



O impacto das TICs na educação
El impacto de las TICs en la educación
The Impact of ICT in education

“Assessing Impact of ICT on the quality of education”

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- To understand some of the **weakness** of the design, implementation and evaluation of ICT in educational settings
- Propose a **conceptual model** to create ICT for education programs
- Discuss **applications for public policies**

History

Significant evaluation studies

Uses of ICT on education &
Research topics

Technological development

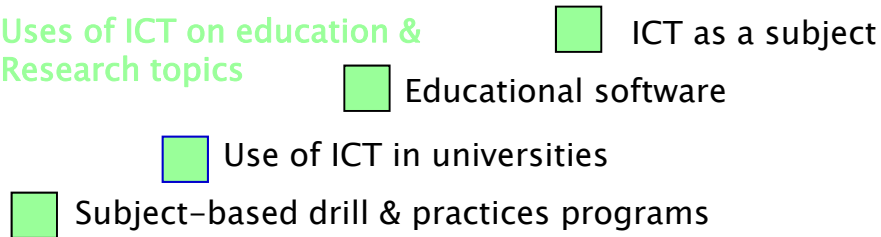
Years



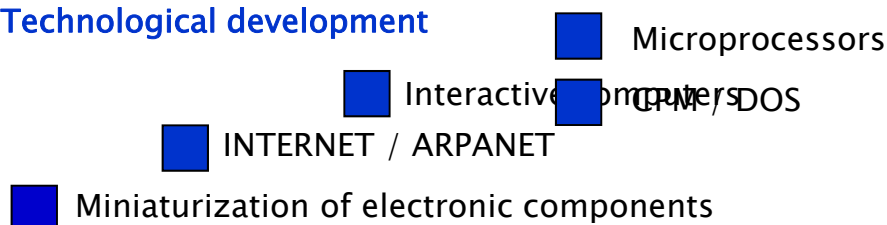
History

Significant evaluation studies

Uses of ICT on education & Research topics



Technological development



1950-67 1968-70 1970-77 1978-80

History

Significant evaluation studies


Uses of ICT on education & Research topics

- Widespread use of computers in schools
- LOGO
- Spreadsheets / word processors software

Technological development

- World wide web
- Windows
- IBM-PC / Apple Macintosh

1980-90

A horizontal black arrow pointing to the right, starting from a small black dot on the left and ending with a black arrowhead on the right.

History

Significant evaluation studies

- SITES M1
- ImpaCT2
- ImpaCT

Uses of ICT on education & Research topics

- Theories about educational change
- Need of resources for teaching with ICT
- Widespread use of ICT in schools

Technological development

- Personal Digital Assistants
- Interactive whiteboards
- Classroom Projectors
- Laptop computers

1991-99

History

Significant evaluation studies

- Silicon Valley vs Silicon Glen
- SITES M2

Uses of ICT on education & Research topics

- On-line courses and assessment
- Conflict between productivity and educational software

Technological development

- Wireless network massification
- Learning Virtual Environments
- Internet massification

2000-04




History

Significant evaluation studies


Impact Report (European Schoolnet) 

Uses of ICT on education &
Research topics

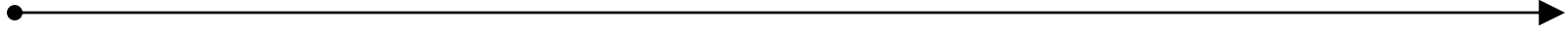
Impact on standardized tests 

Digital Literacy 

Technological development






Web 2.0 

2004-07






History




Significant evaluation studies

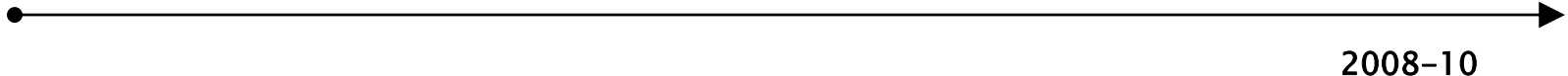
- Evaluation of “Computadores para educar” (Colombia) 
- Evaluation of “Enlaces” network (Chile) 
- Effectiveness of Reading and Mathematics Software Products II (USA) 
- Effectiveness of Reading and Mathematics Software Products I (USA) 
- SITES 2006 

Uses of ICT on education & Research topics

- 21st Century skills 
- CSCCL 
- 1:1 

Technological development

- Kindle, Ipad 
- OLPC, Netbooks 
- YouTube, Facebook, Twitter 



What affects the impact of ICT on education?

What we know

- ICT was not designed for educational purposes
- Technology is put before pedagogy
- Existing educational research was not applied to ICT programs
- ICT generally implemented without valid theoretical support
- ICT competes with the needs of the system, measured by standardized tests
- Lack of adequate ICT monitoring initiatives, to learn from experience

What we know

- No accepted standard methodologies for measuring the impact
- Evaluation weaknesses are:
 - What to measure
 - What to measure with
 - How to measure

What we know

- What to measure:
 - Identifying the effects of ICTs
 - Identifying how the ICT design and its curricular implementation affect students' attainment
 - Teachers' pedagogical approaches

What we know

- What to measure with:
 - Assessment instruments don't match the defined aims
 - The instruments that measure educational results are rarely sufficiently investigated, as far as reliability and validity

What we know

- How to measure:
 - It is difficult to isolate the role technology plays in experimental studies carried out in real educational settings
 - There are substantial differences between the design and actual implementation of ICTs in education
 - Lack of explanation regarding results
 - Relevance of findings

Concepts & background

- Efficacy, effectiveness, efficiency
- Formative and summative studies
- Investigation methods: “Design research”
- ICT for education program
- Experimental design

Concepts & background: 3E

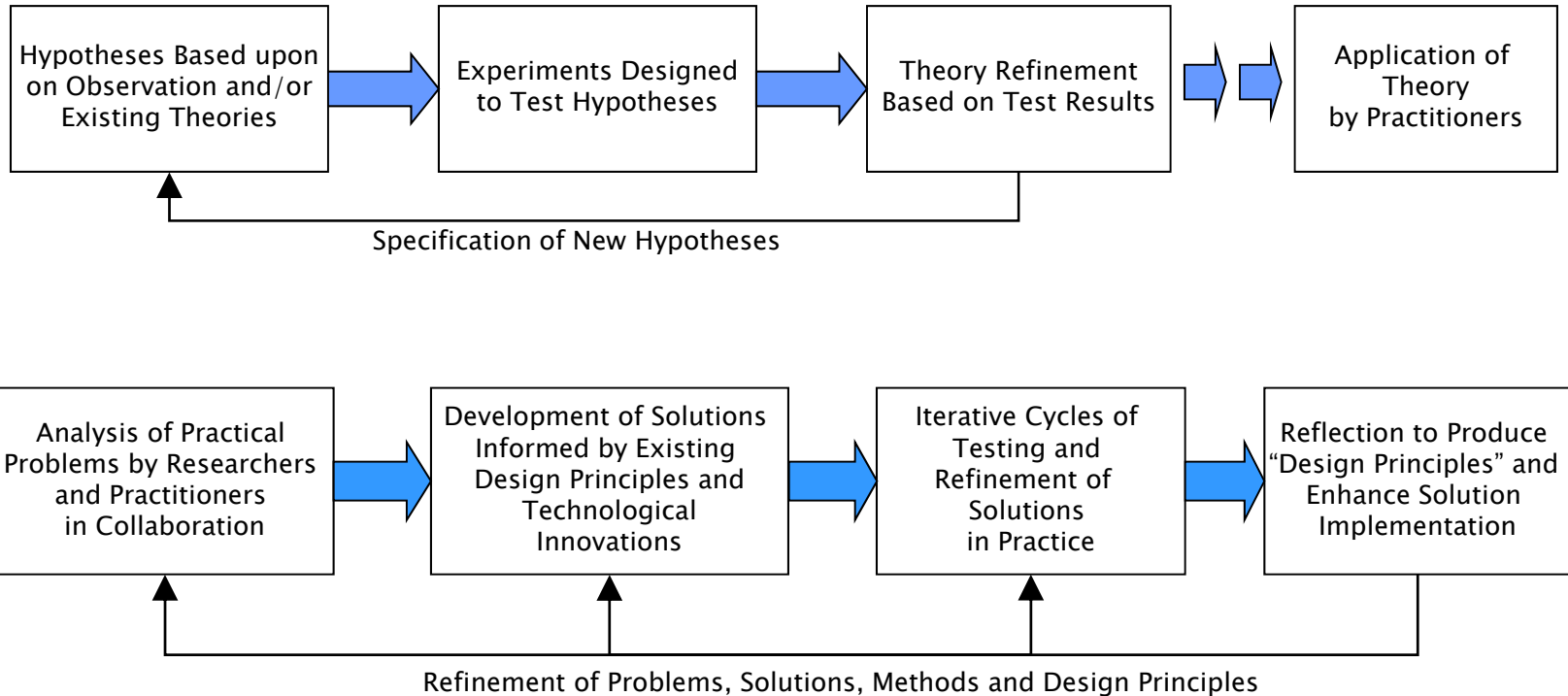
- **Efficacy** : when in controlled environments, technology is evaluated to determine if it *can* improve students' results
- **Effectiveness**: when in real educational settings, technology is evaluated to determine if better results are *really* obtained
- **Efficiency** : considers program costs to effectiveness, measuring its practical applicability and replicability

