

SOME CONTROVERSIAL ISSUES IN SCIENCE EDUCATION



REASON TO BE A CHEMIST:

*Knowing how to completely dissolve the bodies of
your enemies*

Heritage language

THE TWO FACES OF S&T. HOW TO KEEP A RIGHT BALANCE

- S&T in the service of the good; saving lives, improving material conditions, providing knowledge, pushing back ignorance and superstition, providing insight, wisdom and cultural values.
- Providing tools for oppression and material and cultural domination, means for the exploitation of nature and weapons for mass destruction.

Finding the *right* life *balance* and purpose are the two the most important things for humans being.

SOME CHALLENGES. WHAT TO DO?

- S&T as driving the economy;
- School S&T as fossils? (Positivism is dead – but won't lie down). What about a constructivism?
- “Science War” from social scientists: Progressive or reactionary? Again the importance of a right balance;
- Global and local science. Maybe GLOCAL.

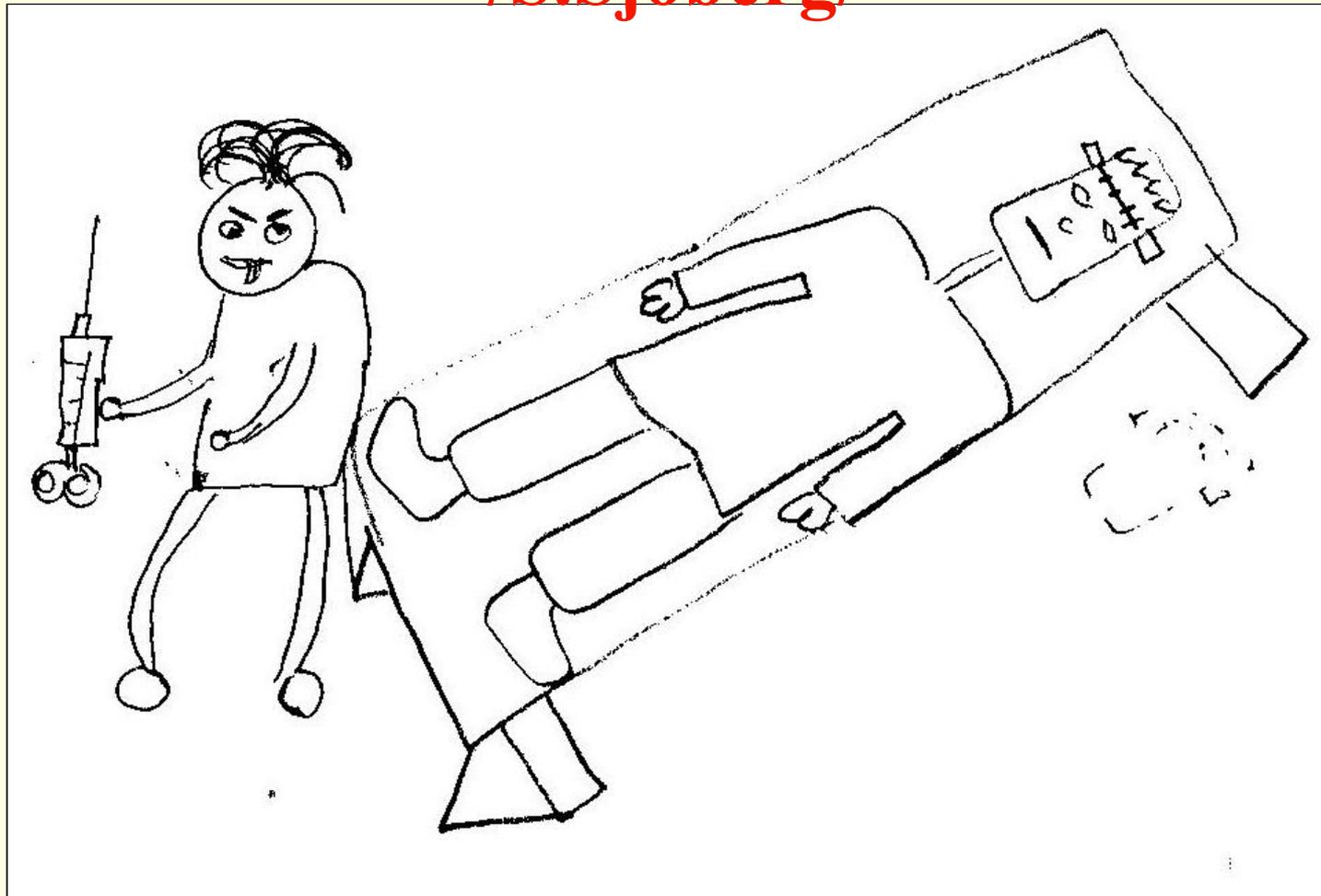
