



The education we want: Preparing students to make societies more sustainable

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Top 20 inventions in the last 50 years (1)

- Colour TV
- DVD & Blu ray
- Lasers
- Microwaves
- Bar codes and scanners
- Automated Teller Machine (ATM)
- Space exploration
- Magnetic resonance imaging
- DNA testing and sequencing
- Birth-control pill



<http://www.newscientist.com/special/big-impact>
<http://www.cnn.com/id/44504579/page/17>

http://www.answers.com/Q/How_has_technology_changed_in_the_last_50_years

Top 20 inventions in the last 50 years

(2)

- Light and portable computers
- The microprocessor
- The mobile phone
- GPS /Satnav
- Internet
- Email
- Online Shopping/ecommerce
- Green chemistry
- Photovoltaic Solar Energy
- Biofuels



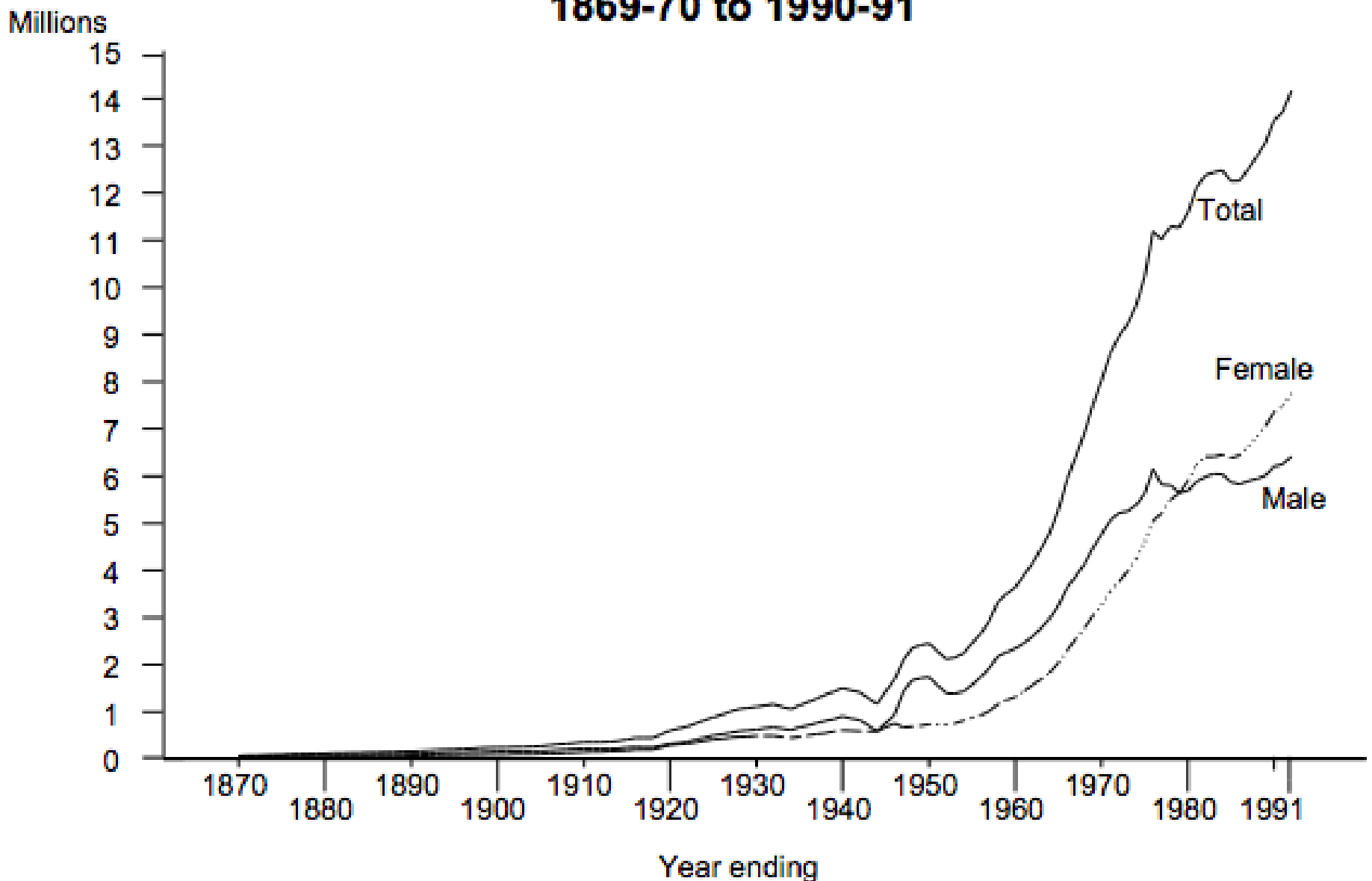
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http://www.answers.com/Q/How_has_technology_changed_in_the_last_50_years

