“Work done by our partners for increasing society’s commitment in ICT”

Dimitris Alimisis

School of Pedagogical &
Technological Education, Greece

ICT opens opportunities in many fields…

- Banking, health care, biotechnology, communications, entertainment and more are all fields that depend on the knowledge and skills that the discipline of ICT can offer
- This demand calls for greater emphasis on ICT subjects in education.
- Students need to be introduced to these topics earlier and in greater depth to generate further interest in these growing majors

"ICT is everywhere, except in schools" (OECD, 2008)

While experts are optimistic concerning the development of technology-enhanced learning opportunities…

…scepticism prevails concerning the ability of formal education systems and institutions to keep pace with change and become more flexible and dynamic

surveys of school students' attitudes to Science and Technology (i.e. TISME, The Targeted Initiative on Science and Mathematics Education 2012) witness declining interest and engagement in technological fields of study

"ICT is everywhere, except in schools"

For example in the field of **educational robotics**, as a result of school system deficiencies and rigidity…

Teachers witness that they felt as more convenient

- after-school classes
- or special in-school activities only for certain students

“ICT is everywhere, except in schools”

ICT is offered in a theoretical/”academic” way…

perceptions that ICT is hard, highly gender-biased (only for boys!) and not inviting for most students

"ICT is everywhere, except in schools"

Proposals for a roadmap by which ICT applications can enliven technology education and capture the interest of students

Movements like the so-called "**digital fabrication and making in education**" movement (Gershenfeld, 2007; Blikstein, 2013) have appeared aspiring (and working) to

- overcome bias inherit within the educational systems
- link the intellectual work in the classroom with students' experiences in 'making' and building things.

ICT in schools today do not support the 21st-century learning skills

the "Innovation Union" Flagship Initiative (2012) under Europe 2020 strategy:

- Promoting excellence in education and skills development
- recognizes that weaknesses remain with science and technology teaching;

the skills for future responsible innovators/researchers as well as for "science-active" citizens have to be built starting from early age including scientific reasoning, as well as transversal competences such as

- critical thinking,
- problem solving,
- creativity,
- teamwork
- communication skills

ICT in schools today do not support the 21st-century learning skills

calls for educational approaches that will foster creativity and inventiveness (e.g. Resnick, 2007; Blikstein, 2013)

- To succeed in today's "Creative Society" (Resnick, 2007) students must learn to think creatively, plan systematically, analyze critically, collaboratively, communicate clearly, design iteratively, and learn continuously.

Appropriate learning methodologies: Constructivism/Constructionism and Inquiry-based Science Education can strongly contribute to the development of these skills.

European Commission call (2011) for actions aimed to achieve the more widespread use of problem and inquiry-based science teaching in primary and secondary schools.

ICT in schools today do not support the 21st-century learning skills

most uses of technologies in schools today do not support the 21st century learning skills.

new technologies are simply reinforcing old ways of teaching and learning

Current typical school labs seem not appropriate for fostering critical thinking, problem solving, creativity, and teamwork and communication skills

Labs are architected for rigorous, disciplined, and scripted experiences in which students are guided usually through recipe-style guides towards the acquisition of predefined knowledge

ICT in schools today do not support the 21st-century learning skills

current societal developments call for a shift in ICT education from technical (or computer) skills towards computational thinking.

move from just learning to use computers to offer vocational skills for future ICT workers

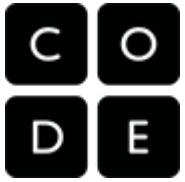
ICT has an important role to play:

- can provide essential skills necessary in the workplace of the 21st century
- equip new generations with a sound “technological literacy” for their better preparation for life in the “Creative Society”.

opportunities for all children

- Every student in every school should have the opportunity to learn computer science
- the joy and magic of programming to every child
- Coding is all around us – everything that works has some kind of “code” running behind it
- Teaching young people to code early on can help build skills and confidence and energize the classroom with learning-by-doing opportunities

Code.org



- non-profit foundation dedicated to growing computer science education
- To increase the representation of women and students of minoroties in the field of Computer Science
- Bringing Computer Science classes to school, especially in urban and rural neighborhoods

THE HOUR OF CODE IS COMING!