STRANGE NEW WORLD: CURRENT PRIORITIES

- **NASA:** Budgets larger than 20 African State budgets during Cold War
- New enemies – new budget increases!
- **NOKIA:**
Higher R&D budget than all R&D in Sub-Saharan Africa
- **Nike:**
More spending on R&D for shoe soles than the world's spending on malaria research
- **Gillette:**
750 mill USD on the development of Mach3
(New razor blades to replace Mach2!)
- April 2003: 650 Billion \$ to War on Iraq.
(6,5 % of the US GDP – only 0,23 % for development aid)
- US annual private spending 400 Billion \$ on “fight against fat” -- Similar spending on pet (dog, cat) food.

A SCIENTIST AT WORK

Boy from Norway, 13 year (SAS-study)

/S.Sjoberg/



A scientist at work

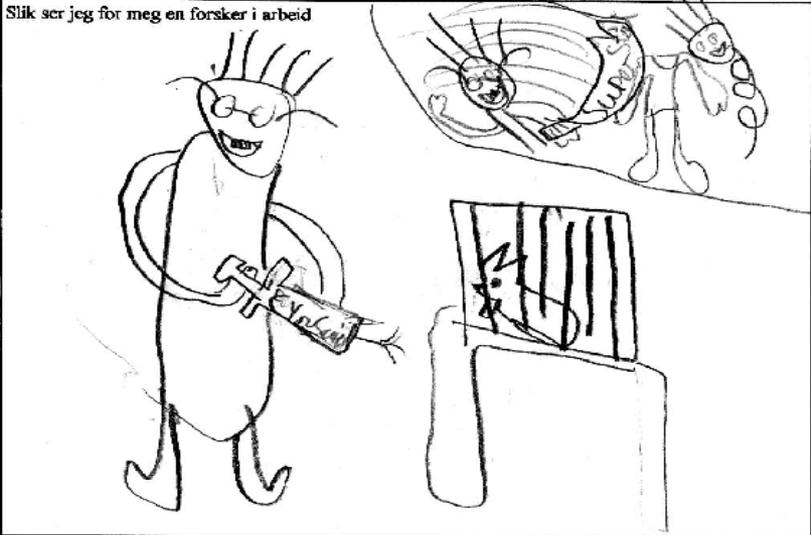
(Boy from Norway, 13 years) /S.Sjoberg/

"I think they experiment with animals and kill them. And then they develop poisonous gases and atomic bombs"

1028 Boy Norway

6. Forskere i arbeid

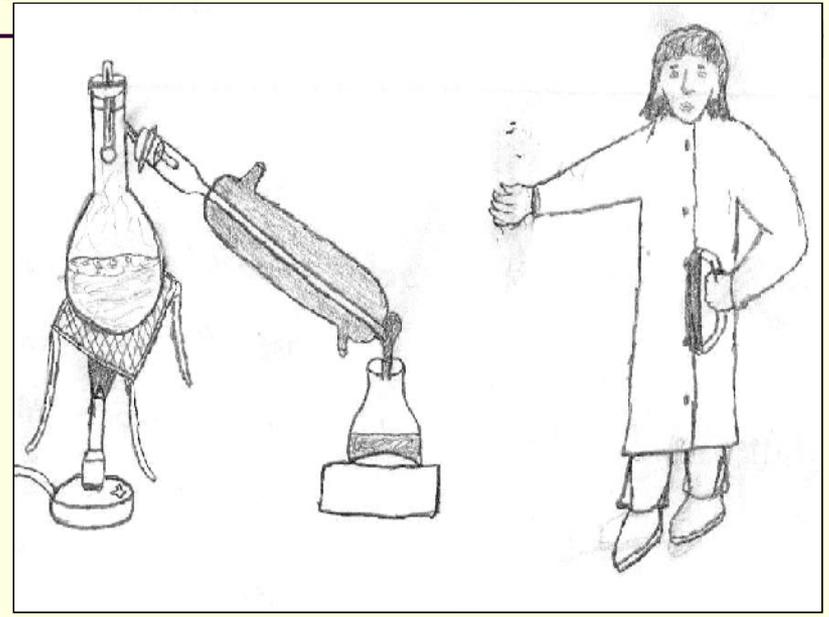
Tegn
Slik ser jeg for meg en forsker i arbeid