The education we have

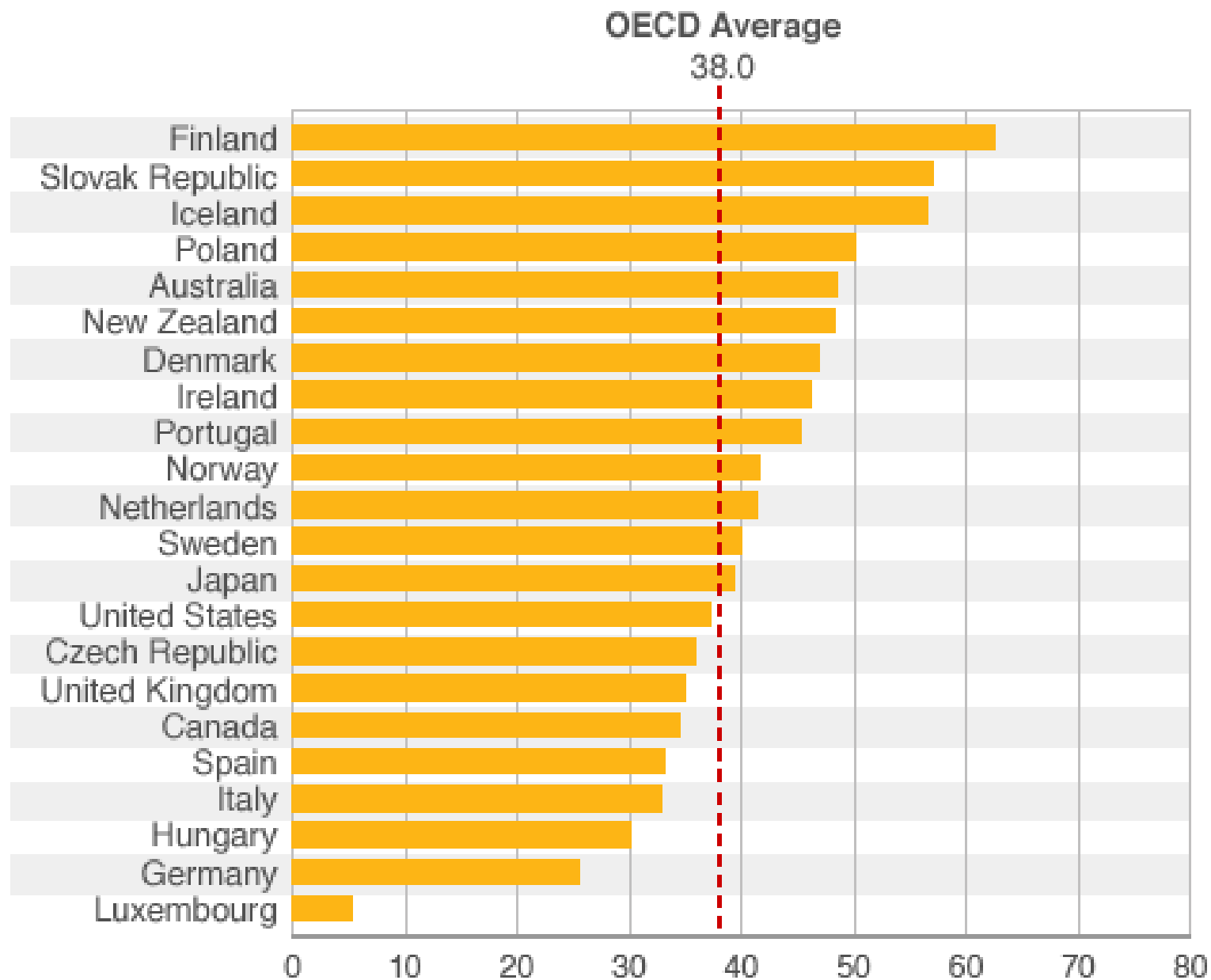
- The number of students around the globe enrolled in higher education is **forecast** to more than double to **262 million by 2025**
(<http://www.universityworldnews.com/article.php?story=20120216105739999>)
- In more developed countries, the percentage of adults with the equivalent of a college degree rose to **more than 30% in 2010**
(<http://247wallst.com/special-report/2012/09/21/the-most-educated-countries-in-the-world/>)

**Figure 14.--Enrollment in institutions of higher education, by sex:
1869-70 to 1990-91**



Source: U.S. Department of Commerce, Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*; and U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics*, various issues.

Graduation rates in OECD countries



Source: OECD

In spite of the advances...

