Some reflections on PROFILES from a ‘critical friend’

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Strengths of PROFILES

- The central role of CPD in the project.
- The role of teachers as equal partners with science educators.
- The focus on the development, testing and dissemination of exemplar materials.
- The emphasis on developing scientific literacy along with science.

A common message – teachers matter

"The joint efforts of scientists, teacher educators and science teachers are required to successfully address the challenges of science education." (Gago, 2004)

"Teachers are key players in the renewal of science education." (Rocard et. al., 2006)

"Good quality teachers, with up-to-date knowledge and skills, are the foundation of any system of formal science education." (Osborne & Dillon, 2008)

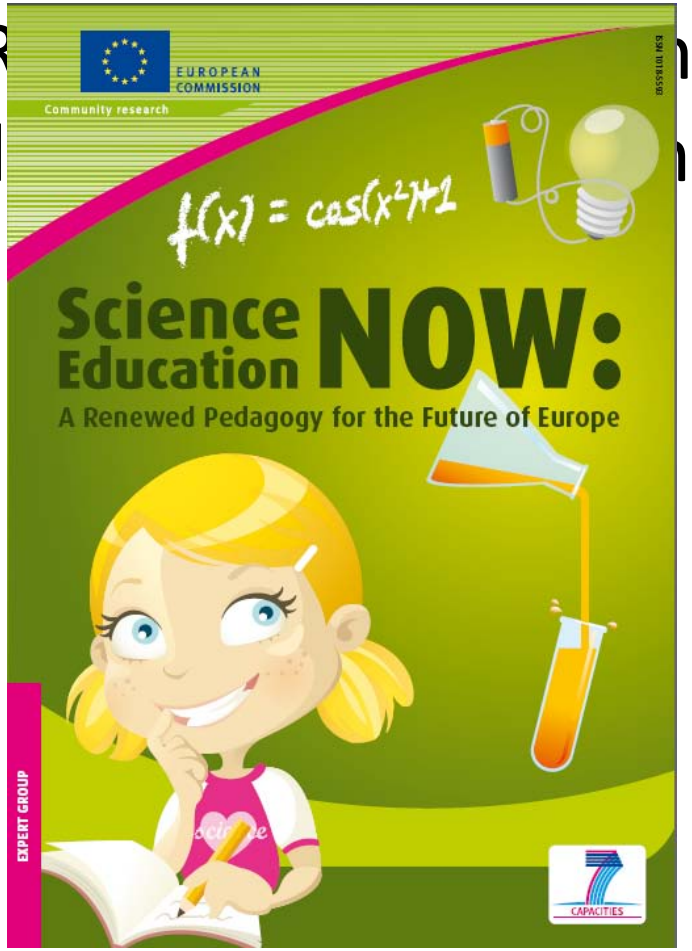
"The quality of an education system cannot exceed the quality of its teachers." (McKinsey report, 2007)

Outline

1. Should IBSE be the only show in town?
2. How much national impact does PROFILES have?
3. How can the outcomes of PROFILES be disseminated more widely?
4. How can we ensure sustainability?
5. How do measure the success of IBSE?
6. How does PROFILES relate to the other EU projects?

1. Should IBSE be the only show in town?

- The Rocard R[illegible]mmended that IBSE be used [illegible]nce education in Europe.



The headlong rush towards IBSE

"A reversal of school science-teaching pedagogy from mainly deductive to inquiry-based methods provides the means to increase interest in science. Inquiry-based science education (IBSE) **has proved its efficacy** at both primary and secondary levels in increasing children's and student's interest and attainment levels while at the same time stimulating teacher motivation." Rocard Report, 2007, *Science Education NOW: A renewed Pedagogy for the Future of Europe*