Skriv
Skriv noen ord om hva du tror forskere gjør og hvilke saker de arbeider med

Jeg tror de eksperimenterer med dyr og dreper dem!
Og de utviker de nye giftene og AtomBomber

SCIENTISTS AT WORK: DEVELOPING COUNTRIES /S.SJOBBERG/



1. They are always thinking
2. They always have ideas
3. They (most) are brilliant people.
- 4 They are always making experiments new discoveries
5. If scientists were not here we ordinary people wouldn't know anything. (Girl Trinidad)

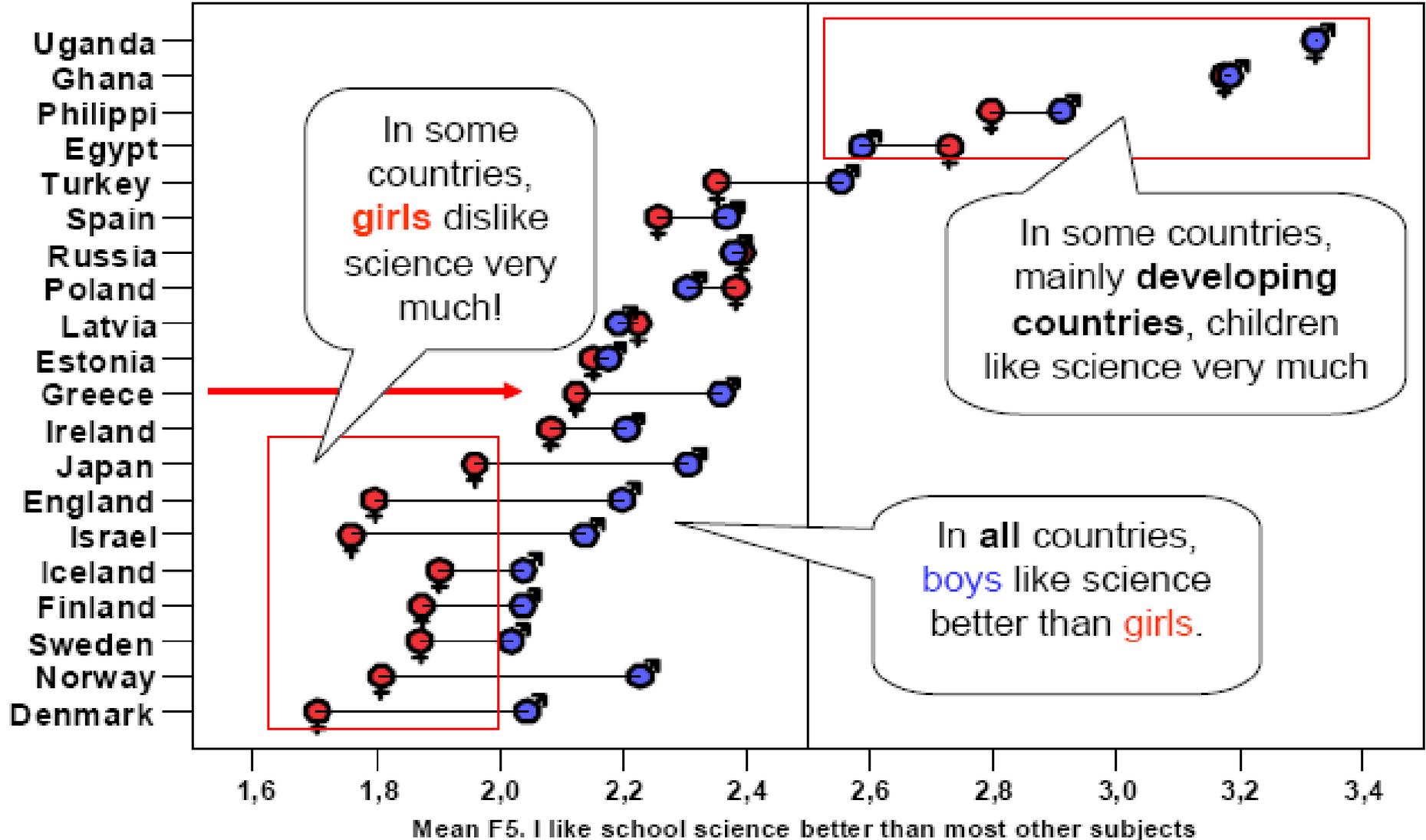
Scientists helps people regain their health.