Background: evaluation studies

- Formative studies are carried out to improve learning environments *while* the program is being developed
- Summative studies aim to show its impact *once it is completed*

Conceptual model

Background: design research

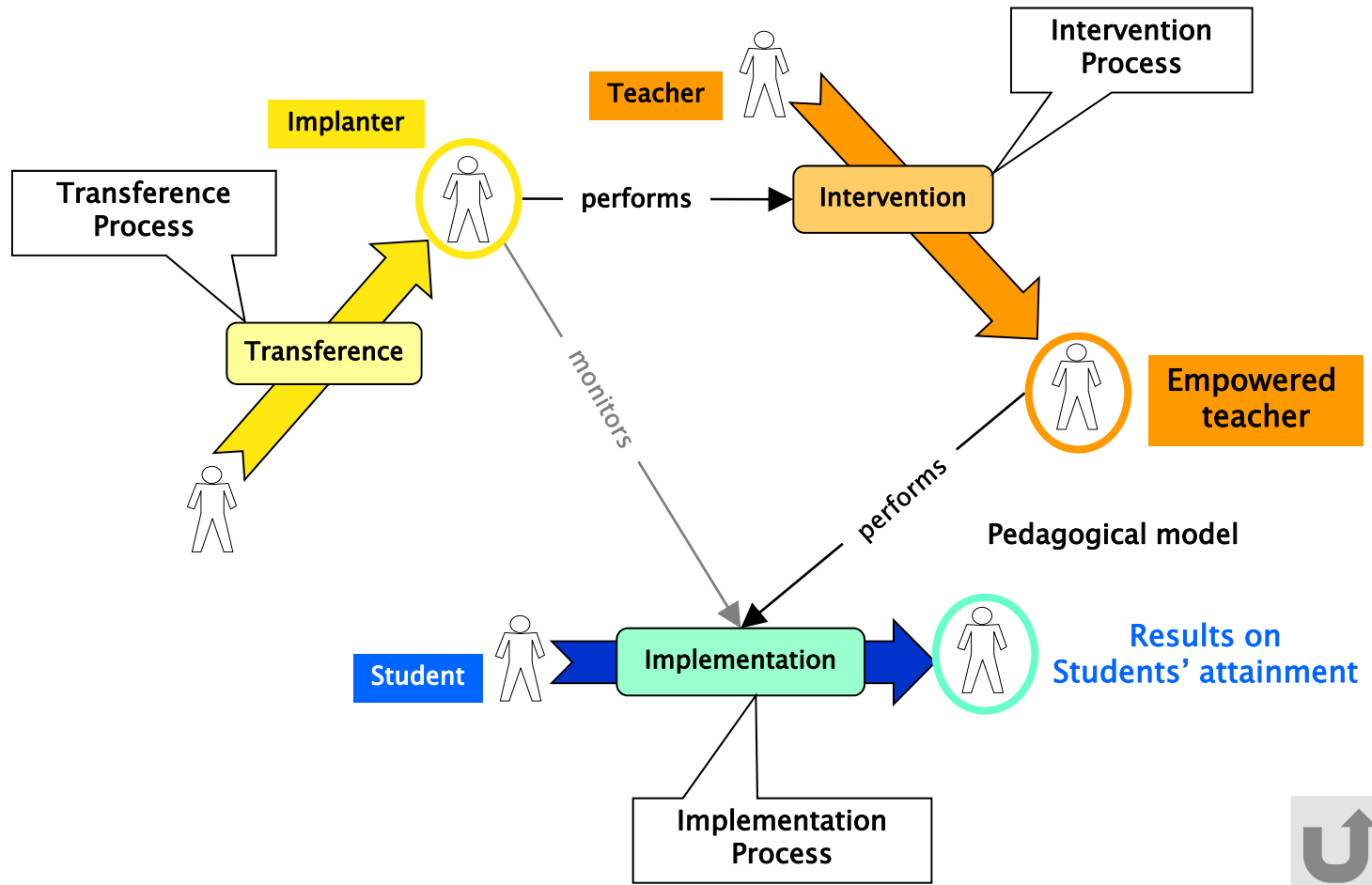


Background: ICT4E program

- ICT for Education (ICT4E) Program:
 - Pedagogical Model (**what** is installed)
 - Intervention (**how** it is installed and monitored)
 - Transference (**training** for intervention)