Promoting IBSE in Europe

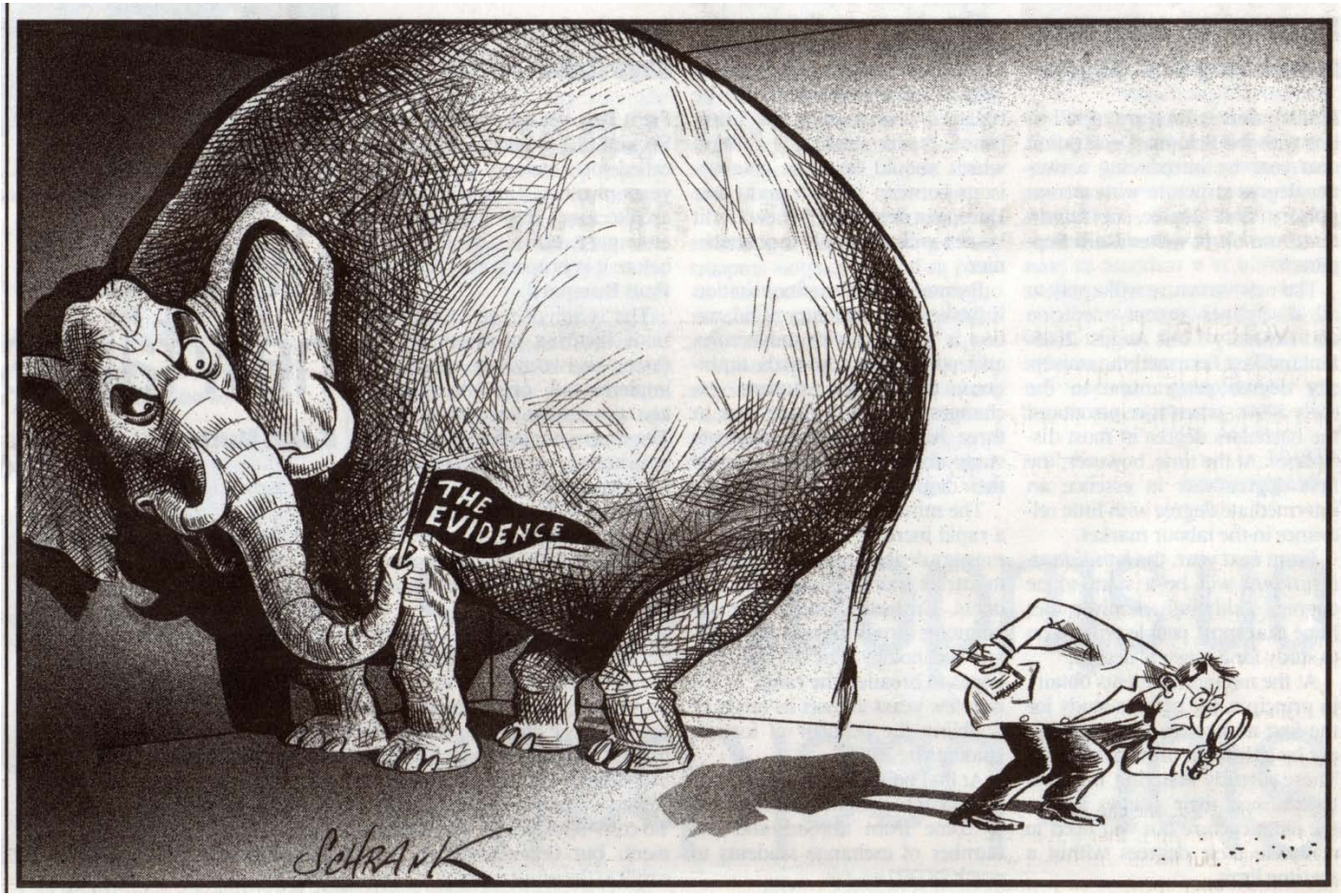
FP-6 and FP-7 projects – many parallel projects in IBSE across Europe. (Now in its 4th cycle)

IAP-International Conference: *Taking inquiry-based science education (IBSE) into secondary education* York 2010

A Renewal of science education across Europe

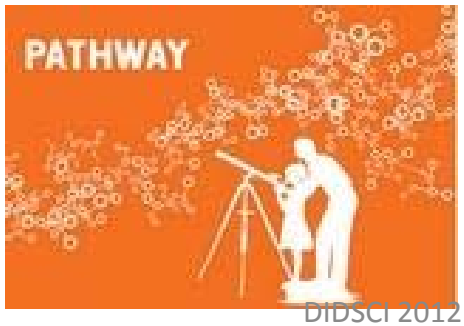
ALLEA, 2012

Is IBSE *sufficiently* evidence-based?



European science education projects

http://www.scientix.eu/web/guest/home

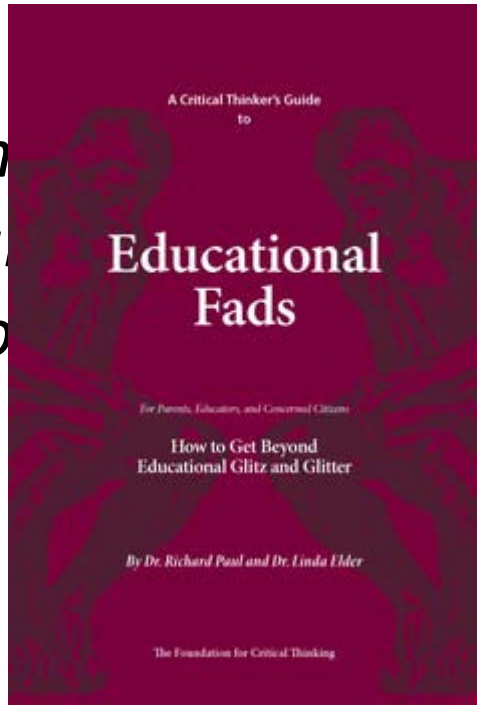


How do we avoid following the latest fads and fashions?

Fads come and go in education, especially educational technology, without any real evaluation of the evidence.

“Teachers call it the "reform du jour," an
the biggest challenge at the start of a
That's when the latest idea for how to
student performance kicks in.”