They help those that are sick or ill to get well.

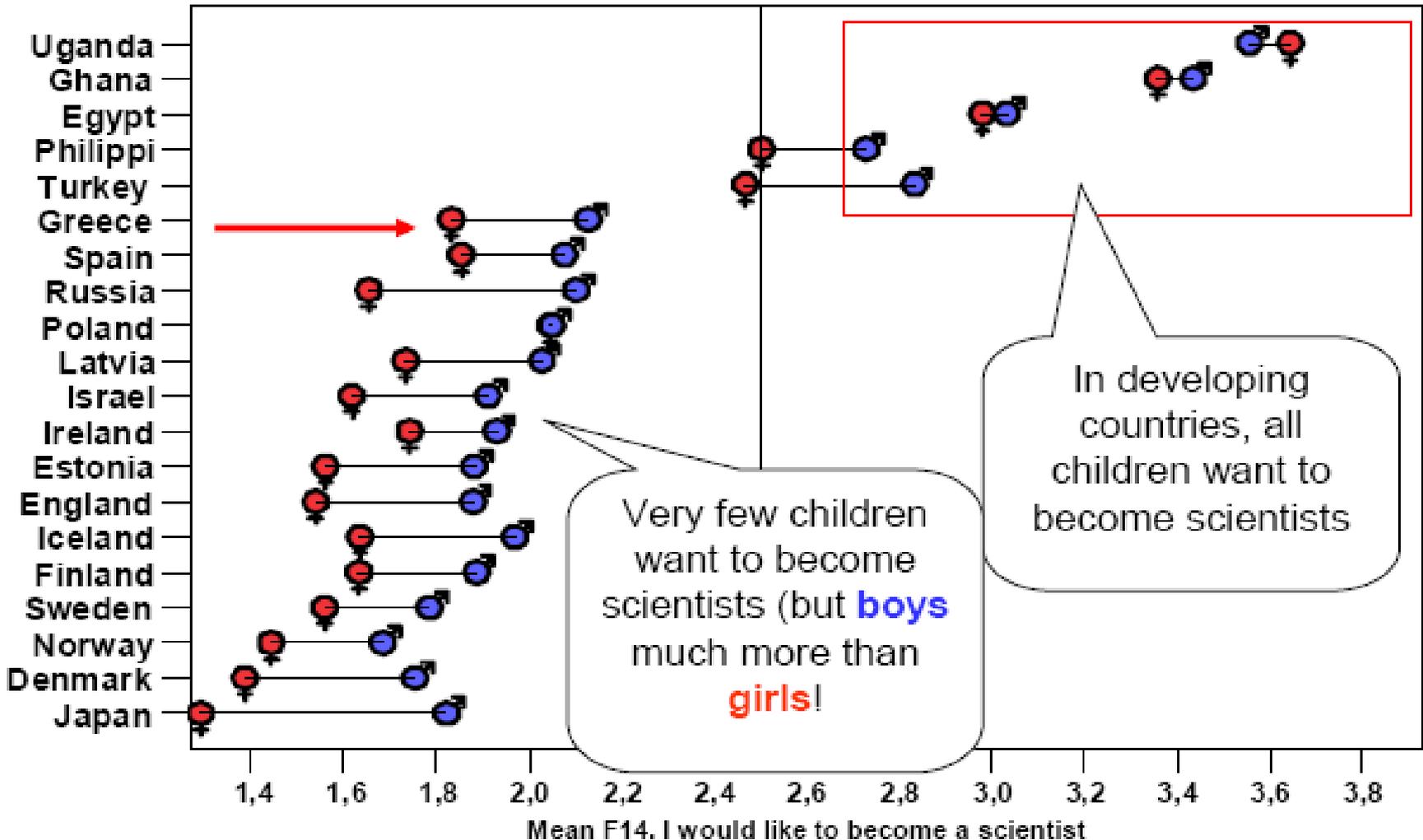
They are fund of discoveries.