Conceptual model

Background: ICT4E program

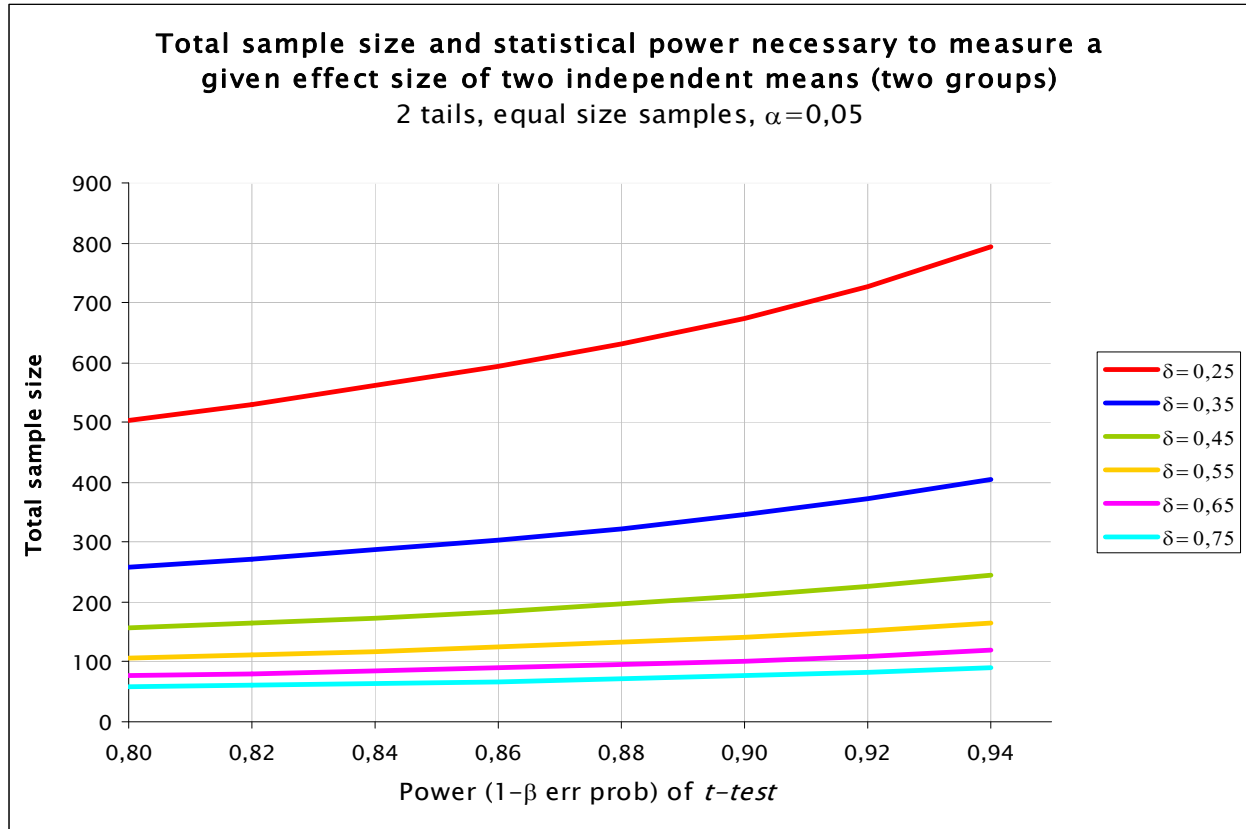


Background: designing experiments

- To find rigorous evidence ([BEE](#), [WWC](#)) of the impact of technology on students' attainment, key are:
 - Experimental design
 - Sample size
 - Interpretation of results
- Effect size and statistical significance must be interpreted together (Fan, 2001)
- When **effect size** (δ) is measured, **type I** (α) and **type II** (β) errors have to be controlled
 - These 3 elements are related with the sample size:
 - $\alpha = 0.05$
 - $1 - \beta \geq 0.8$ (Fox & Mathers, 1997)
 - $\delta \geq 0.25$ (Agodini et al. 2003).
 - Effect size diminishes with larger sample sizes (Slavin & Smith, 2009).

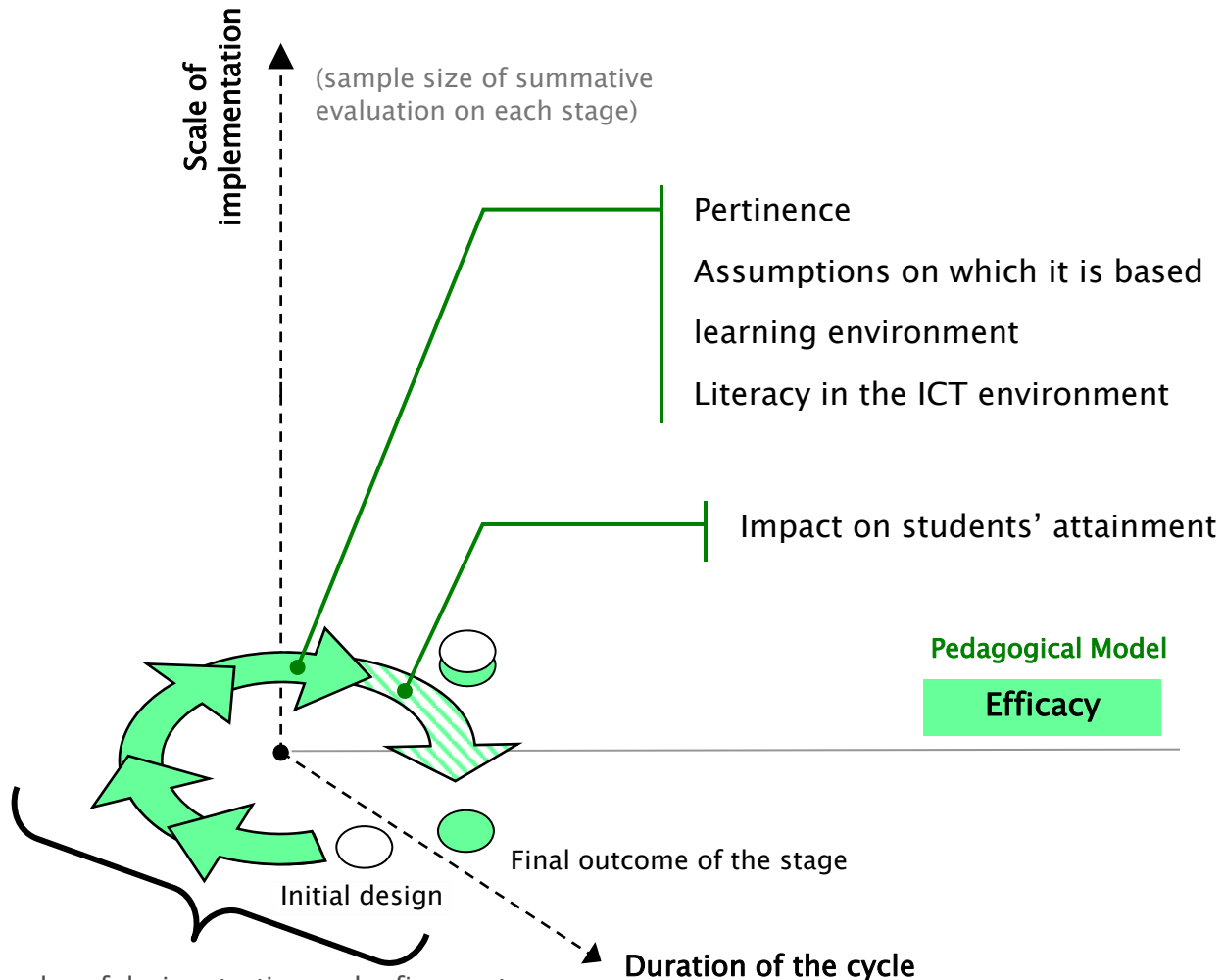
Conceptual model

Background: sample size



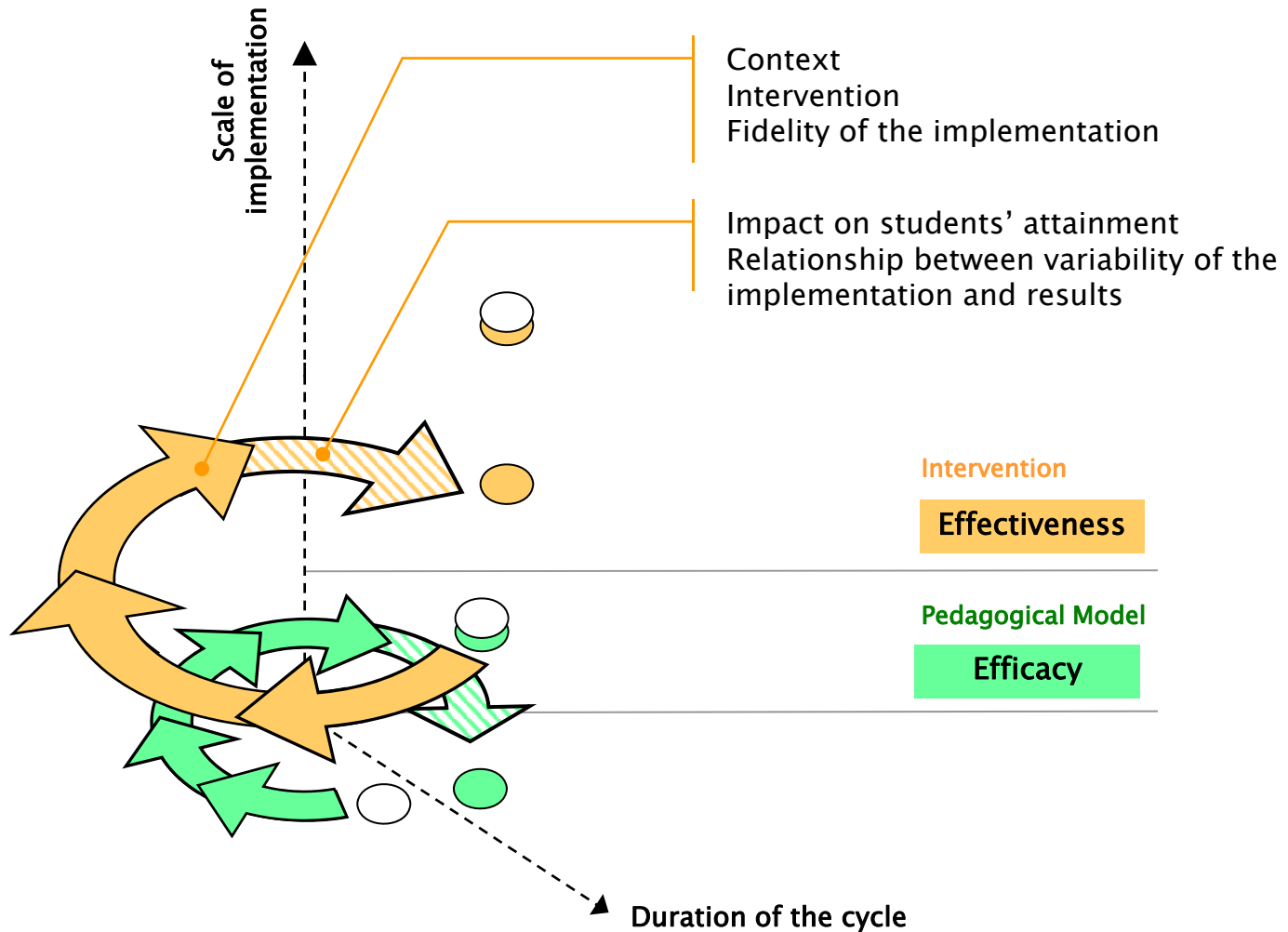
- Decomposes the problem of designing, implementing and evaluating ICT4E programs in stages:
 - **Efficacy**: studies the impact in laboratory and real educational environments focusing on the **pedagogical model**
 - **Effectiveness**: studies the impact in real educational environments focusing on the **pedagogical model and intervention**
 - **Efficiency**: studies the impact in real educational environments focusing on the **pedagogical model, intervention, transference** and **costs** of the solution.
- Ensure the effectiveness of the ICT4E programs before performing expensive summative evaluations.