G.R. Chaddock, 1998



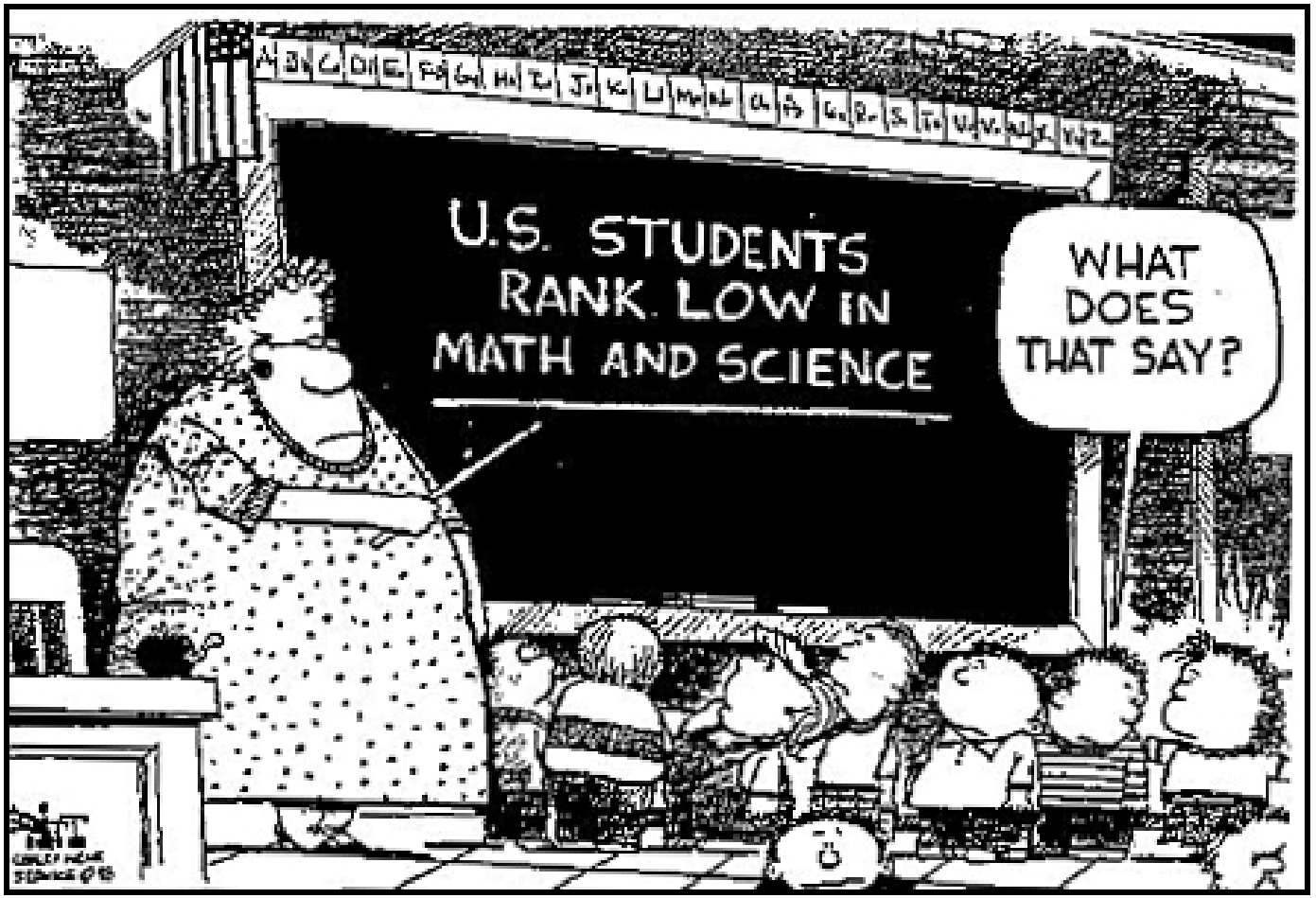
Do the latest ideas actually work?

- Inquiry-based science education (IBSE)?
- Learning styles?
- Smaller classes?
- Critical thinking?

Etc. etc.

We need to research the effectiveness of different strategies, and not just accept them wholesale or rely on single studies!

The PISA effect



The danger of following the crowd

- **Are Teachers Hand-cuffed by Flawed Education Research?**
- **We Must Stop the Avalanche of Low-Quality Research**
- **Second-Class Science: Education research gets an F.**

  Newsweek May 9, 2010

Is IBSE the answer?

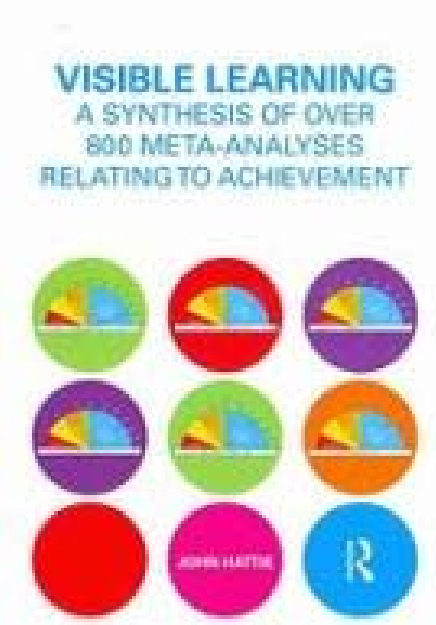
In a controlled study, inquiry methods and direct instruction gave the same gain in understanding scientific concepts.