- **2% of the world population** attend higher education, but more than **80 per cent** of the decision-makers in industry, community and politics are **graduates of universities** (Scott et al., 2013)
- **25%** of teachers were **absent** from school, and only about half were teaching, during unannounced visits to a nationally representative sample of government primary schools in **India** (Kremer et al. 2004)
- Most **senior judges** in England and Wales went to private schools and **Oxbridge**
(<http://www.bbc.com/news/education-28953881>)



And

- The **rising unemployment** of recent graduates in Europe has emphasised the needs of the labour market in connection with higher education reforms (<http://www.universityworldnews.com/article.php?story=20130419155742341>)
- Nearly **one in 10 students** were believed to be unemployed **six months** after graduating from UK universities in 2012 (<http://www.bbc.com/news/education-23080323>)



Universities

- For centuries, universities have been at the forefront in **creating and breaking paradigms**, and educating the future decision-makers, entrepreneurs, and leaders (Cortese, 2003; Elton, 2003; Lozano, 2006a)
- HEIs have remained **traditional** (Elton, 2003)
- They have had a tendency to **self-replicate** (Walther, Mann, & Radcliffe, 2005)



Reductionistic education

- Much of modern education and praxis has relied on **Newtonian and Cartesian** mental models, which are based on rationality, causality, mechanistic interpretation, silo thinking, and **reductionism** (Ketola, 2009; Lovelock, 2007; Nonaka & Takeuchi, 2001)



Reductionistic education

- This has resulted in **unprecedented advances** in development and industrialisation (Dunphy, Griffiths, & Benn, 2003; Jensen, 1993)
- But, it has led to the **conquest of nature** through competition (Cortese, 2003), industrialisation (Carley & Christie, 2000; Orr, 1992; Reid, 1995; WCED, 1987), **overspecialisation** and disciplinary isolation (Cortese, 2003; Costanza, 1991)



Reductionistic education

- This has also fostered highly **individualistic**, greedy and self-interested behaviours (Stead & Stead, 1994)
- Such reliance on rationality, whilst neglecting and **ignoring emotions** (Henry, 2001), have resulted in a civilisation crisis that confronts us with an **unsustainable present and a threatened future** (Carley & Christie, 2000; Haberl, Fischer-Kowalski, et al., 2011; Reid, 1995)

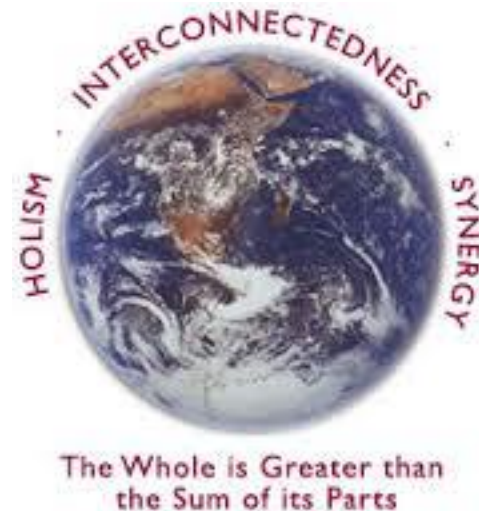


A **paradigm revolution** is needed to break through existing knowledge barriers and current unsustainable mental models, and foster metanoia for sustainability

New ways of learning are needed, which actively and consciously engage in the use and protection of **natural resources**, and the safeguarding and improvement of **societal well-being**, for this **generation and future ones** (see Burke, 2000; Cortese, 2003; Rosner, 1995)



This revolution has to be based on **holism**, i.e. examining a thing from outside and asks questions while it works (Lovelock, 2007), **transdisciplinarity** (Brown, Harris, & Russel, 2010), **system thinking** (Bagheri & Hjorth, 2007), and long-term thinking (WCED, 1987)





*“Education is **critical** for promoting sustainable development and **improving** the capacity of people to address environment and development issues” (UN, 1992)*

We are **at the very end** of the United Nations’ Decade of Education for Sustainable Development (DESD)
(UNESCO, 2005)

