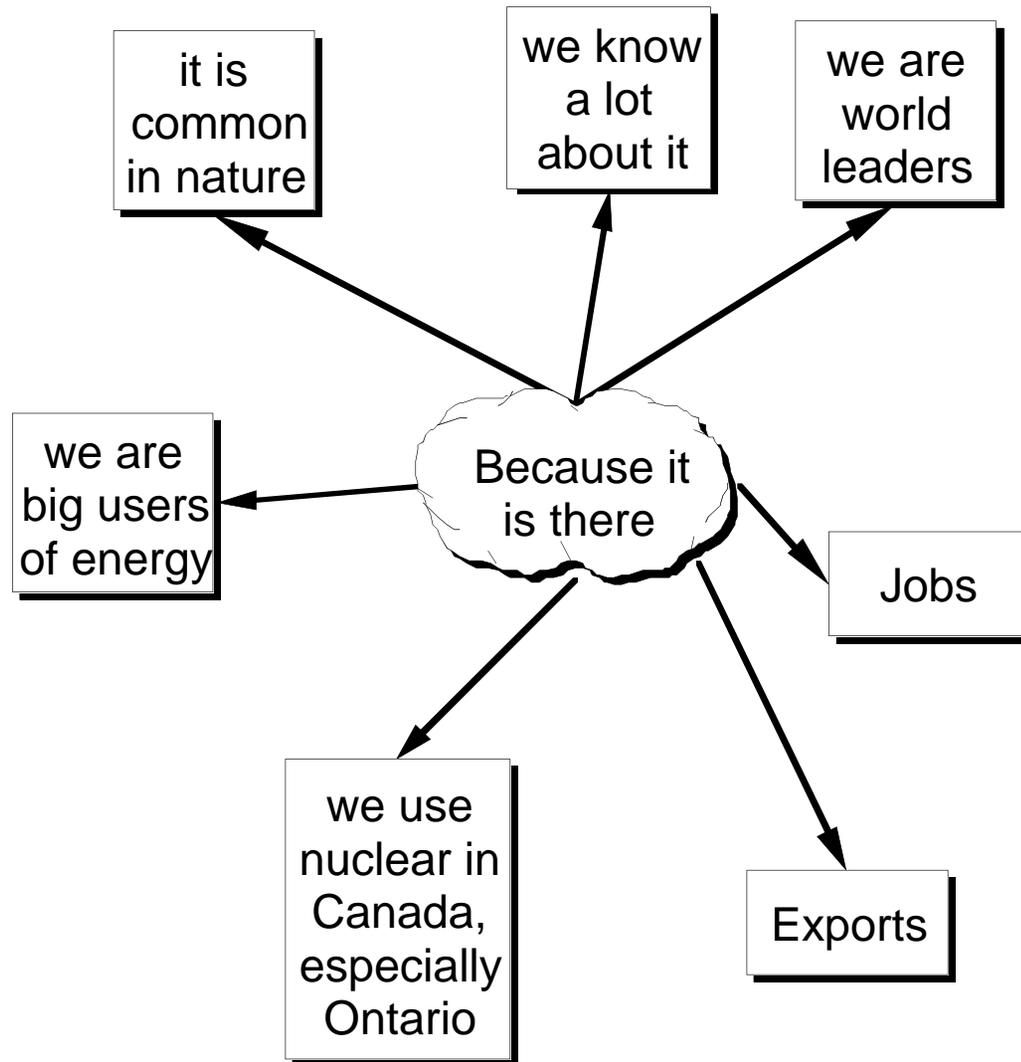

Science of Nuclear Energy and Radiation