They are also kept in the hospital to take care of those that are not healthy. (Girl, Nigeria)

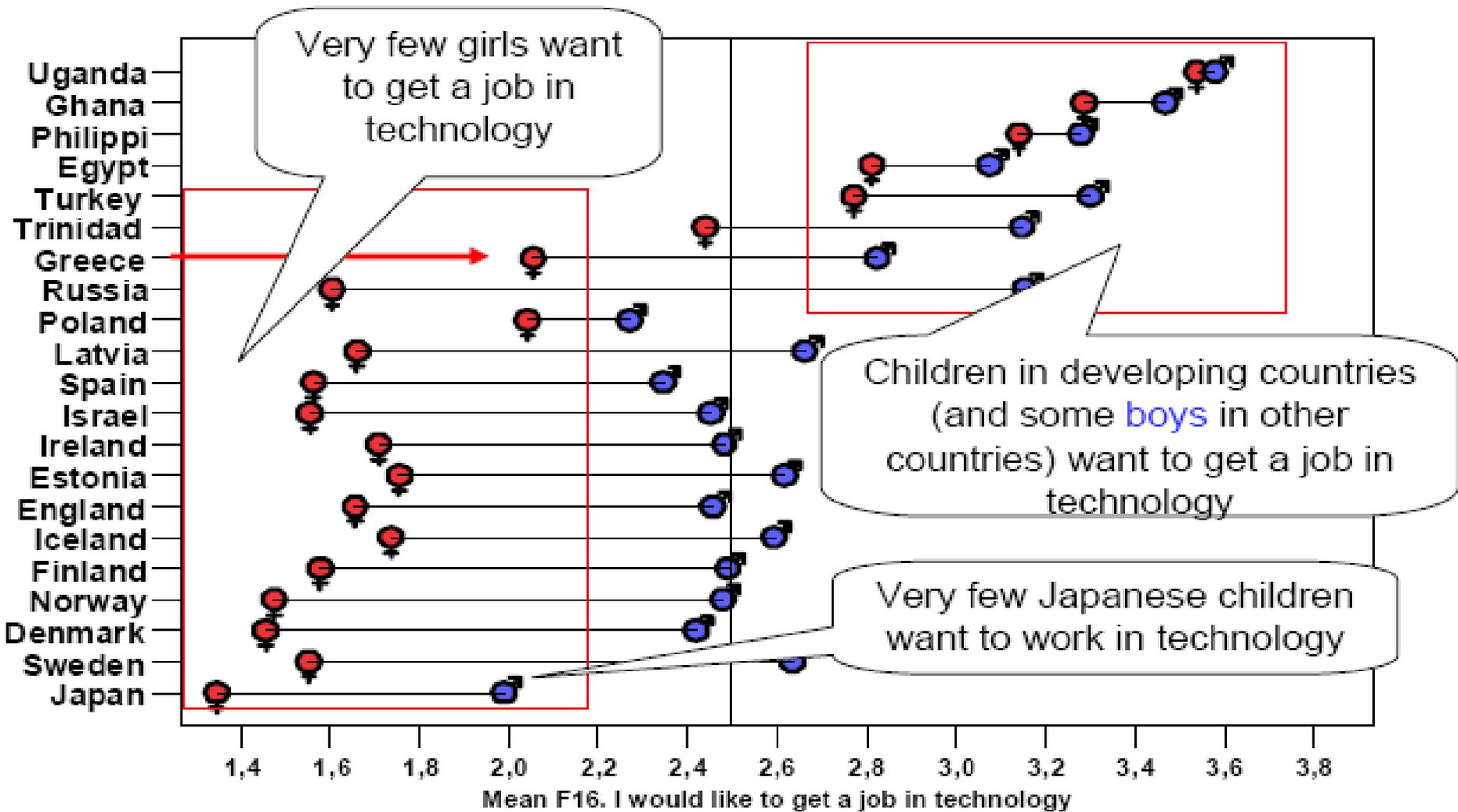
”I like school science better than most other subjects”