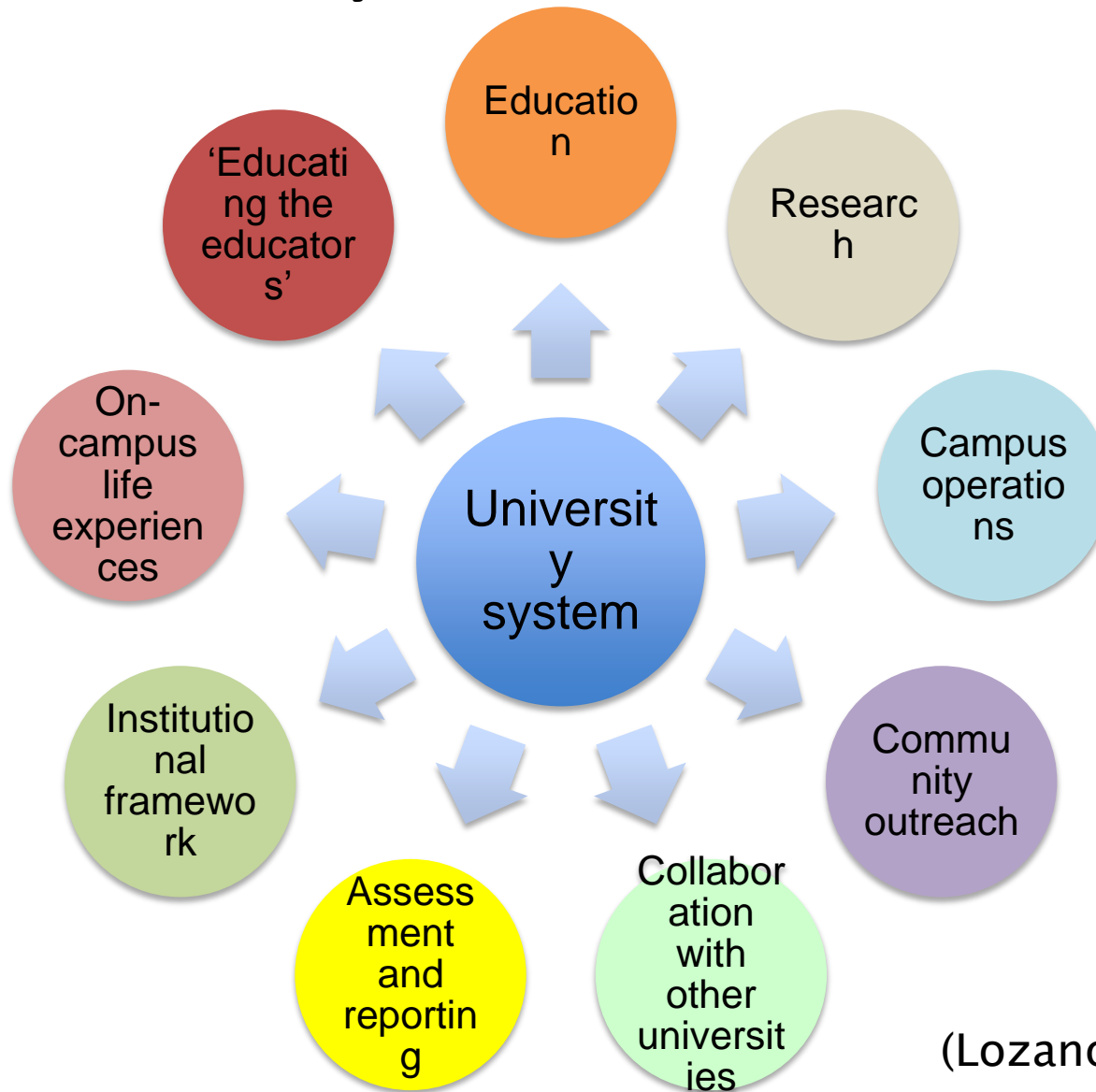


SD in Higher Education Institutions

- During the last decade an **increasing number** of HEIs have been incorporating and institutionalizing SD into their **systems** and addressing their **stakeholders**
- Yet, SD is still an **innovative idea in most HEIs**, and has not yet permeated into all disciplines, scholars, and university managers, or throughout the curricula

(Calder and Clugston, 2003; Cortese, 2003; Lozano, 2006)

HESD system elements



(Lozano et al., 2013)

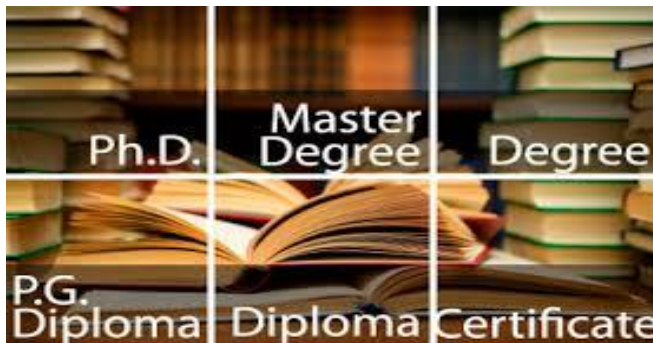
HEIs' stakeholders

- Academic directors
- Directors of department,
- Directors of divisions,
- Professors (in undergraduate and postgraduate courses)
- Researchers
- Staff
- Students
- Alumni
- Community
- Employers
- etc.



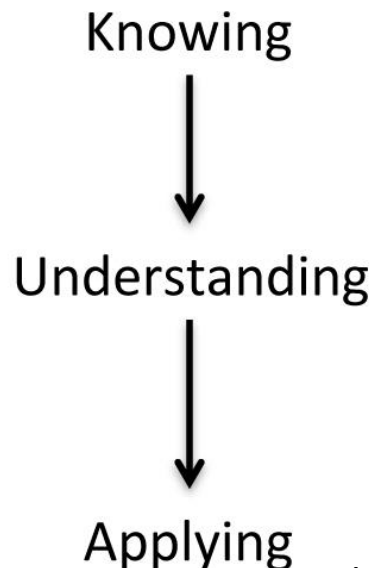
One of the key areas of interest for HESD has been...

- ... the incorporation of the concept into **curricula at all levels**
- Including **methods** to achieve this in practice (Boks & Diehl, 2006; Wemmenhove & de Groot, 2001)
- And particularly in terms of **students** gaining an understanding of how their decisions and actions affect the environment and society (Lozano, 2010b; Lozano & Peattie, 2009).