Recruit your school to learn computer science

- to inspire 10 million students to learn to code
- The **Hour of Code** is a one-hour introduction to computer programming, designed to help students easily understand how to code and show that anyone can learn. Students can participate in Hour of Code anytime during Computer Science Education Week (9-15 Dec, 2013)
- Computer Science Education Week (**CSEdWeek**) is an annual program dedicated to showing K-12 students the importance of computer science education

“Computing in the Core”

a non-partisan advocacy coalition of associations, corporations, scientific societies, and other non-profits seeking to elevate the national profile of computer science education in K-12 within the US and work toward ensuring that computer science is one of the core academic subjects in K-12 education.

Learning programming or coding skills is highly useful for children…

it teaches them to solve problems and improve their technical skills

"when you introduce a child to programming, in the process he/she's not just **learning to code**, but also **coding to learn**." (Mitchel Resnick)

Need for new and broader perspectives…

The way ICT is currently introduced in educational settings is unnecessarily narrow;

to address larger target groups of learners broader perspective projects are needed.

A wider range of possible ICT applications has the potential to engage young people with a wider range of interests.

we need to develop new and innovative ways to increase the attractiveness and learning profits of ICT courses

Strategies for engaging a broader range of learners in ICT…

Young people who are not interested in traditional approaches to ICT become motivated when learning activities are introduced as a way to tell a story or in connection with other disciplines and interest areas, such as music and art

Different students are attracted to different types of ICT activities

- projects focusing on themes, not just challenges;
- projects combining art and science;
- projects encouraging storytelling;

Programming For All Ages

- for kids 5+: Visual programming interface that weaves in music, stories and animation.
- Learn coding by looking at and tweaking the code behind the visual interface.
- 8-12 Years: Go beyond the play -- use visual programming languages like Scratch & Blockly to program
- 12+ Years: Write code -- for fun, and to build applications

Apps For Teaching Programming Skills To Children

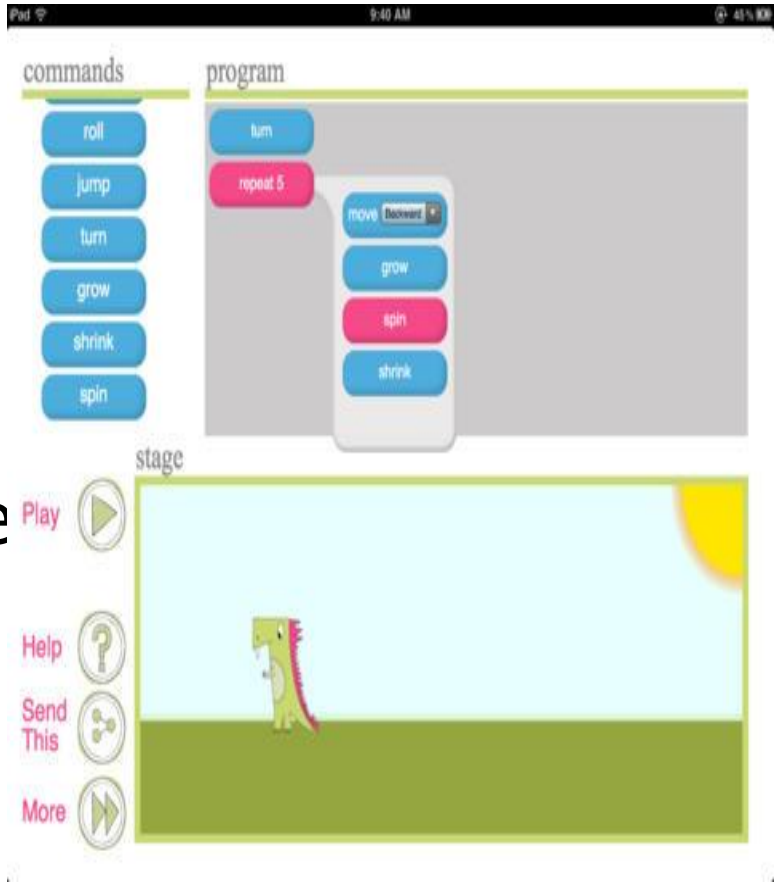
- understand the basics of thinking and planning to make things happen and create numerous applications such as interactive games
- don’t require any coding background or expertise
- iPad- iPhone- or web-based
- Low cost or free

Teaching children the basics of programming (yes, we do mean coding!)