Conceptual model

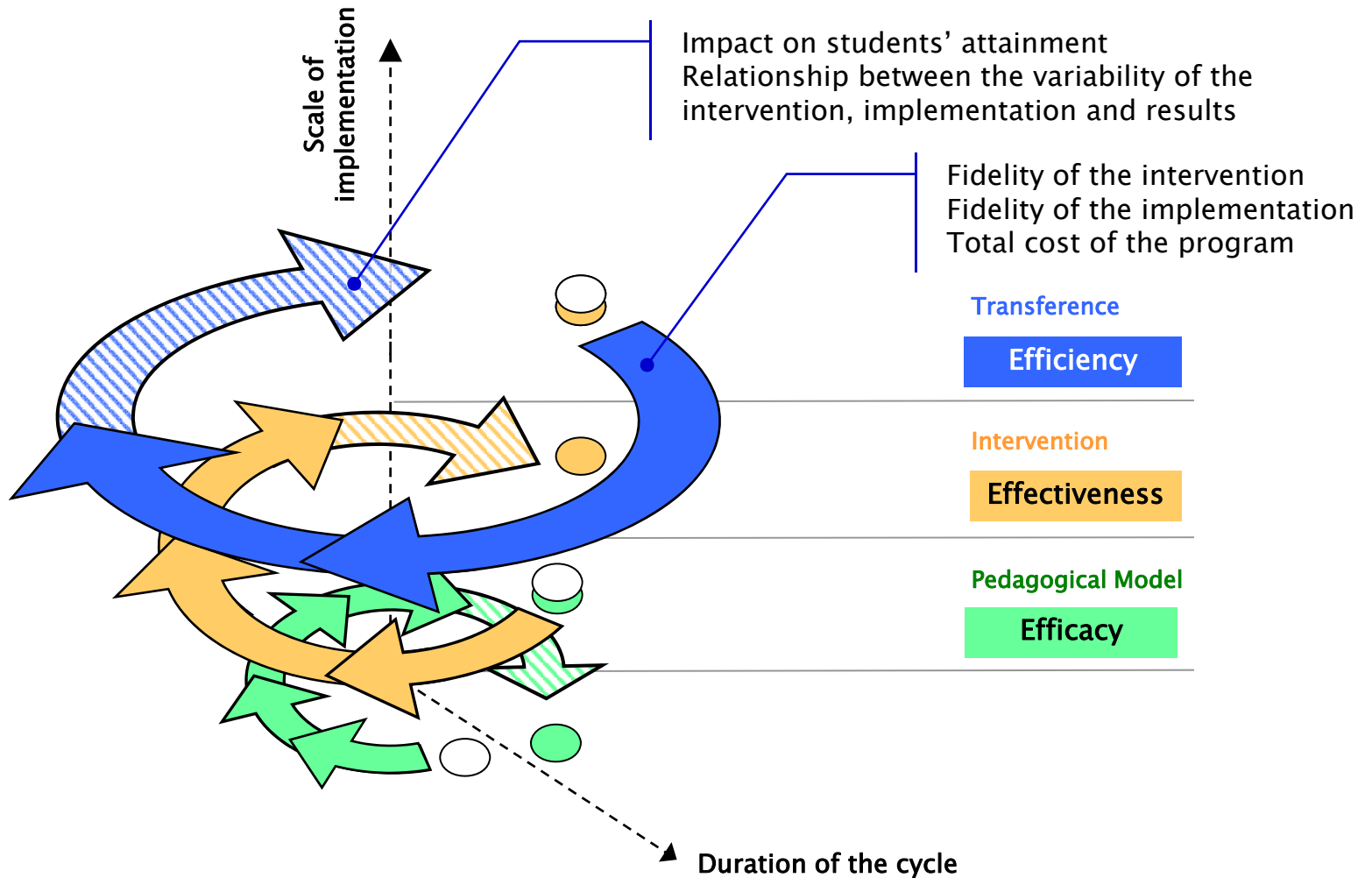


Iterative cycles of design, testing and refinement performing formative and summative evaluations