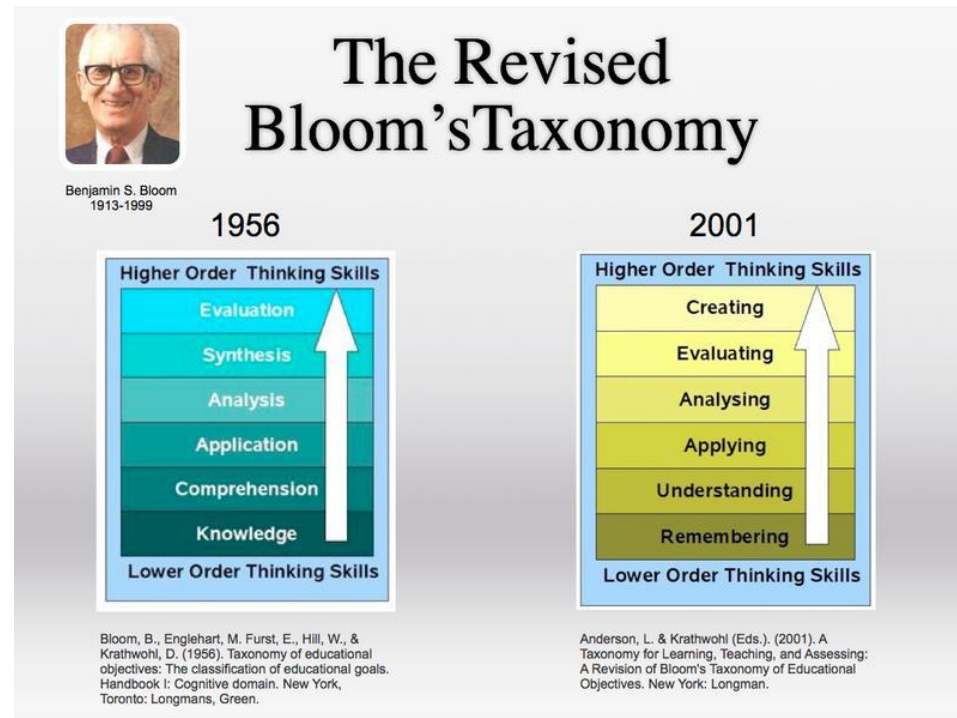


Linear learning

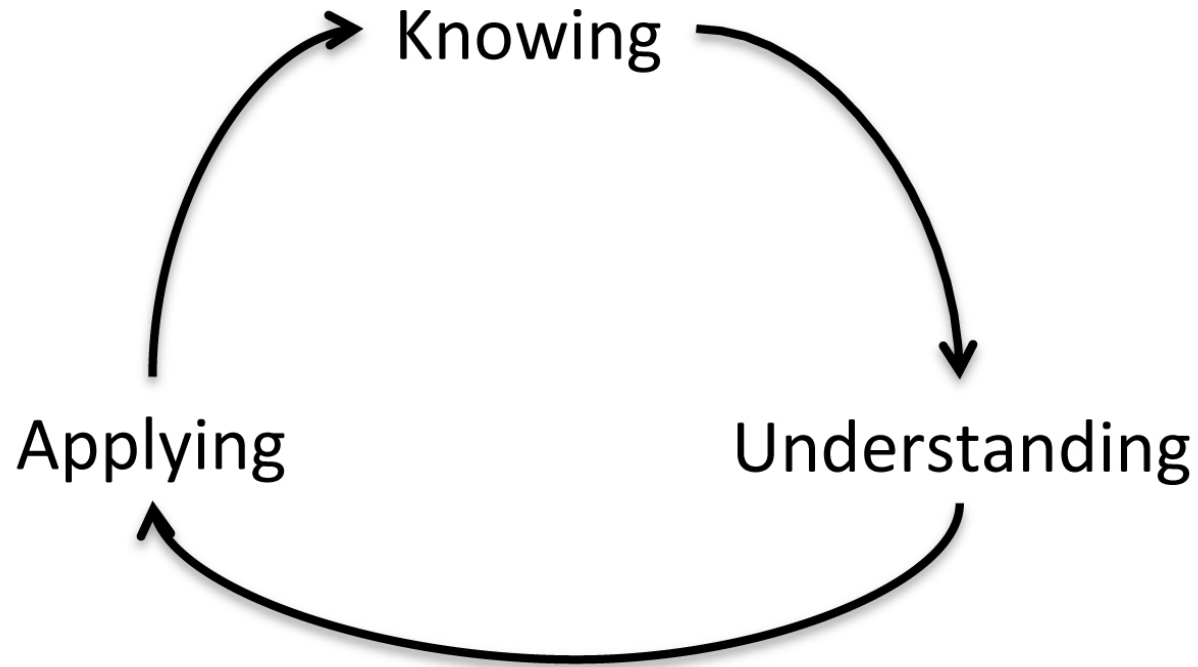
- Traditionally, learning has been considered to follow a linear path, where knowing is followed by understanding, and this in turn by application



(Posch & Steiner, 2006)