"Some claims for inquiry methods regarding understanding the nature of science are not sufficiently well supported by evidence."

(Coburn et al. 2010)

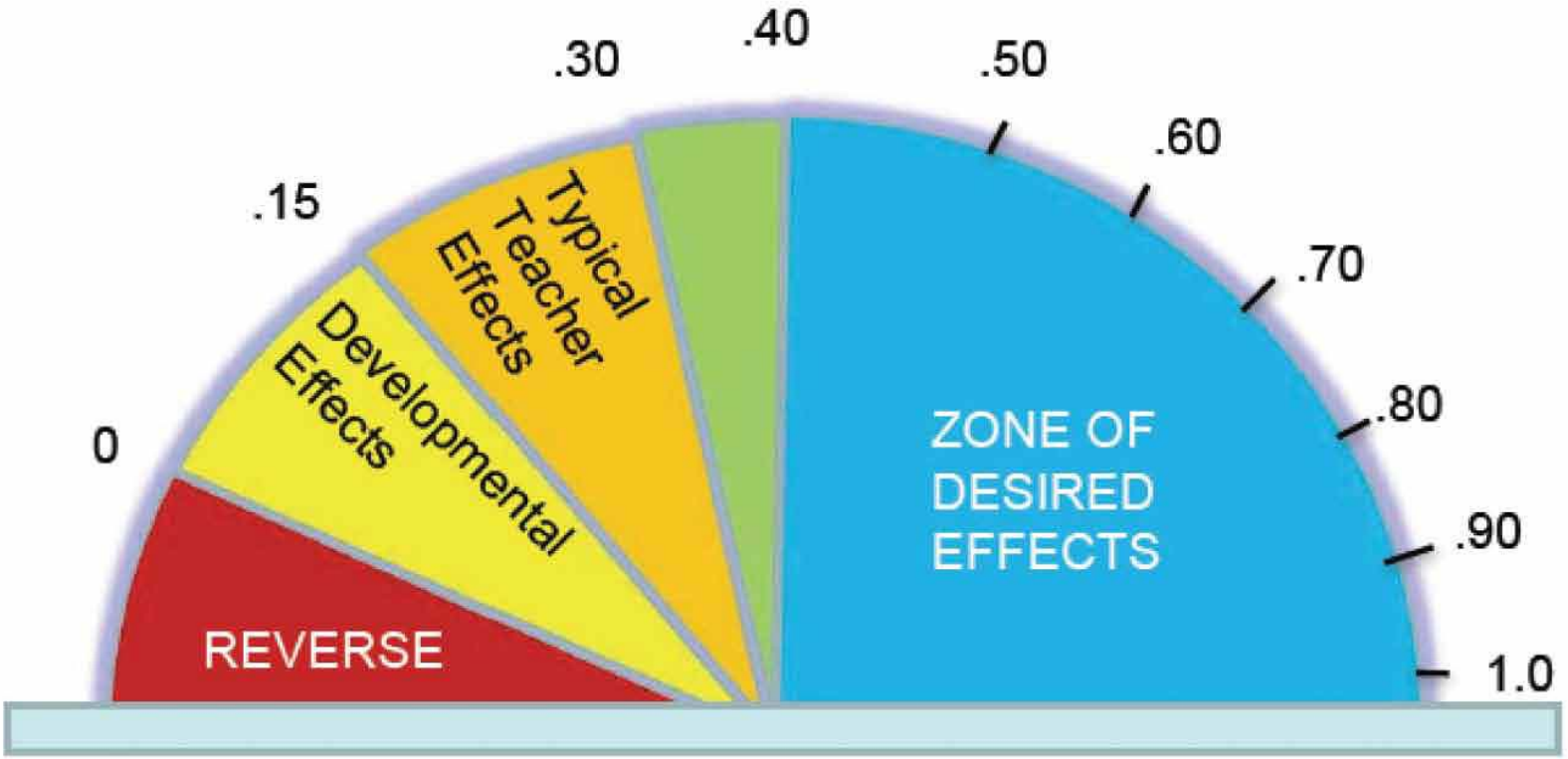
Meta-analysis of research studies

John Hattie (2008)
Visible Learning;
A synthesis of over 800 meta-Analyses relating to achievement
Routledge



Conducted > 800 meta-analyses of >50,000 studies of educational strategies involving >200 million children.