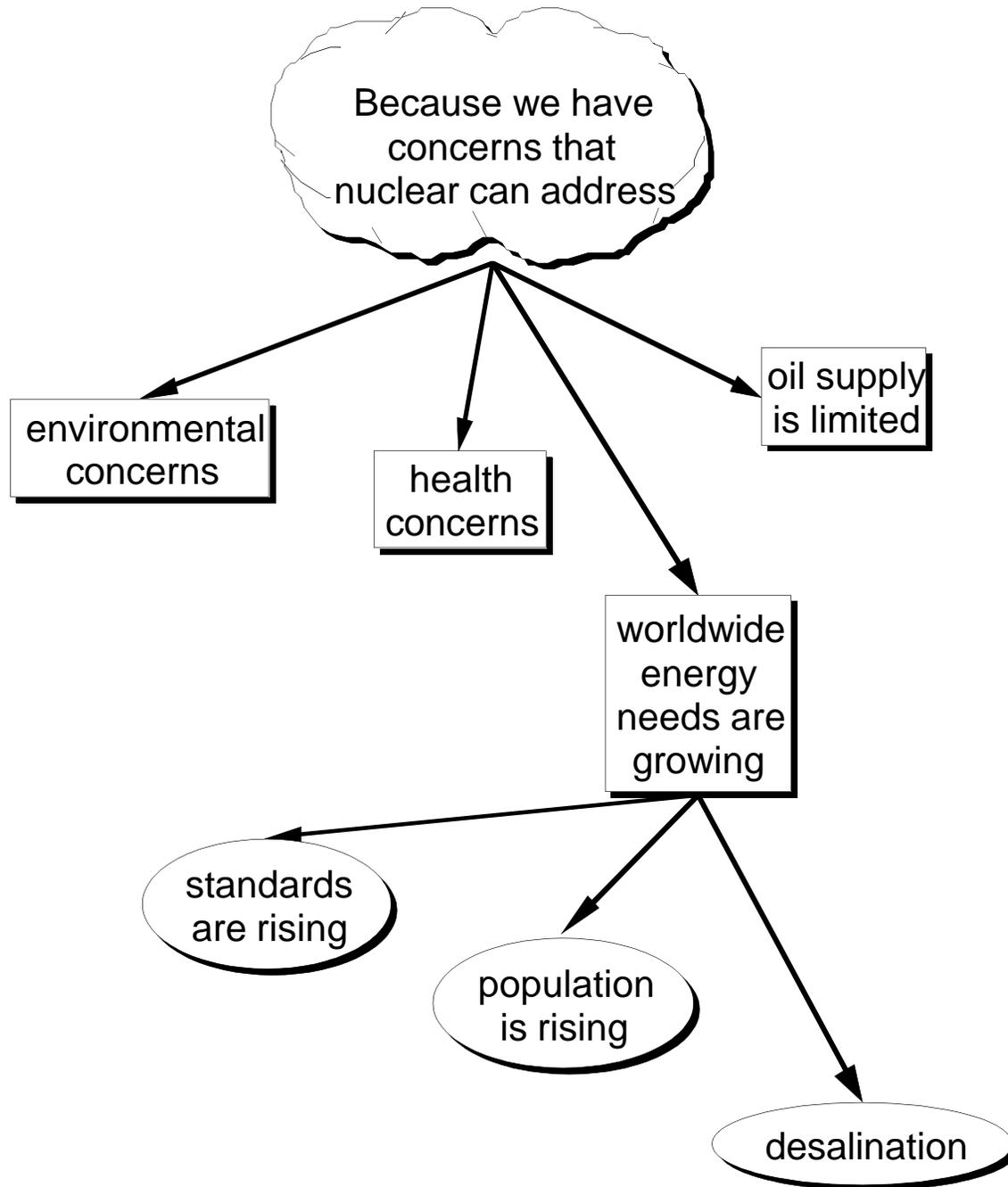
Introduction to the Course

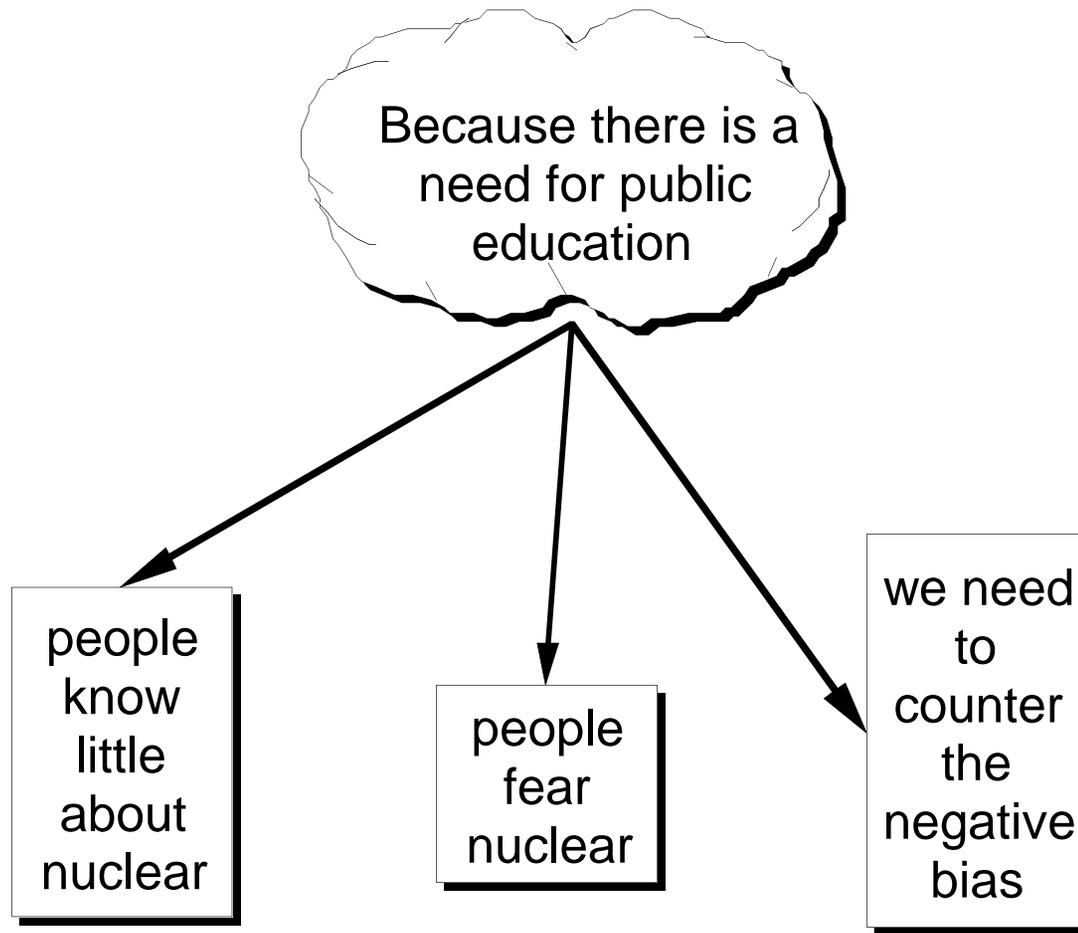
by