- iPad-iPhone-based
- Logo programming language
- basic concepts of programming in a colorful graphic environment
- a free play "compose" mode

Daisy the Dinosaur

- iPad-iPhone-based
- Learn the basics of computer programming
- free, fun app
- easy drag and drop interface
- Kids intuitively grasp the basics of objects, sequencing, loops and events by solving challenges



Scratch

- a web-based MIT project
- for kids of ages 8 to 16 years
- kids create games, animations and interactive stories using drag-and-drop code blocks
- youngsters learn to think creatively and reason systematically

Scratch…

- a media-rich programming environment
- allows to easily create sophisticated computer programs by putting together visual programmable blocks, similar to LEGO pieces
- using a computer mouse instead of typing programming commands on a computer keyboard
- students shift from media consumers to media producers
- Students share their creations on the Web

Embodiment…

…in programming activities to make them more meaningful for children

Embodied experiences with programming can be realised when students physically move their own bodies and then program robots to perform a certain task

Learning develops from personal embodiment to embodiment through surrogate robots

Embodiment within computing seems a promising path for further research based on current theories of embodied cognition.

toolkit ‘Kinect2Scratch‘

- a bridge from the Microsoft depth-camera to Scratch
- making programming interesting by teaching Kinect game creation with the Scratch language

toolkit ‘Kinect2Scratch‘

- Focuses on creative coding and interactive art
- how to build the next generation of natural user interfaces

Programming Robots…

- abstract subjects come to life
- helping teachers to easily demonstrate abstract concepts in real life.
- inspiring students to be the next generation of makers, discoverers, and innovators
- You don’t need to be experienced with robotics or have a degree in computer science, just an enthusiasm for your subject area!

Our relevant projects…

- Teacher education in LOGO/SCRATCH
- Teacher education in robotics
- Bringing Scratch in school classes
- Robotics courses for children
- Using robotics to teach programming concepts in pilot classes
- Robotics exhibitions/competitions for children/teenagers

Is ICT education offering what promises?

the impact needs to be validated through research evidence

Research needs to prove if more children become interested in ICT or develop significantly better cognitive or social skills.

impact on students' further educational career?

Validation difficulties…

Students developing their projects or problem solving takes usually diverse and unpredictable paths making difficult for evaluators to follow students' progress.

- Need for proper monitoring tools/environments based on data coming from the under evaluation learning situation.
- Data mining methods with authentic data to prove sstudents' progress

Conclusions / suggestions…

- ICT has much potential to offer in education
- benefits are not guaranteed for students just by the simple introduction of ICT in the classroom
- technology alone cannot affect minds
- a need for rethinking our approaches in ICT Education
- Proper educational philosophy, namely constructivism/constructionism, curriculum and learning environment are some of the important elements that can lead ICT education to success
- Shifting focus from technology towards partnership with learning theories putting the emphasis on the curriculum than on the technology
- The curriculum is the keystone in ICT education
- qualitative and quantitative performance metrics for expected outcomes and for validation of learning benefits

Conclusions

- Broader perspective projects to foster creativity skills for all the children, no matter their school orientation or gender
- Different strategies for introducing students to ICT and concepts to provide multiple pathways into ICT and to ensure entry points to engage young people with diverse interests and learning styles
- validation should be based on a system of indicators and a standardized evaluation methodology for clearly measured and defined benefits.