Effect Size(ES)



Rank Domain Influence
Top 20 factors (based on ES)

1 Student Self-report grades
2 Student Piagetian programs
3 Teaching Providing formative evaluation
4 Teacher Micro teaching
5 School Acceleration
6 School Classroom behavioural
7 Teaching Comprehensive interventions for learning disabled students
8 Teacher clarity
9 Teaching Reciprocal teaching
10 Teaching Feedback
11 Teacher-student relationship
12 Teaching Spaced vs. mass practice
13 Teaching Meta-cognitive strategies
14 Student Prior achievement
15 Curricula Vocabulary programs
16 Curricula Repeated reading programs
17 Curricula Creativity programs
18 Teaching Self-verbalization/self-questioning
19 Teacher Professional development
20 Teaching Problem-solving teaching

Source: Hattie 2008, *Visible learning: a synthesis of over 800 meta-analyses relating to achievement.*

Two opposite styles of teaching

- Activator - An active teacher, passionate for their subject and for learning, a change agent
- Facilitator - A facilitative, inquiry or discovery based provider of engaging activities

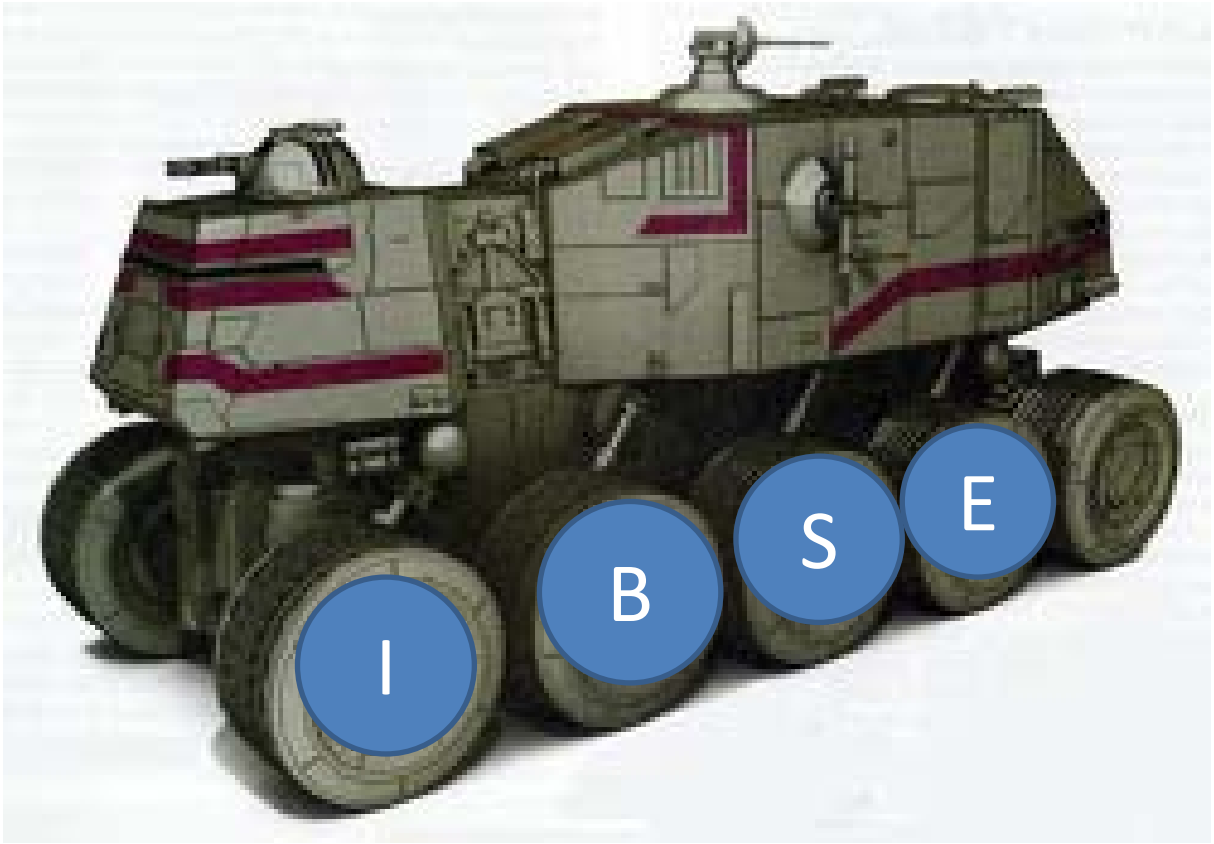
Which is best?

John Hattie (2008) *Visible Learning: a Synthesis of over 800 meta-analyses relating to achievement*

Activator of Facilitator of Learning?

An Activator ES	*A Facilitator ES*
• Reciprocal teaching 0.74	Simulations and gaming 0.32
• Feedback 0 .72	Inquiry based teaching 0.31
• Teaching students self-verbalization 0.67	Smaller class sizes 0.21
• Meta-cognition strategies 0.67	Individualized instruction 0.20
• Direct Instruction 0.59	Problem-based learning 0.15
• Mastery learning 0.57	Different teaching for boys & girls 0.12
• Goals - challenging 0.56	Web-based learning 0.09
• Frequent/ Effects of testing 0.46	Whole Language Reading 0 .06
• Behavioural organizers 0.41	Inductive teaching 0.06
ACTIVATOR 0.60	***FACILITATOR 0.17***

Is IBSE the only show in town?



Does research show inquiry-learning is effective

- John Hattie's study showed a size effect of 0.31 for inquiry-based teaching (86/138) versus 0.57 for concept mapping (33/138). 0.61 for problem solving teaching (20/138).