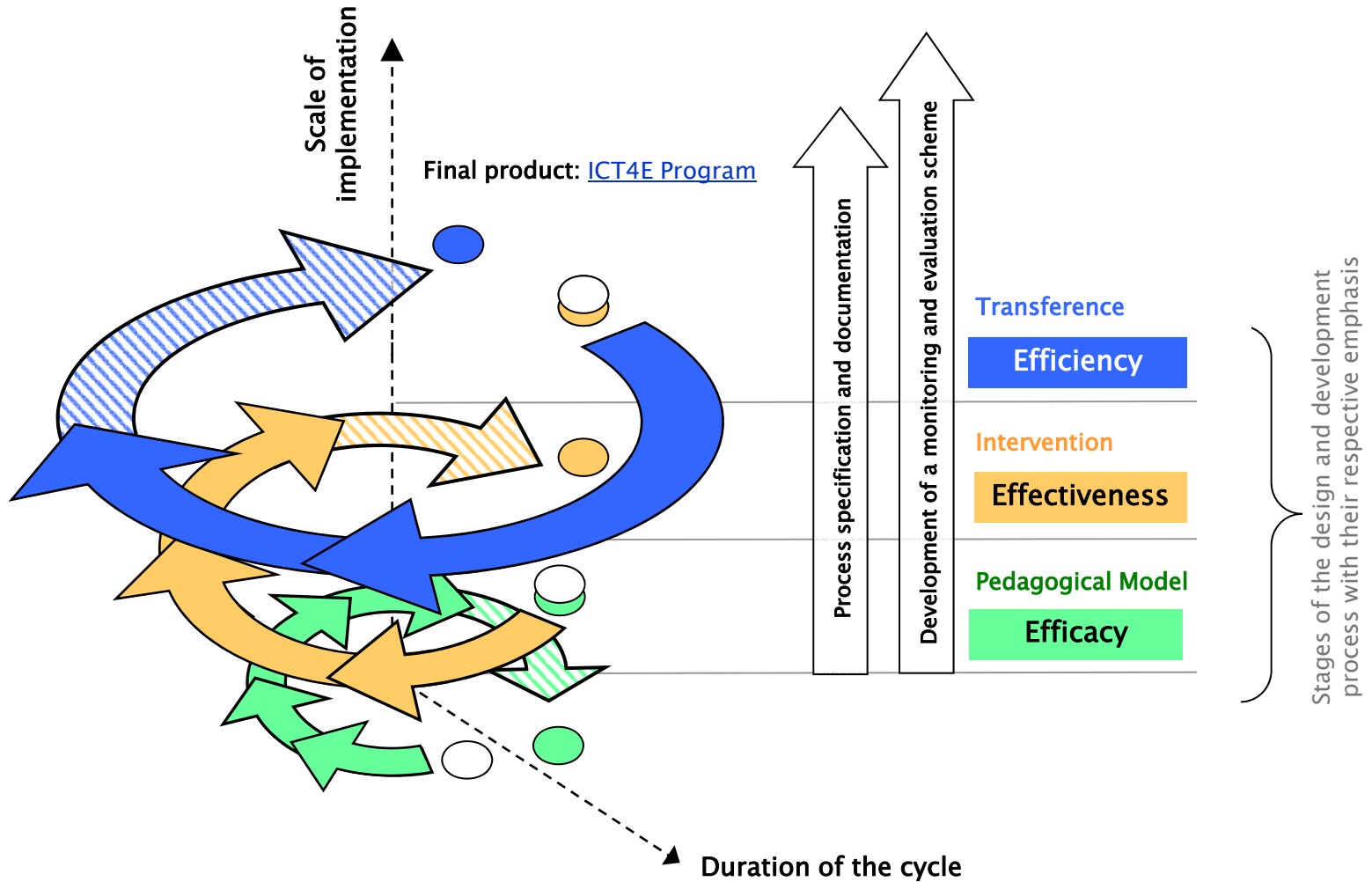
Conceptual model



Conceptual model



Conceptual model



Conceptual model

An example

Collaborative activities without technology



Primary education
(1st and 2nd grades)

Collaborative learning
(Dillenbourg, 1999)

Pedagogical Model

Efficacy

1 school

weeks

Duration of the cycle

Conceptual model

An example

Collaborative activities with technology



Primary education
(1st and 2nd grades)

Mobile Computer supported
Collaborative learning
(Zurita & Nussbaum, 2007)

Pedagogical Model

Efficacy

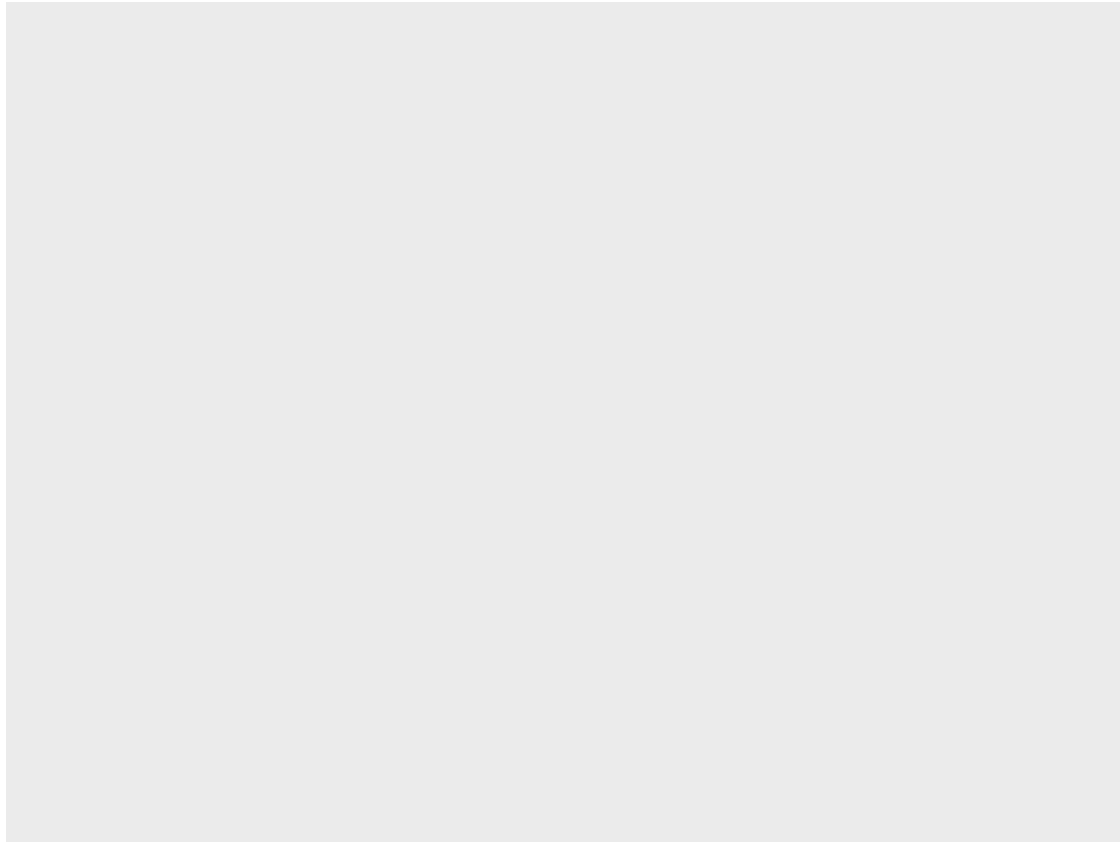
1 school

weeks

Duration of the cycle

Conceptual model

An example



Collaborative activities without technology

Conceptual model

An example



Collaborative activities with technology

Conceptual model

An example

2004



Secondary education
(9th and 10th grades)

Intervention

Effectiveness

5 schools

— months

Duration of the cycle

Conceptual model

An example

2005–2006



Secondary education
(9th and 10th grades)

Intervention

Effectiveness

5 schools

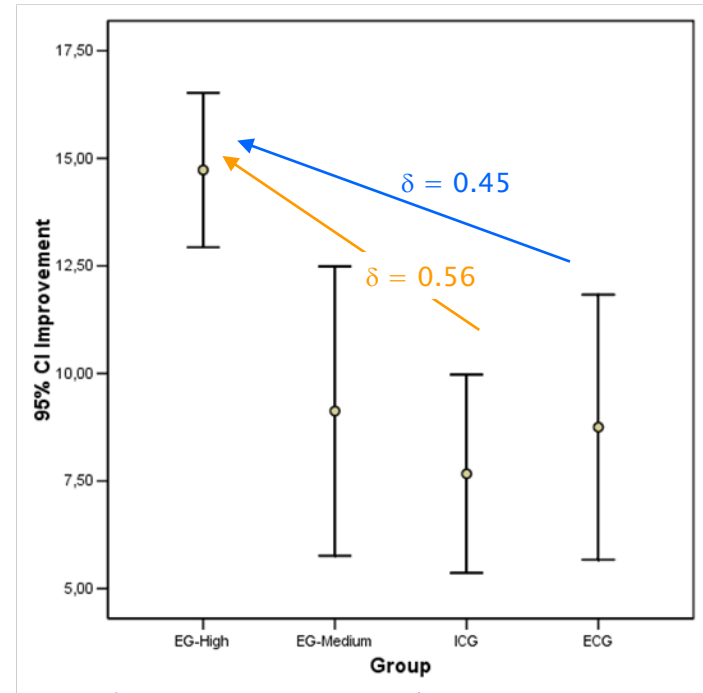
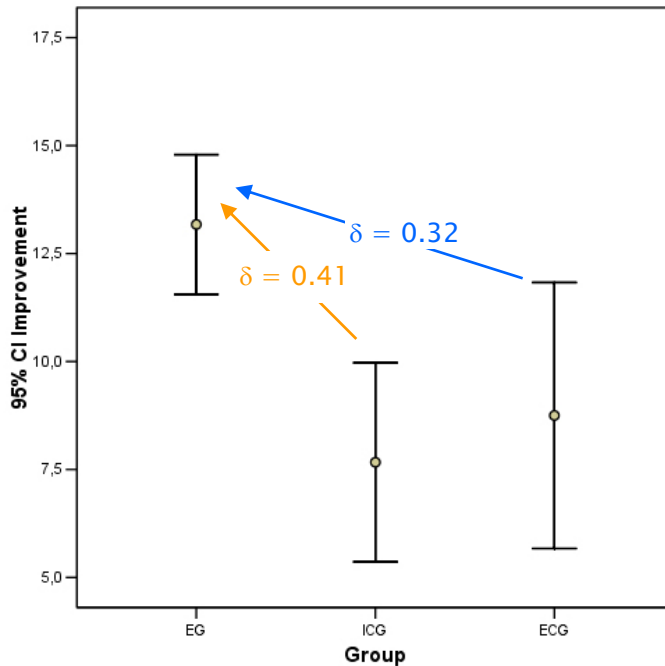
— months

