

Morality and epistemology in upper secondary school students deliberation on risk assessment concerning genetic engineering

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Controversial issues as a basis for science education

- Swedish curriculum states that students should learn to take a stand in socio-scientific issues using scientific facts and knowledge.
- But, students face challenges when required to integrate scientific facts and values in their reasoning (e.g., Sadler & Donnelly, 2006).



- SSI connected to risk and risk assessment offer opportunities to learn how subject matter and values interact

because

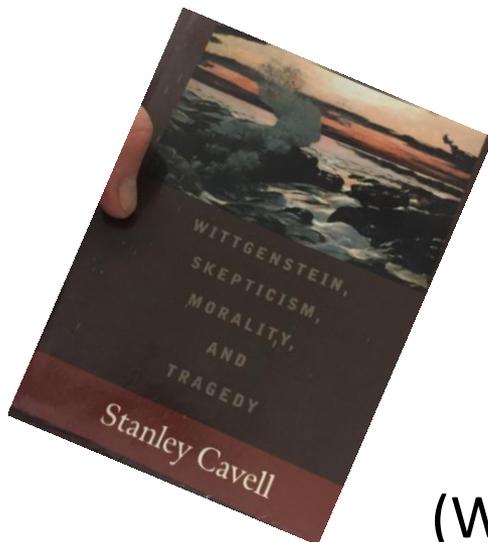
- Risk assessment always involves both scientific knowledge and value judgments (cf Schenk et al, this presentation).

Aim

Generate knowledge about how science teaching can be designed to provide students with the opportunity to deliberate, conduct risk assessments and take a stand in SSI where scientific knowledge has an important role.

Theory

Conversations about risk taking can be studied as different language games, epistemological (fact-based) and moral (value-based).



(Wittgenstein 1968, 1975; Cavell, S. 1979/1999)

Research questions

Overarching

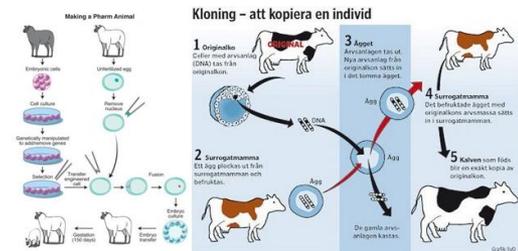
- How can an understanding of the relationship between epistemology (factual knowledge) and values (moral) in student deliberation be helpful for developing education in genetic engineering linked to risk.

Specific

- How does science subject matter enter into students' deliberations?
- How do moral judgments enter into students' deliberations?
- How do science subject matter and moral judgments interact in students' deliberations?

Areas in genetic engineering

- Prenatal diagnosis
- Gene testing and genetic counselling/self-test
- Personalized medicine (pharmacogenomics)
- DNA-based forensics
- Gene bank and biodiversity
- Gene therapy
- Cloning
- GMO's



Study design

- 32 students divided into 8 groups
- each group responsible for one area

Student task:

1. Find out about opportunities, risks and ethical issues in your area.
2. Formulate a value clarification question that requires your classmates to make a decision and take a stand.

Documentation

Video recordings and transcriptions of student conversations



Analysis

PEA

Practical Epistemological Analysis

(Wickman, P.-O. & Östman, L. 2002)

DEQ

Deliberative Educational Questions

(Lundegård I. & Wickman, P.O. 2007, 2012)

Kloning

Vad är Kloning?

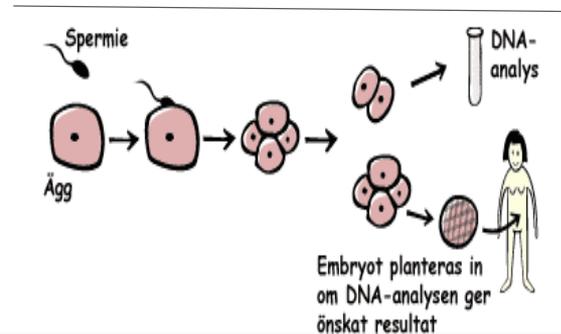
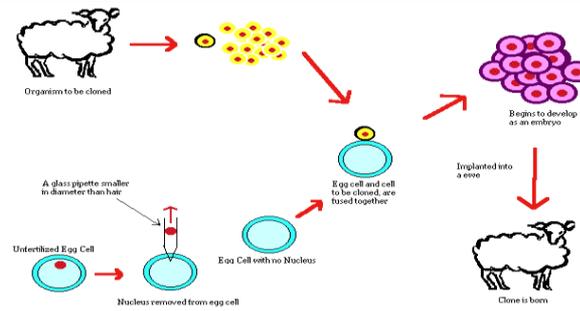
Embryokloning, Kärncelledning

Vad används det till?