Are we putting all our eggs in the right basket?

2. How much national impact does PROFILES have?

Projects are run by enthusiasts for enthusiasts.

How much impact outside the project schools does PROFILES have?

Is it a passing enthusiasm or a long-term feature of science education?

Danger of the impact being too local.

How does it relate to other FP7 projects in the same country?

Irish IBSE FP7 projects

TEMI
UL

PROFILES
UCC

ESTABLISH
SAILS
DCU

3. How can the outcomes of PROFILES be disseminated more widely?

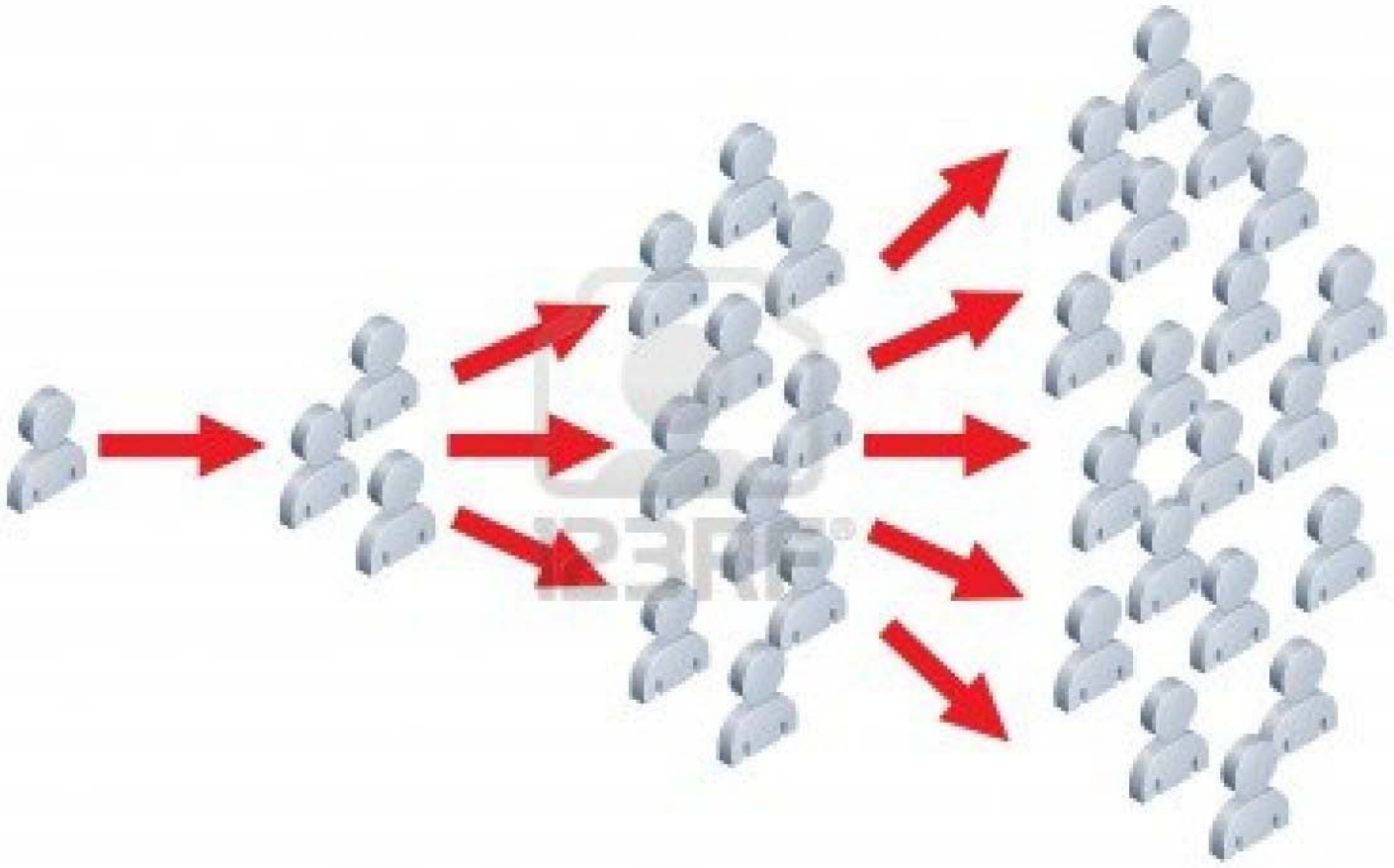
Challenge as to how to disseminate the PROFILES philosophy and materials in:

a) The partner countries outside the PROFILES team;

b) Countries outside the project.

There is a danger of it remaining as reports on a shelf and a fading memory.

Dissemination



How can PROFILES go viral?

Using the model of infection by a virus:

- We need a potent virus (good idea, approach, materials – PROFILES)
- We need a vector (project teachers)
- We need a method of transmission (website, publications, conferences)
- We need a target population (science teachers)
- **We need time for infection to be established**

Importance of sharing materials

- Very important for the modules developed in each country to be made available and shared through an internet platform and publicised widely.