Duration of the cycle

Conceptual model

An example

Students' attainment in Physics (10th grade) 2005–2006



(Rodríguez et al. 2010)

Conceptual model

An example

2007



Primary and secondary
education

Transference

Efficiency

30 schools

years

Duration of the cycle

Conceptual model

An example

2008



Primary and secondary
education

Transference

Efficiency

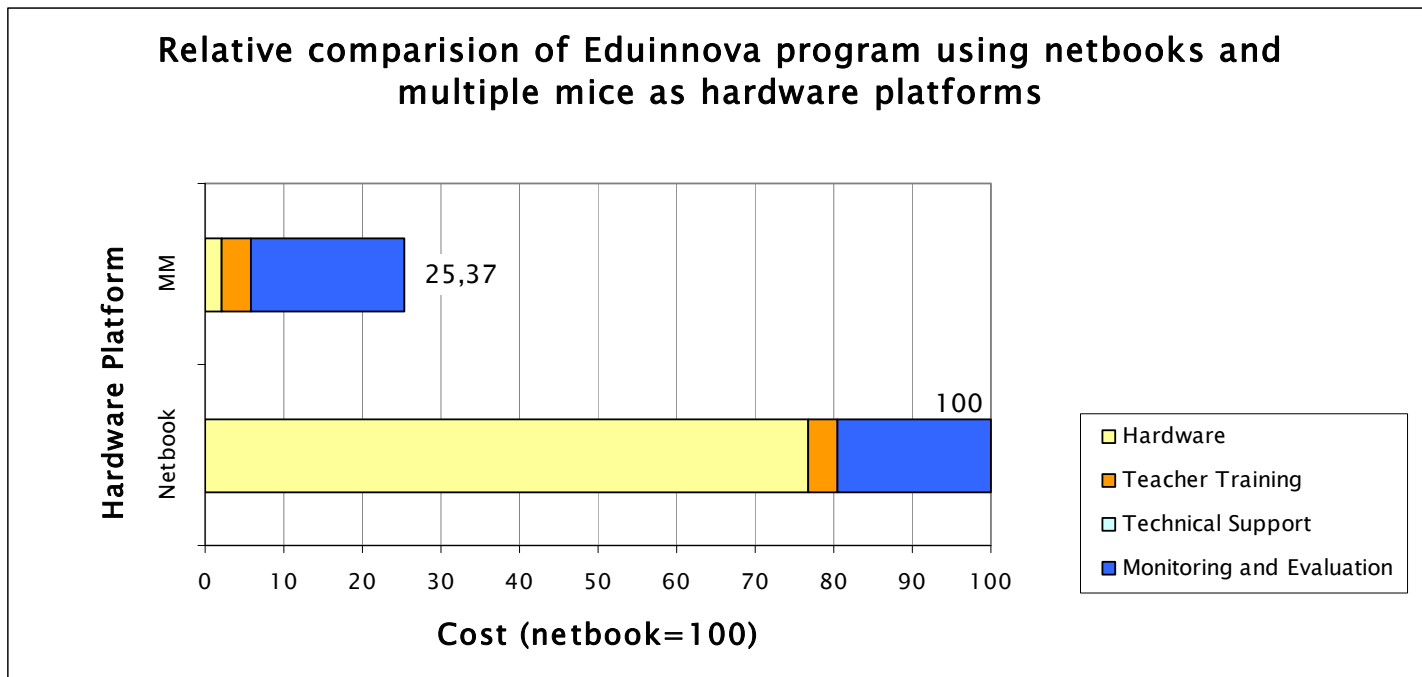
30 schools

years

Duration of the cycle

Conceptual model

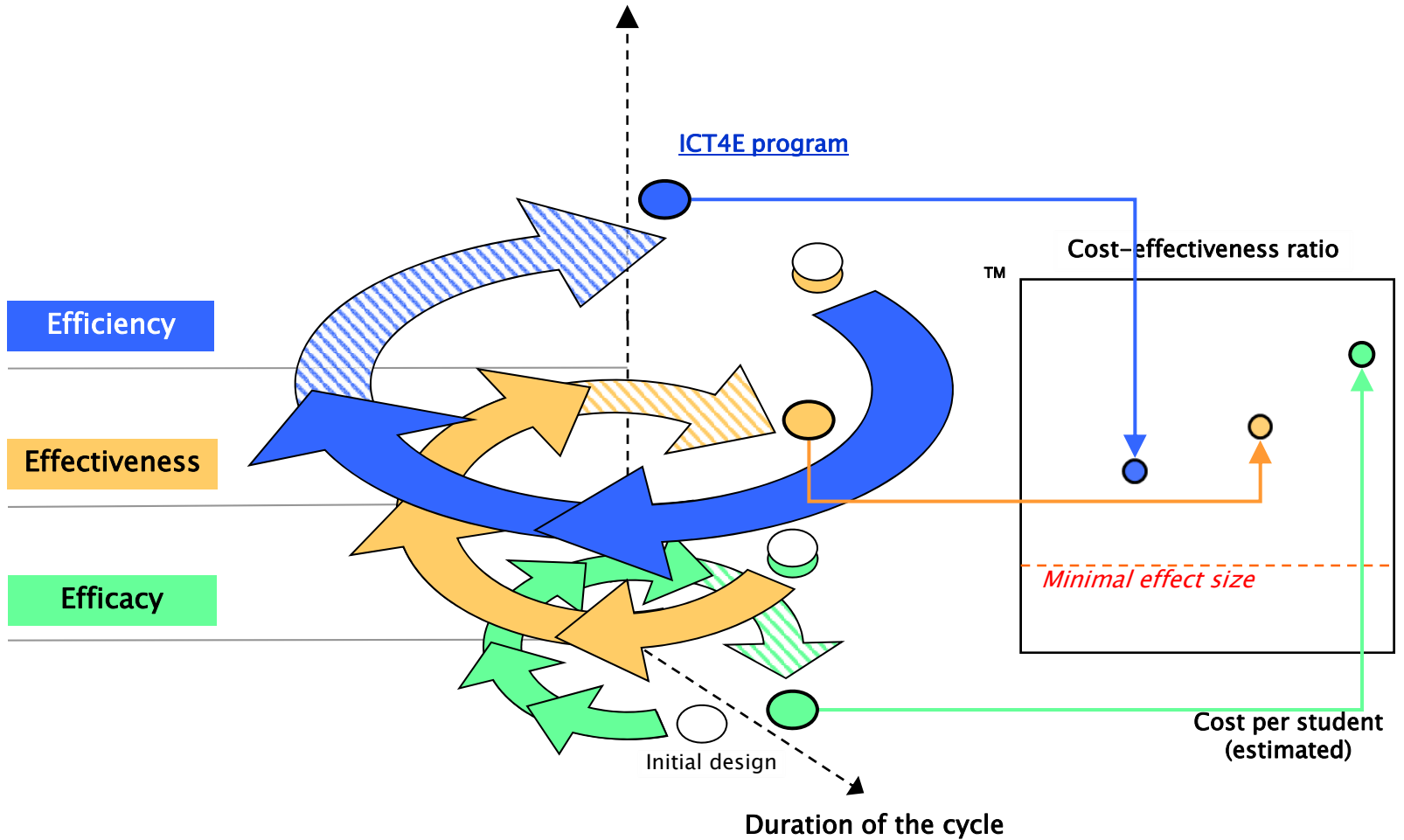
An example



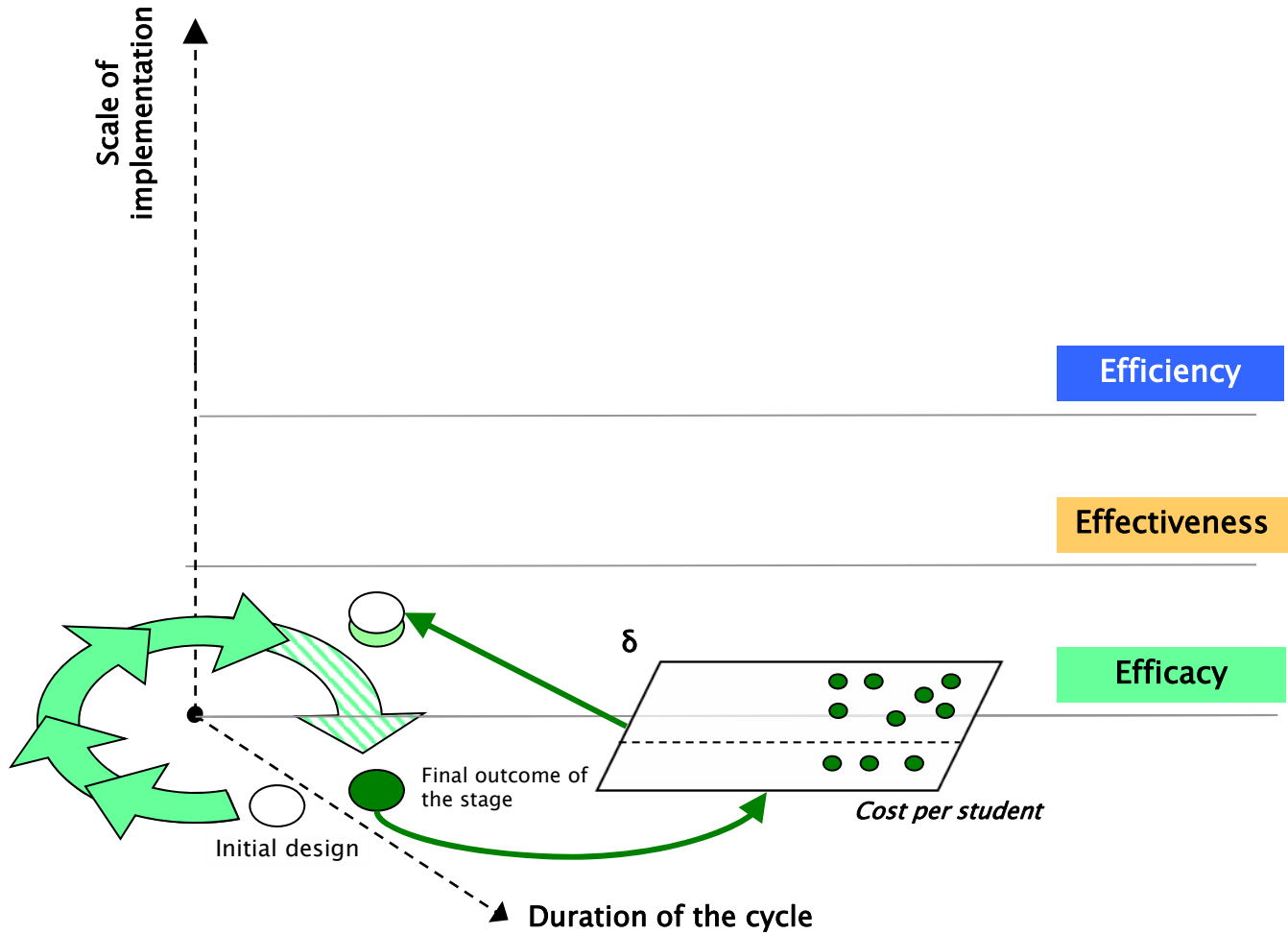
δ MM 0.52 - 0.66

Applications

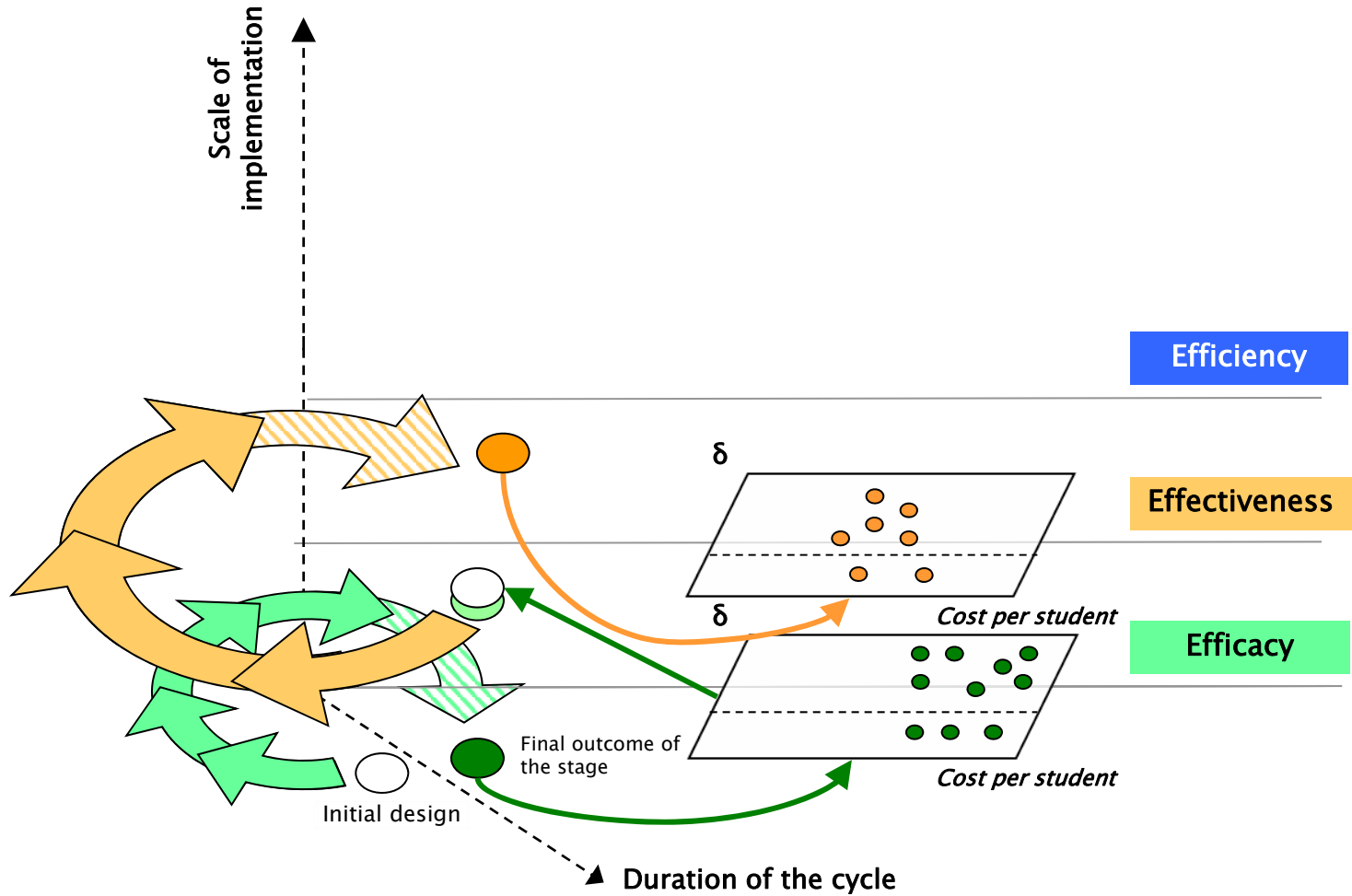
Incorporating cost-effectiveness to design