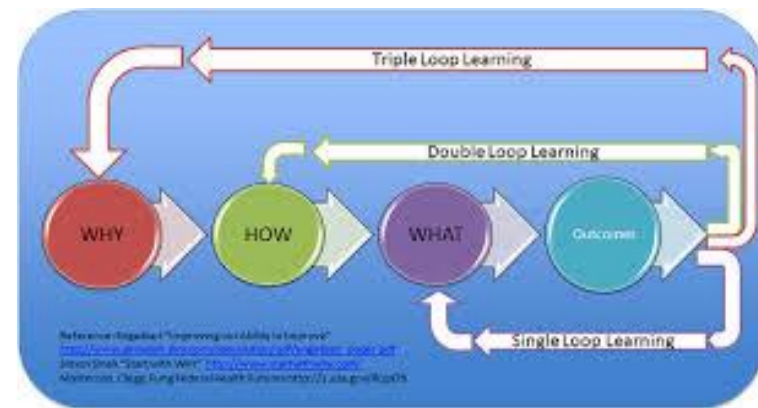


Circular learning



(Posch & Steiner, 2006)

Learning loops



- **Single-loop** refers to organisations detecting and correcting errors, to carry on with present policies, or to achieve objectives
- **Double-loop** learning occurs when the underlying assumptions, norms, objectives, policies, goals and programmes are questioned, opened to confrontation, and submitted to comprehensive periodic reassessment against established standards, to ensure they remain relevant
- **Triple-loop** learning entails developing new processes, or methodologies, for arriving at such re-framings

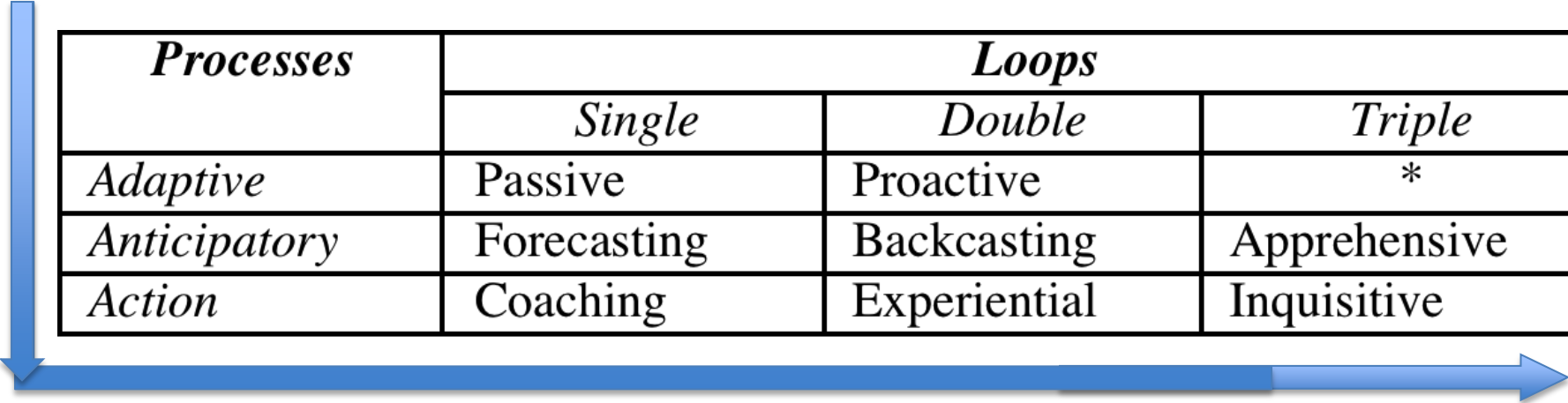
(Argyris, 1977; Senge, 1999)

Doppelt's types of learning

- **Adaptive learning** is a reactive, coping form of learning, which usually involves the search for **direct solutions** to immediate problems
- **Anticipatory learning** focuses on **avoiding future problems**, by identifying potential events and searching for the best ways to prepare for them. It is more creative than adaptive learning
- **Action learning** involves turning real problems or tasks into a **learning laboratory**, where teams seek to resolve problems and simultaneously, learn from their experiences

(Doppelt, 2003)

Learning typologies



<i>Processes</i>	<i>Loops</i>		
	<i>Single</i>	<i>Double</i>	<i>Triple</i>
<i>Adaptive</i>	Passive	Proactive	*
<i>Anticipatory</i>	Forecasting	Backcasting	Apprehensive
<i>Action</i>	Coaching	Experiential	Inquisitive

Continuous learning

- It cannot be expected that individuals, groups, or the organisation would **change their habits** after a few days of education (Kotter, 1996)
- Learning needs to be **continuous** to facilitate changes in the other types of mental attitudes
- Initiatives that fail to **change mental models** and behaviours tend to produce frustration and are prone to failure (Doppelt, 2003)



SD and modern education

- The concept of **SD contrasts** with the existing concepts and teaching methods in universities, which are mainly focused on resource depletion
- World-wide, all university **leaders should recognize** that it is not possible to continue in such pathway