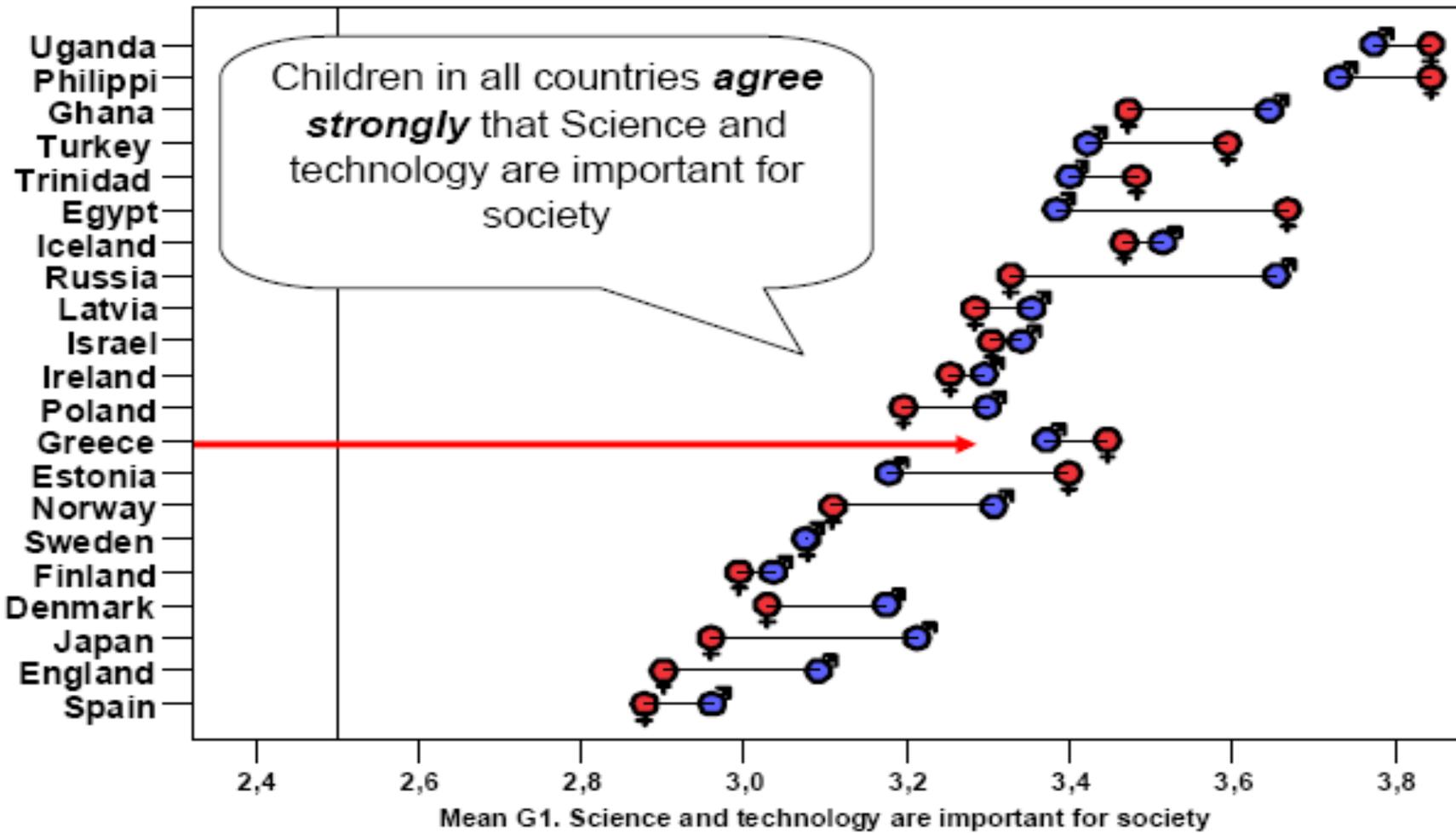
”I would like to become a scientist”