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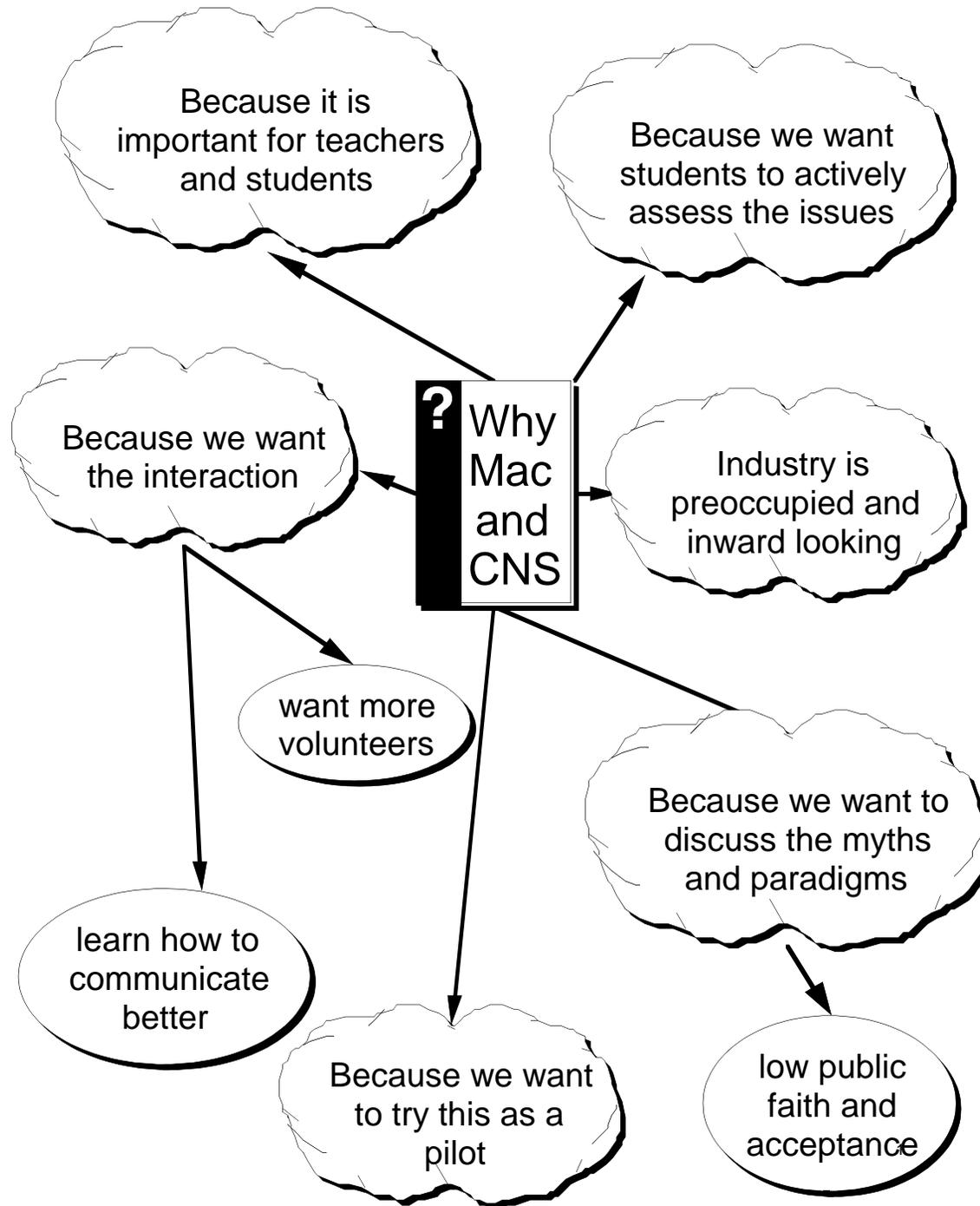