4. How can we ensure sustainability?

Dissemination and sustainability are not the same thing.

Sustainability refers to the development and continuance of a project after the funding stops.

The enthusiasts move on to a new project and the teachers go back to their old ways.

How do we infect the education system permanently with the PROFILES virus?

Changing the education system

A key problem in sustainability is embedding new ideas within the education system:

- Traditional, entrenched views (principals, teachers, inspectors, examiners).
- Constraints of the existing curriculum.
- The examination strait-jacket.
- The time problem in schools.

The process of change

- How do we change a science teacher's existing practices, philosophy and mindset?
- In order to effect change a teacher must want to change or see the value of change in their school.
- Change takes time – 80 hours?

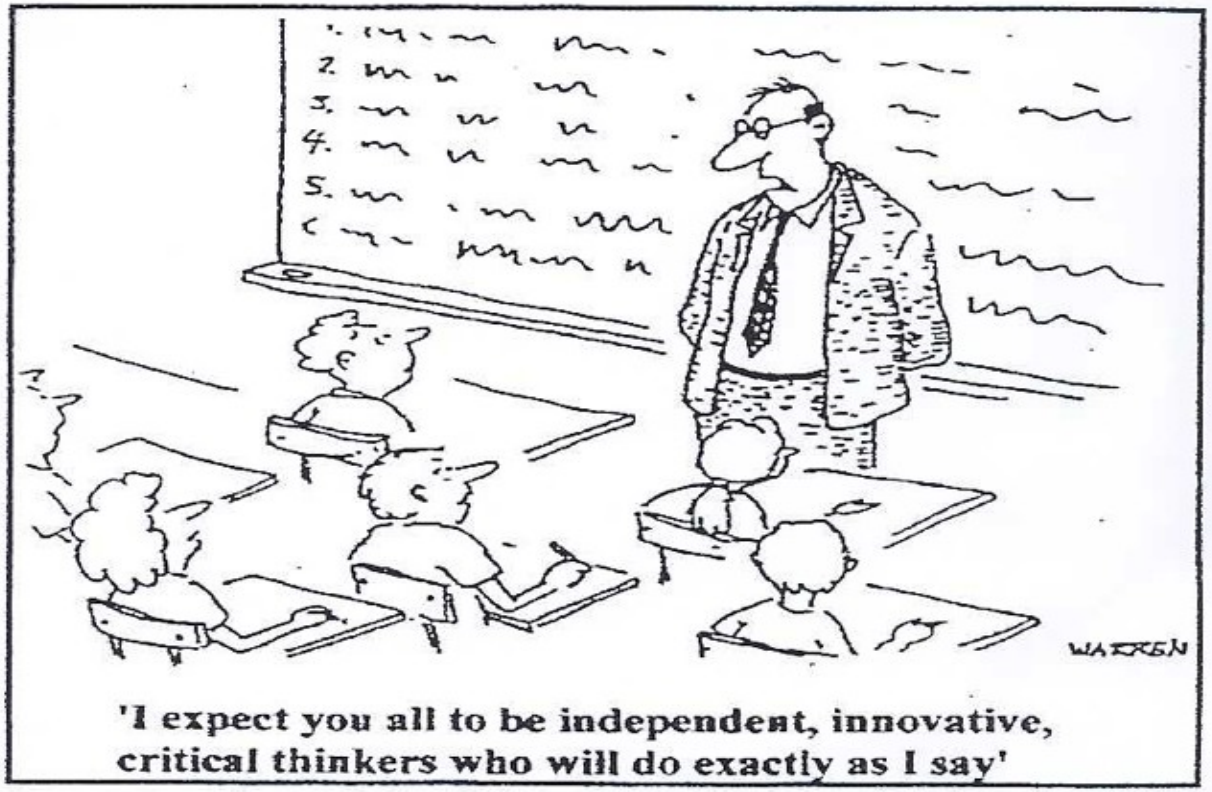
Theory and practice

In theory there is no difference between theory and practice. In practice there is.

Yogi Berra

Difficulty of introducing change

How we implement ideas is vital to their success in the classroom.



The gap between theory and effective practice is large

5. How do measure the success of IBSE?

Should we be evaluating the success of PROFILES in each country?

How do we measure its success? **On teachers? On students? On the system?**

Are we measuring the effect of PROFILES or the effect of the enthusiastic teacher?

Is the investment in IBSE across the EU good value for money and is it having any lasting impact?

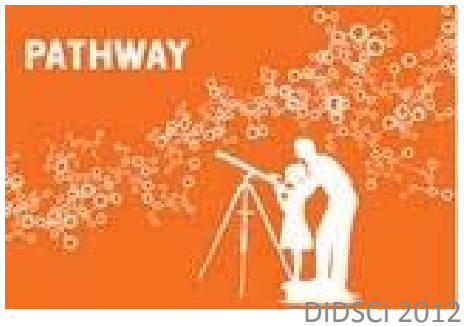
6. How does PROFILES relate to the other EU projects?

- There are possibly too many EU FP7 projects in the area of IBSE?