Forskning, Växtförädling, Husdjursavel, Industriellproduktion

Vad finns det för konsekvenser?

Bromsa utvecklingen, Rädda människor, Bibehålla "perfekta" frukter, Osäker process



Cloning



Value-clarification-questions

1. Is it okay to extract stem cells from a fetus in order to make a clone if the mother has a miscarriage?
2. If it becomes possible to clone and mass produce healthy organs, for example kidneys. Should it be possible to buy them if you get some kind of disease?

Research question: How do moral judgments enter into students' deliberations?

Moral questions (DEQ's) which appeared during the deliberation:

- Should it matter how far a living fetus has come in its development for whether you are allowed to extract stem cells from it?
- **When should a fetus be considered a living human being?**
- Is it (does it feel) right to extract stem cells from a dead fetus in order to develop a new individual?
- Is it (does it feel) indecent/uncomfortable ("sick") to extract something from something dead and use it to create new life?
- Is it (does it feel) unnecessary to clone a baby that has not yet developed into a person?
- **Do you lose less of your child the earlier the abortion is conducted?**
- Should a woman who wants to extract stem cells from her fetus be allowed to?
- **Would it feel strange to have a baby that is cloned from a dead child?**
- Should you be allowed to use surrogate mothers for developing individuals from stem cells from dead fetuses?
- **Is it important to consider that some parents want children made from their own genes?**
- Is it (does it feel) better to develop an individual (with the help of a surrogate mother) from a fertilized egg than from stem cells from a dead, cloned fetus?
- Does the fact that the woman cannot become pregnant (because of some disease) affect whether it is right to extract stem cells from the dead fetus?
- Is it right to do stem cell-transfer if the child risks being injured by the operation and thereby loses its possibilities to live a decent life?

Research question: How does science subject matter enter into students' deliberations?

Epistemological questions (DEQ's) concerning science which appeared during the deliberation:

- What is the definition of a fetus?
- When should a fetus be regarded as a living being?
- When during the fetus's development *is it possible* to extract stem cells from a fetus in order to create a new individual?
- *Is it possible* to extract stem cells from a dead fetus and use them to develop a new individual?
- Is it just looks and certain traits but not thinking that becomes identical between the individual providing the stem cells and the new, cloned individual?
- When does memory and thinking begin in an individual?
- Does a person's personality originate primarily from her upbringing or does it come from the genes?
- Is there any difference between using stem cells from a cloned, dead fetus or a fertilized egg, when implanting them in a surrogate mother?
- What's the risk that the mother is injured or the fetus malformed at the operation and transfer of stem cells?

Is it okay to clone stem cells from the fetus when the mother has had a miscarriage?

- Dwayne: *I mean, I really think it depends on this ..., how far along she is. I mean, what is the definition of a fetus, as well? When there are only a few tiny cells, or?*

- Elijah: ***Whenever the miscarriage occurs, you can make a clone (Epistemological).***

- Dwayne: ***Yes, I understand that you can do it, but I think like this..., that if it's on the day she was to give birth, then it is wrong (Moral).***

Stand fast

Moral

- It's wrong to kill a human being.

Epistemological

- Genetics are important for the development and character of a person.

Conclusion

- Moral and epistemological language-games interact in important ways in students' deliberations, e.g:
 - Moral judgments lead to demand for additional knowledge
 - Epistemological judgments lead to moral decisions
- Students' deliberations rest on certain assumptions that are not questioned.
- It is important to allow students to learn scientific facts in close connection to moral judgements.
- Students' moral judgments and stand taking in controversial issues constitute possibilities to deepen and develop their scientific knowledge

Thank you for listening!

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RiskEdu



<http://www.riskedu.se/>

How can teachers support the development of scientific literacy through teaching about risk and risk-assessment?