SD and education

- We need to **dispel ignorance** about the impacts that development and industrialisation have had, and are having, on the environment and societies if we are to move towards more sustainable societies
- We need to **'unlearn'** the old models and provide new ones as part of the solution that actively and consciously engages in the prudent use and protection of natural resources, whilst safeguarding and improving societies' quality of life and well-being for this and future generations

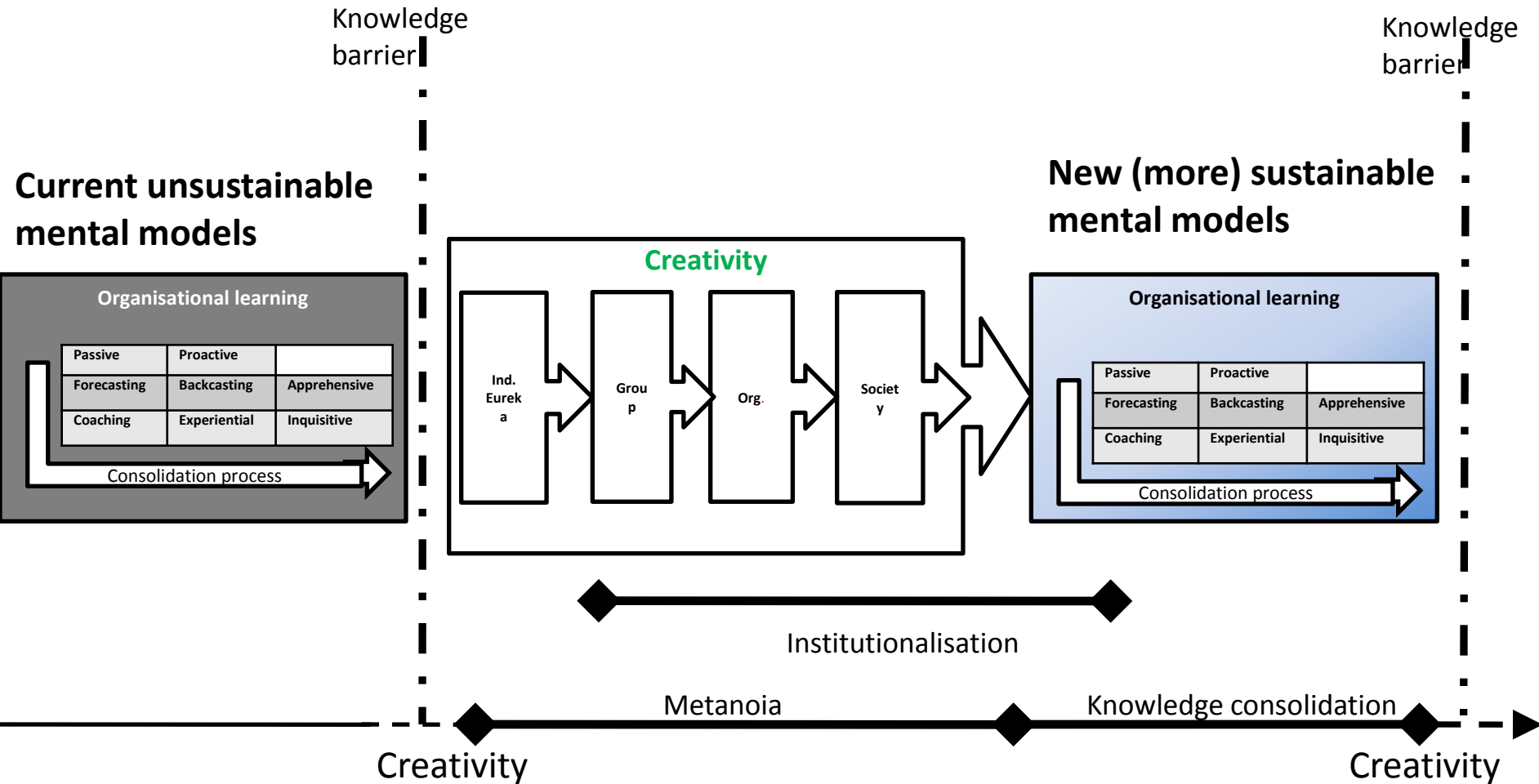


Destroying 'silos'

By rejecting current mental models and synthesising new ones, creativity can rupture knowledge barriers, **demolish silo mentalities**, and abrogate reductionism by fostering sustainability **metanoia** throughout the complex mosaic of individuals, groups, organisations, societies, and their **interactions**



Towards more sustainable knowledge ...