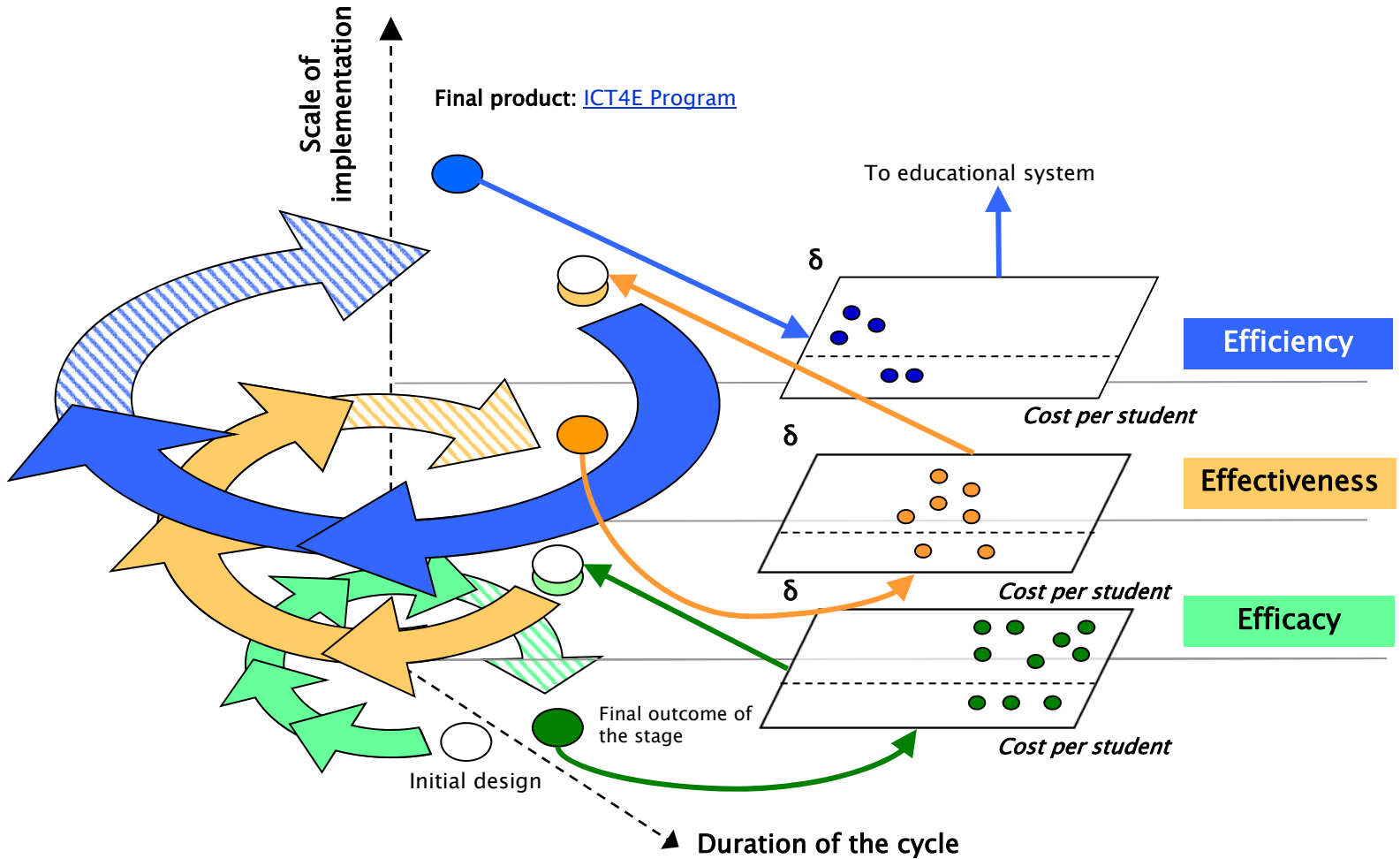
Development of an ICT4E policy



Development of an ICT4E policy



Development of an ICT4E policy



Conclusions

Pros

- Develops ICT4E programs based on rigorous evidence of the real effectiveness of the pedagogical model, intervention and transference
- Gives the decision-maker tools to build a public policy for the development of ICT4E programs
- Provides guidelines for evaluating grant proposals, and the projects themselves
- Educational policies are defined based on the specific schools needs, diversifying the equipment in schools

Cons

- Formative and summative evaluation methodologies require long-term alliances between researchers, schools and politicians
- Public and/or private agencies must be prepared to support this process to achieve the expected results
- It can take more time and resources than initially expected

Challenges (i)

- Long term commitment: political and institutional viability to carry out this proposal
- Evaluation requires specific technical abilities: governments must collaborate with specialized institutions, such as universities and research centers
- Requires long term incentives for researchers which currently are rewarded mainly by publishing

Challenges (ii)

- Evaluation standards for each stage, which can be objectively and transparently applied
- Ethical issues regarding educational research in real settings
- Standards for the calculation of the total cost of the program, to calculate, compare, and make transparent the differences between several proposals

- (Some) key players:
 - Government and Research agencies (e.g.)
 - [BECTA](#), [Education.au](#), [Enlaces](#), [KERIS](#), [LSL](#)
 - [FutureLab](#), [Mathematica Policy Research](#), [SRI International](#)
 - Institutions: (e.g.)
 - [Interamerican development Bank](#) (IADB)
 - [World Bank](#) ([InfoDev](#))
 - United Nations ([CEPAL](#), [UNESCO](#))
 - [OECD](#)

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leading most innovation

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Francia

Activities by themes > Capacity Building > ICT in Education

BLOG VIDEOS

Homepage

Capacity Building

ICT in Education

edu

Did you know

In Benin, the cost of a generic PC is equivalent to a teacher's salary in eight months?

Featured blogs

Michael T Sr. ICT Specialist

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- Michael Truca
- Robert Hawki

Guest Bloggers

- Arturo Muent

ICT in Education

The use of ICT in and for education is now seen worldwide as both a necessity and an opportunity.



UNESCO is giving a high priority to the use of ICT for more equitable and pluralistic development in education, aiming to: expand the knowledge base about the issues,

The broad questions on which UNESCO focuses are:

- How can one use ICT to accelerate progress towards education for all and throughout life?
- How can ICT bring about a better balance between equity and excellence in education?
- How can ICT help reconcile universality and local specificity of knowledge? and
- How can education prepare individuals and society to benefit from ICT that increasingly permeate all realms of life?

Several points must be borne in mind as one pursues these questions. First, ICT are only a part of a continuum of technologies, starting with chalk and books, all of which can support and enrich learning. Second, ICT, as any tools, must be considered as such, and used and adapted to serve educational goals. Third, many ethical and legal issues intervene in the

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Resources

- News Archives
- Documents/Publications
- Projects
- Websites

Features

- Education in and for the information society
- UNESCO ICT Competency Framework for Teachers
-  The UNESCO International Institute for Capacity Building in Africa (IICBA)

World Press Freedom Day

~~UNCLASSIFIED~~
~~CLASSIFIED~~

Freedom of information the Right to Know

World Press Freedom Day, Brisbane, Australia
3 May 2010.

- (Some) specialized journals:
 - British Journal of Educational Technology
 - Computers and Education
 - Educational Evaluation and Policy Analysis
 - Education and Information Technologies
 - Educational Technology and Society
 - Journal of Educational Research
 - Review of Educational Research



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