ICT in schools
ICT in universities
ICT careers

ICT in schools

ICT in universities

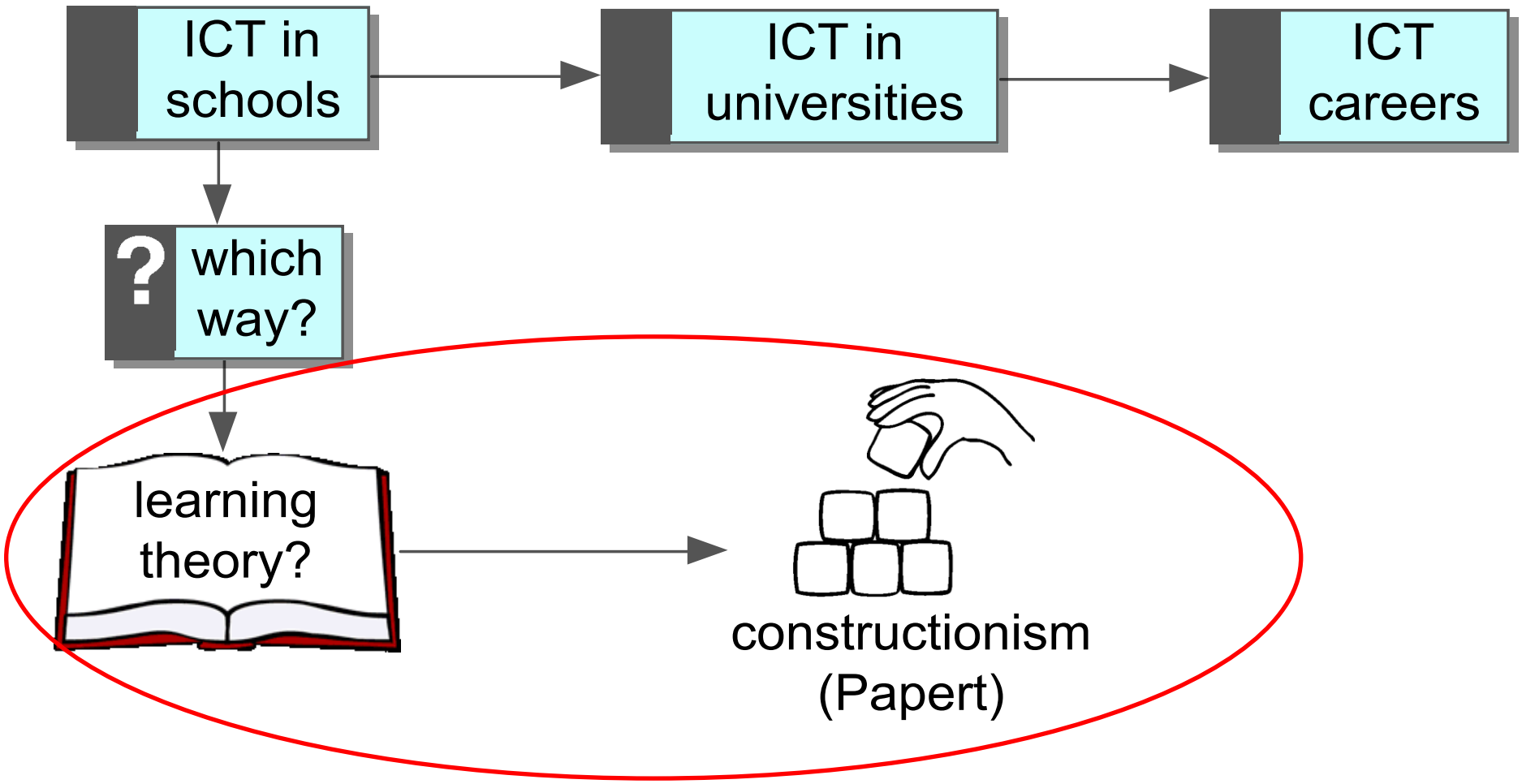
ICT careers

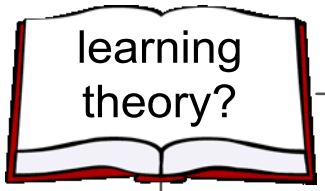
which way?

learning theory?

curriculum?

tools?


ICT in schools
ICT in universities
ICT careers
? which way?
learning theory?
constructionism (Papert)



constructionism
(Papert)

project-based
learning

curriculum?

problem-
solving

enquiry-
base
learning

From Workplan

05.2013 - 06.2015: Small-scale short-term studies to collect additional evidences about different interventions and approaches for developing and improving the conception for affecting students' ICT-related attitudes, knowledge, and skills

- i-pad/i-phones – based coding
- visual programming to control robots
- Scratch + kinect (embodiment!)

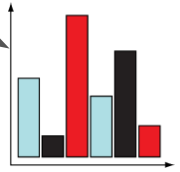
curriculum?

tools?

robotics

courses for teachers

teaching programming concepts in pilot classes

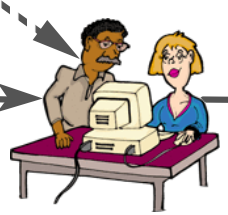


Validation

SCRATCH

imagine • program • share

Scratch + Kinect



courses for teachers

teaching programming concepts in pilot classes

curriculum?

tools?

i-pad/i-phones – based coding apps

robotics

SCRATCH

imagine • program • share

Scratch + Kinect

courses for teachers

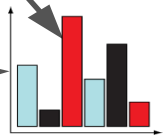
courses for teachers

courses for teachers

programming in pilot classes

programming in pilot classes

programming in pilot



Validation

Realisation…

Projects

1. Mobile programming
2. programming robots
3. Scratch + kinect

Actions…

- Teacher training course
- Teachers-Participants implement the activities in one school class
- Validation based on data from school classes