How should the subject matter be treated?

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Philosophical underpinnings are required in this course because, ultimately, the acceptance or rejection of nuclear power depends on the fundamentals - philosophy and value systems.

● **Doubt**

- When all is said and done, there remains doubt - it is the one thing that I am sure of. There will always be considerable uncertainty and, hence, risk.
- Doubt is heaven to some because it gives the potential for change.
- Doubt is hell for others because of the hazards of uncertainty.
- The question is: “How do we best proceed?”
- Basically we need to minimize risk and maximize benefit. The two are not necessarily the opposite of each other.

● Life is Complex

- Many interconnected spheres
 - biosphere
 - stratosphere
 - ecosystems
 - social systems
 - legal systems
 - judicial systems
 - economic systems
 - etc.

- Given our lack of knowledge (doubt again) about how the spheres work, we need to adopt a “Respect for all Things in Life”.

- Ultimately, everything is important. But, practically, we need to set priorities. We need a methodology to do this - a management system.

● Specialization

- Given the doubt and complexity, specialization is required to manage the practicalities of life.
- This implies:
 - organization
 - coordination
 - process
 - rules
 - procedures
 - enforcement
 - learning
 - measurement
 - faith / trust in others
- Specialization implies certain individuals or groups will be in positions of privilege, eg. Teachers, doctors, engineers, etc.
- This raises social issues of rights, responsibilities, freedom, equality, empowerment, etc.
- Need a methodology to make decisions regarding risks vs benefits (both of which are value laden).