European science education projects

http://www.scientix.eu/web/guest/home

1. How much national impact does PROFILES have?



6. How does PROFILES relate to the other EU projects?

- There are many EU FP7 projects in the area of IBSE?
- How do they relate to each other?

  Overlap? Duplication? Transfer between projects? Evaluation of success?
- We need a meta-analysis of all IBSE projects to draw out general findings, identify best practice and best materials etc.

A way forward

The ProCoNet and the new Comenius project INSTEM is a welcome initiative. (Peter Gray)

We need a synthesis, a meta-analysis of all the IBSE projects to ensure all that money was not wasted.

A final message

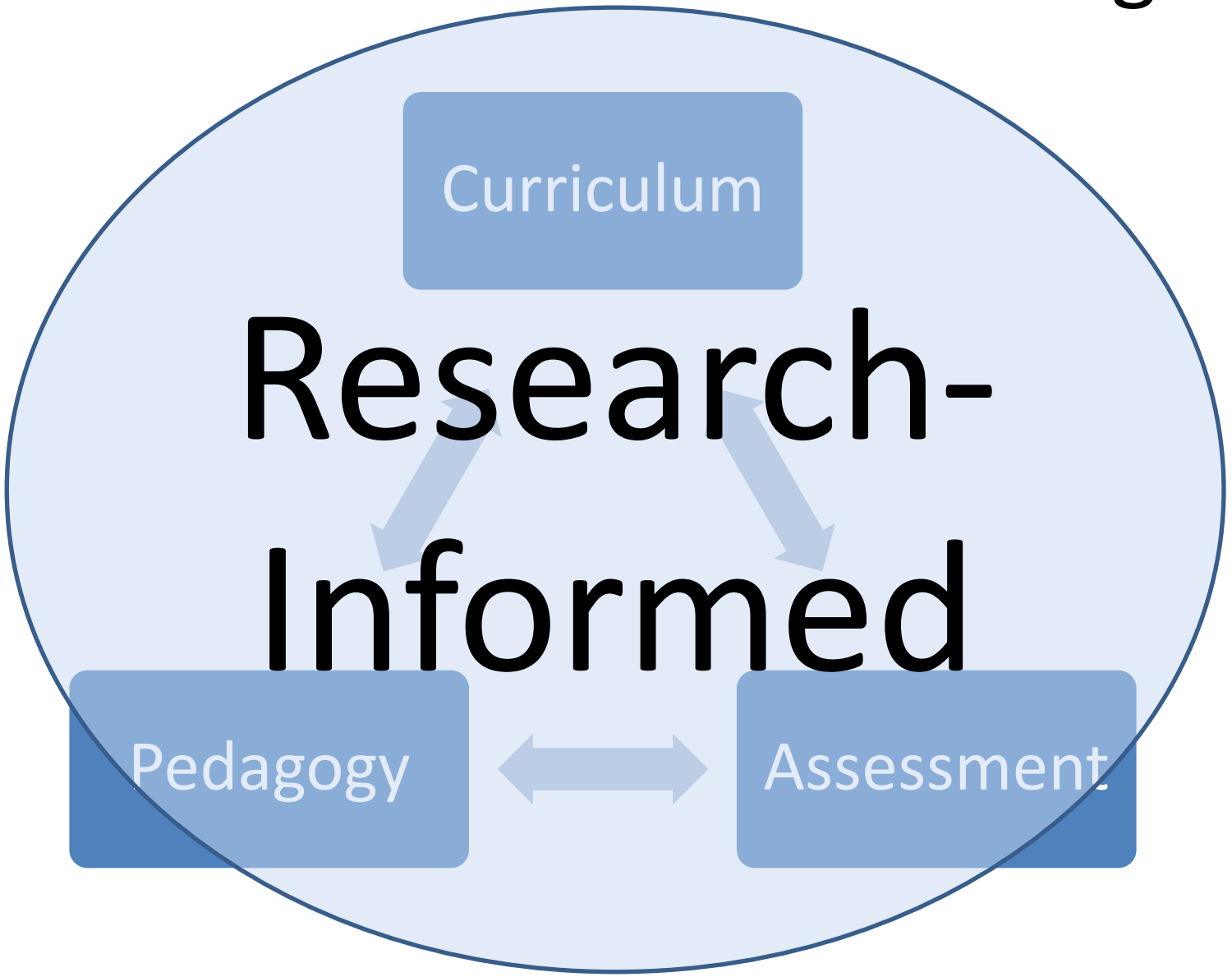
- In improving science education in Europe there is no single silver bullet.
- PROFILES is not ‘the’ answer – but it is part of the answer.
- IBSE should only be one of the teaching approaches a science teacher can draw on in their practice.
- The EU needs to invest more widely in science education research and development, not just in IBSE.

What teachers do, matters most!

Research suggests that "visible teaching and learning occurs when learning is the explicit goal: when there is feedback given and sought and when there are active, passionate, and engaging people, including teachers, students, and peers participating in the art of learning."

John Hattie *Visible Learning* (2008)

Research-informed Teaching



Thank you for your attention and the opportunity to participate in the conference