Bridging 'science and the arts'

- Fostering and supporting **creativity** can help to break silo mental models, by bridging the **schism** between **rationality and emotions**, as well as that between **science and the arts**



Challenging the *status quo*

- Progress towards more sustainable societies implies that we **move** from **reactive** responses to immediate problems, towards a more **proactive** focus on avoiding possible future problems and prepare for potential events
- Turn real-life problems into a **learning laboratory** where **new** theories, methodologies, and tools are developed that **challenge the *status quo*** in order to solve today's problems with **tomorrow's ideas**

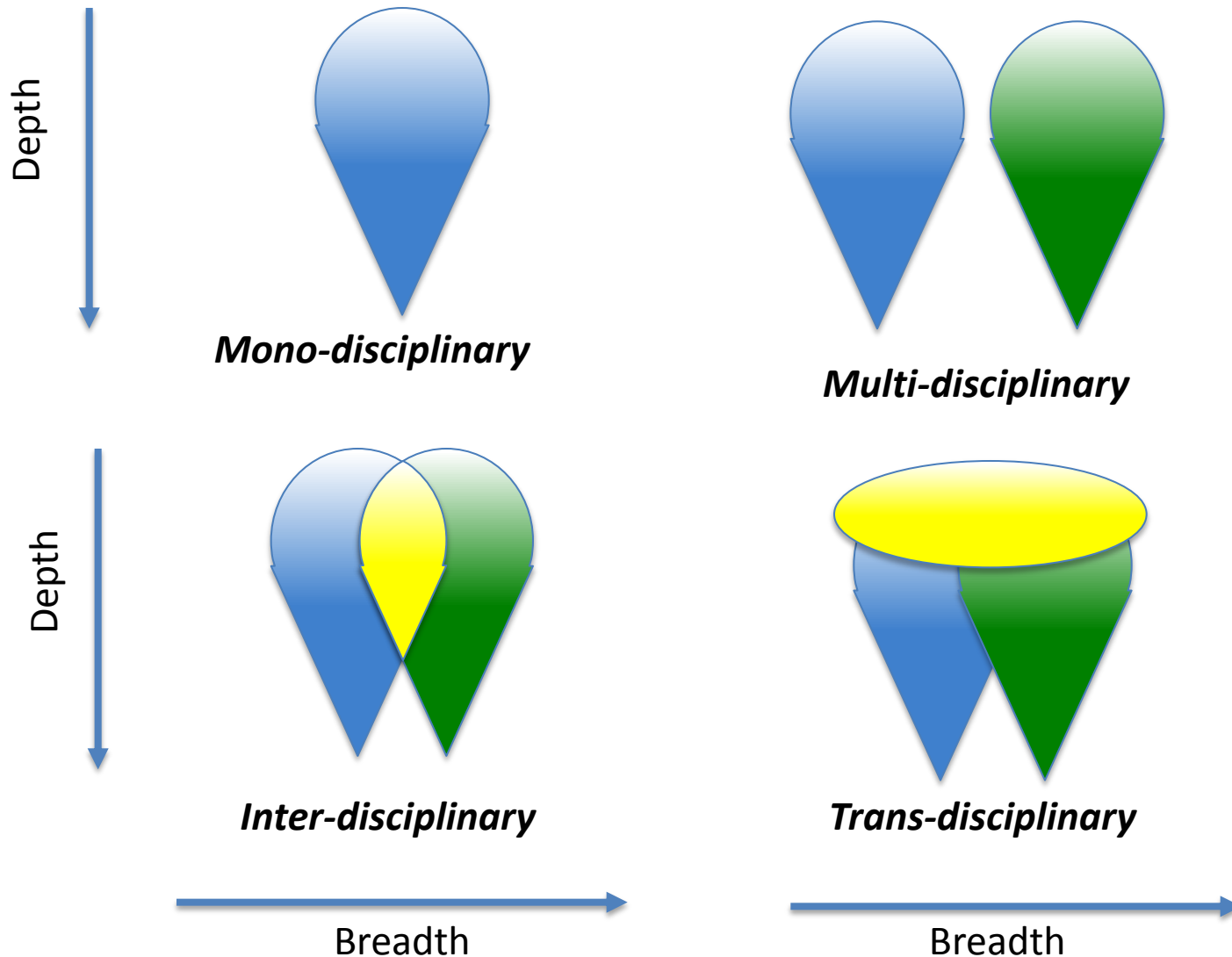


Fostering metanoia



- **Lower types** of learning (e.g. passive learning) that do not question the underlying principles of the organisation, tend to increase bureaucracy, and curtail response to internal and external stimuli
- **Discerning and inquisitive learning** can play important roles in facilitating organisational '**metanoia**' by questioning current mental models and developing new theories, methodologies, and processes

Moving towards transdisciplinarity





*To develop a complete mind:
Study the science of art;
Study the art of science.
Learn how to see.
Realize that everything
connects to everything else.*

- leonardo da vinci

THEORY vs PRACTICE



Theory is when you know everything but nothing works.

Practice is when everything works but no one knows why.

Me, theory and practice are always combined: Nothing works and I don't know why.

In theory, theory
and practice are
the same. In
practice, they are
not.

Albert Einstein

meetville.com



The Future We Want:

Students who

- Are **educated** to be the best in their chosen discipline
- Can communicate and engage with **other disciplines**
- Understand the **implications** of their professional and personal decisions to the **economic**, **environmental**, and **social** of **this generation and future ones**
- Use **discerning and inquisitive learning** in **theory and practice**

We would like to invite you to the Global Cleaner
Production & Sustainable Consumption
Conference

<http://www.cleanerproductionconference.com/>

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THANK YOU!