● **Process Specification - a suggestion**

- Should be non-biased (ie, no a priori preference)
- Ultimately, making a choice boils down to a numerical assignment - whether you think so or not!
- The scorecard process
 - Numerically-based algorithm makes the process explicit so. At the very least, the biases are made visible and provides a basis for discussion.
 - Need to enumerate the attributes of importance.
 - Pre-assign attribute weights.
 - Enumerate the alternatives
 - Set the goal. Best? Least worse? RMS?
 - Score each attribute for each alternative according to an explicit scoring algorithm.
 - Exclude immediately any alternative that excluded if it fails to meet the minimum requirement for any attribute, eg, a car is excluded if you need a truck.
 - Rank the remaining alternatives using a simple scorecard.

- This is a reasonable process given the errors in evaluations of attributes and in the weights chosen.
- Pros and cons are equally pursued for all options commensurate with the probability of success. For example, cars running on water should not be investigated without some evidence that it is viable. Or, if the public has voted that there will be no nuclear reactors, then that option is a non-starter.
- In short, the choice should be made based in an explicit and unbiased comparison of the alternatives.
- Value systems enter via the attributes selected, the weights chosen and the goals set.

● **Rights vs Responsibilities**

- The more rights / privilege/ authority one has, the more responsibility / obligation / accountability one has.
- This implies that those responsible for power production must have the authority and the means to do so. This implies privilege. Equally, they are to be held accountable.
- This also implies that those who object or oppose a privileged group are also accountable for their actions since the right to oppose implies responsibility.

● **Empowerment**

- Those invested with a responsibility or otherwise externally obligated must be empowered to carry out that obligation by those from whom the obligation arose.
- Self-appointed obligations do not imply that others must empower the self-appointed. Eg, a special interest group has no right to public funding. But a publically formed watchdog does have a right to public funding.

- **Freedom vs Equality**

- Freedom and equality are incompatible.
- The more free people are, the less equitable things are.
- The more equitable things are, the more restricted people are.
- Empowered, privileged groups are necessarily inequitable compared to the masses.