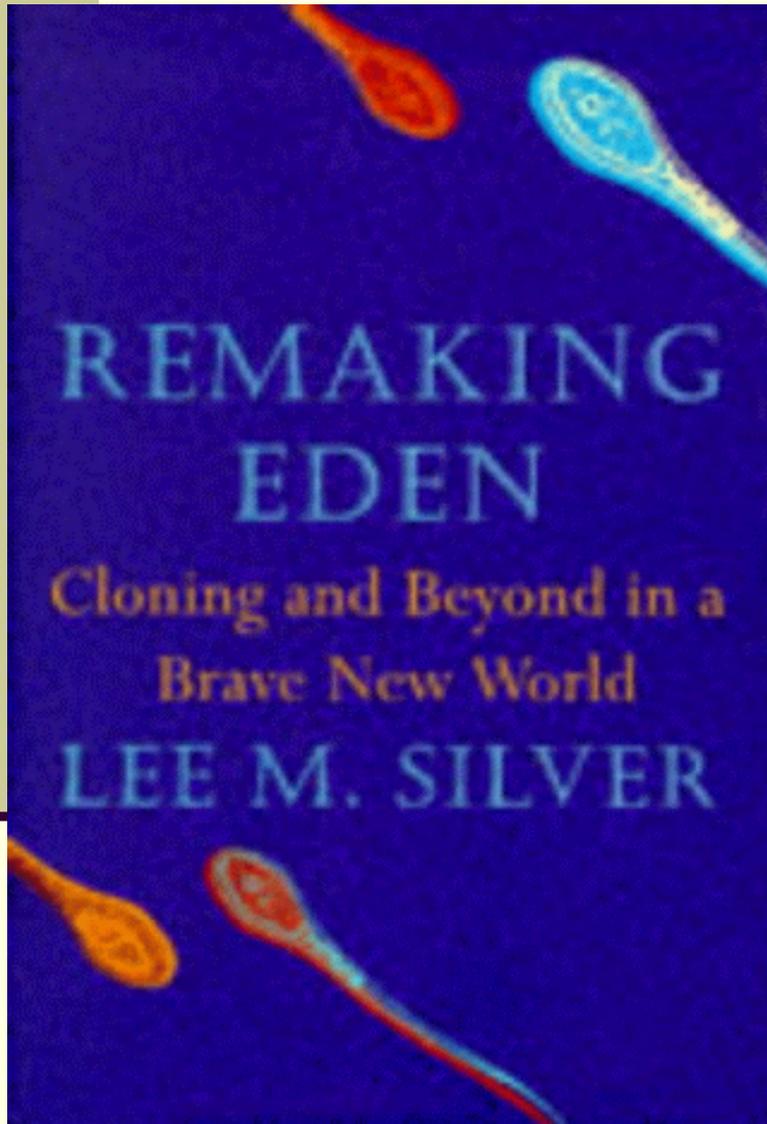


I would like to get a job in technology”



”Science and technology are important for society”





**Concern also about
Biology:**

**”Remaking Eden --
Cloning and Beyond
in a Brave New
World**

RESEARCH RESULTS

(S&T report, EUROBAROMETER, 2010)

- Interest in new scientific discoveries and technological developments is relatively high but there are large country differences;
- Europeans feel less well informed than their level of interest demands. They are less informed now than in 2005;
- European citizens are not very active in science and technology issues;
- Europeans feel most strongly that scientists cannot be trusted to tell the truth about
- Controversial scientific and technological issues because they depend more and more on money from industry;
- Scientists are only looking at very specific scientific and technological issues, which makes them unable to oversee problems from a wider perspective;

RESEARCH RESULTS

(S&T report, EUROBAROMETER, 2010)

- Europeans do not have a clear opinion on the how scientists deal with the complexity of today's world;
- Europeans tend not to trust scientists who depend on money from industry;
- Private funding of scientific and technological research limits the ability to understand things fully;
- Science and technology make our lives healthier, easier and more comfortable;

RESEARCH RESULTS

(S&T report, EUROBAROMETER, 2010)

- Most European citizens do not agree that science and technology will allow the Earth's natural resources to be inexhaustible;
- Science and technology cannot sort out any problem;
- A majority of European citizens, 53% of respondents at the EU27 level, indicate that scientists, because of their knowledge, have a power that makes them dangerous;
- Six out of ten Europeans feel that science and technology can sometimes damage people's moral sense etc.

CAN WE MAKE SCIENCE TEACHING RELEVANT FOR STUDENTS?

- Science seems to be irrelevant for students.
- Science content is dominating over students' everyday needs.
- School science is like repetition and memorising of facts.
- Science education has become value free in the eyes of students.
- The development of problem-solving and decision-making skills is outside the teaching process.

MODELS

- **ORIENTATION** - arousing children's interest and curiosity;
- **ELICITATION/STRUCTURING** - helping children to find out and clarify what they think;
- **INTERVENTION/RESTRUCTURING** - encouraging children to test their ideas: to extend, develop or replace them;
- **REVIEW** - helping children to recognise the significance of what they have found out;
- **APPLICATION** - helping children to relate what they have learned to their everyday lives.