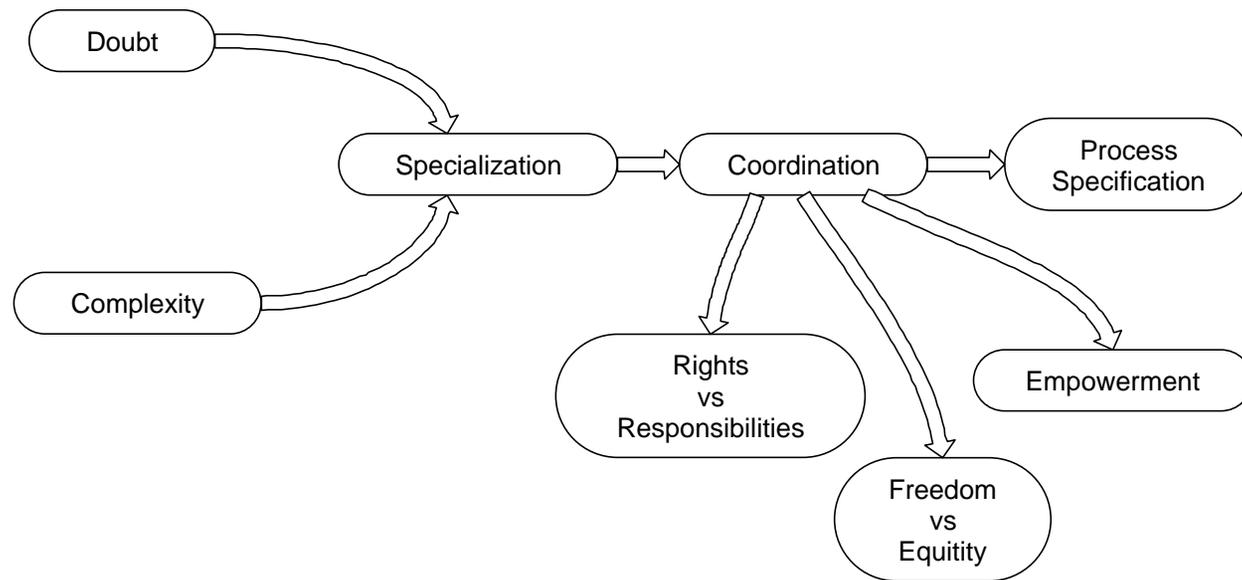
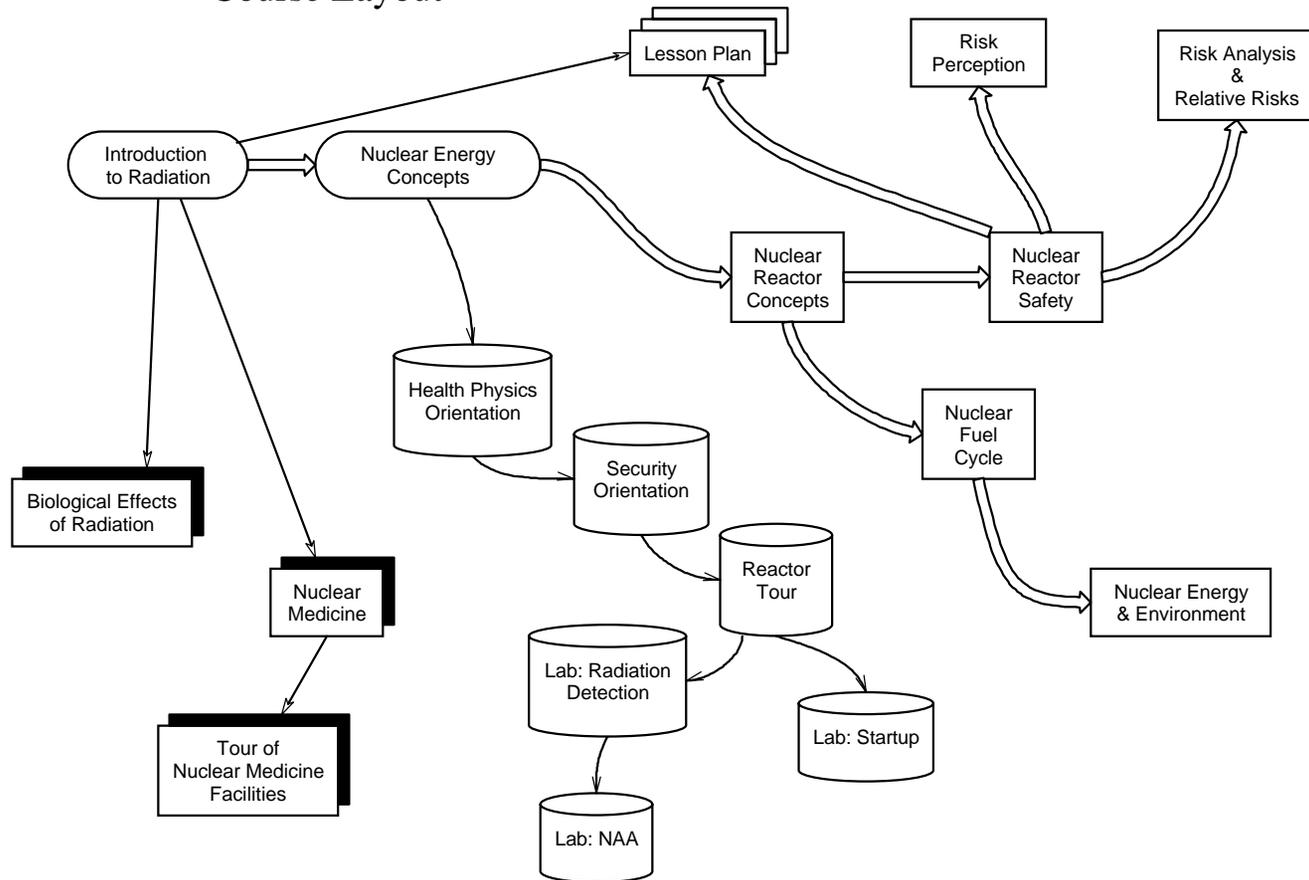


Figure 1 The “etymology” of Western reductionism ... Or how we have been hoisted by our own petard.

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Course Layout



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Figure 2 Course Layout