(Ollerenshaw and Ritchie, 1993, p. 6)

'5Es' MODEL

- **ENGAGE** - engage students and elicit prior knowledge;
- **EXPLORE** - to provide hands on shared experiences of the phenomenon;
- **EXPLAIN** - develop scientific explanations for experiences of conceptual understanding;
- **ELABORATE** - extend understanding to a new context or make connections to additional concepts through a student-planned investigation;
- **EVALUATE** - students re- represent their understanding and reflect on their learning journey and teachers collect evidence of achievement and outcomes

Australian Academy of Science, (2010). Available at: <http://www.science.org.au/primaryconnections/>

CONSTRUCTIVISM “STUDENT-CENTERED LEARNING VS. TRADITIONALISM

- “Constructivism” is not a specific pedagogy but a psychological theory of knowledge (epistemology) which argues that humans construct knowledge and meaning from their experiences.
- Can the learner be as an active “maker of meanings”?
- Is it constructivist approach is OK nowadays? Are we sure?
- Personally I am not.
- Who can deny that the traditional teaching is wrong?

CONTRA CONSTRUCTIVISM

- What is learnt and what the teachers teach must be correct the first time because unteaching is more difficult than teaching.
- Practice is critical to learning - things most often repeated are best remembered ... this is the way the mind works.
- The longer we go without practicing something, the sooner we forget it.

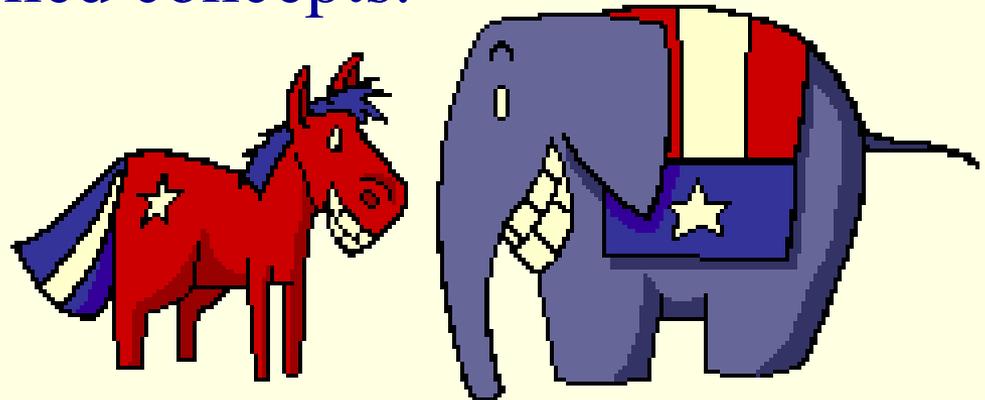


“THE LAWS OF LEARNING”

(by Laurie Rogers)

- Make sure the students are ready for the lesson;
- Prepare an experience that they’ll enjoy;
- Teach students the most efficient, most effective methods first;
- Make the lesson exciting;
- Have students practice the lesson;
- Build on recently learned concepts.

How to reconcile???



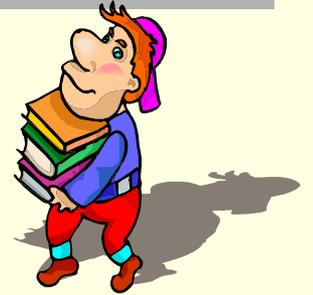
THREE PROBLEMS

- Scientific and technical progress is so far from the cultural-human values.
- There is a conflict between technosphere (created by people) and the nature (natural environment).
- There is a great gulf between man's spiritual growth and humankind technological capacity.



THREE QUESTIONS

- How much education do we need (for human being)?
- How much education a person can maintain/hold/keep?
- Is the human life and acquired educatedness are adequate? Are we living wisely?



THREE PARADOXES

- We do not know everything, particularly what we will find out later - our knowledge is partial, incomplete.
- Each of us can not know everything that is already known. Thus, the ignorance is always unavoidable, whereas knowing (cognition) is always imperfect.
- Ignorance (unknowing) is the component of human life and the research. Each result implies new questions.



THREE THESES FOR THE FUTURE

- The biggest risk are not techniques and technologies, but unknowing (uncomprehending) the nature (essence) of technics (The human dimension in the technological progress).
- The person (as specialist) must be professional and humanist at the same time. We are not able to construct tomorrow (future) by using yesterday`s orientations (The rush into the future backwards).
- The object of a contemporary science is a human being in all his complexity (Nature studies + human studies = future world).



“To long work is not a good choice”

Heritage language



- Let`s promote our children in the way that they feel as not seated in a school classroom, but in the intellectual „stinging nettles“ field (*as to always be on nettles*).

**THANKS FOR
YOUR ATTENTION**