



Digital Technologies for Opening Up Education

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... the speaker ...

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- **Co-Editor-in-Chief**, Educational Technology and Society Journal
- **Steering Committee Member**, IEEE Transactions on Learning Technologies
- **Past Chair**, IEEE Computer Society Technical Committee on Learning Technology (2008-2012)
- **Senior and Golden Core Member**, IEEE Computer Society
- **IEEE Computer Society Distinguished Service Award**, July 2012
- Co-author of **325 publications** with at list **1430 citations (h-index:21)**
- Received **7 times Best Paper Awards** in International Conferences on Learning Technologies
- **Guest Editor** of **26 Special Issues** in International Journals
- **Member of Editorial Board**, **22** International Journals in Learning Technologies
- **Keynote/Invited Speaker** on **56** International and/or National Conferences in Learning Technologies
- **General** and/or **Program Committee Chair** in **35** International Conferences in Learning Technologies
- **Program Committee Member** in **356** International and/or National Conferences in Learning Technologies
- Project Director, Principle Investigator and/or Consultant in **65 research projects** with external funding **14M Euro** (1991-2016)



overview

- **Digital Technologies for Learning and Education**
 - When ? Why ? How ? Which ?
- **Key Technology-supported Educational Innovations**
 - Opening Up Education to facilitate Personalized Learning
 - Connecting Learning inside/outside Physical Classrooms through the Digital Cloud
- **Examples of European and Global Initiatives towards Large-Scale Implementation of Technology-supported Educational Innovations**
 - Europe: ODS – ISE
 - The World: China – ALECSO - India
- **Current Technical, Pedagogical and Organizational Challenges**
 - Smart Integration of Physical Learning Spaces and the Digital Cloud



Digital Technologies for Learning and Education

When ? Why ? How ? Which ?



Digital Technologies:

- technology as an enabler for *transformations*
- use to provide *learning experiences* that would not possible without the digital technologies

Advance personalized learning - Engineering Challenges - Windows Internet Explorer

http://www.engineeringchallenges.org/cms/8996/9127.aspx

File Edit View Favorites Tools Help

Advance personalized learning - Engineering Challenges

LOWGRAPHICS | HOME

NATIONAL ACADEMY OF ENGINEERING
OF THE NATIONAL ACADEMIES

CHALLENGES IDEAS NEXT STEPS COMMITTEE

DEVELOP CARBON SEQUESTRATION METHODS MANAGE THE NITROGEN CYCLE PROVIDE ACCESS TO CLEAN WATER RESTORE AND IMPROVE URBAN INFRASTRUCTURE ADVANCE HEALTH INFORMATICS

GRAND CHALLENGES FOR ENGINEERING

Grand Challenges

- Introduction
- Make solar energy economical
- Provide energy from fusion
- Develop carbon sequestration methods
- Manage the nitrogen cycle
- Provide access to clean water
- Restore and improve urban infrastructure
- Advance health informatics
- Engineer better medicines
- Reverse-engineer the brain
- Prevent nuclear terror
- Secure cyberspace
- Enhance virtual reality


Advance personalized learning

How will you use technology to learn?

Home > Grand Challenges > Advance personalized learning

Advance personalized learning

Instruction can be individualized based on learning styles, speeds, and interests to make learning more reliable.




For years, researchers have debated whether phonics or whole-word recognition is the best way to teach children how to read. Various experts can be found who will advocate one approach or the other.

Ask an astute first-grade teacher, though, and the answer is likely to be that it depends on the kid. Some pupils respond more favorably to the whole-word approach; others learn faster with phonics. Young brains (and older brains, for that matter) are not all alike. Learning is personal.

VIDEO

Engineering will contribute to our joy of living.



WHAT DO YOU THINK? Do you use tech to learn?

<http://www.engineeringchallenges.org/cms/8996/9127.aspx>



«*personalized learning*»

teaching – scaffolding - feedback

(«*learning experiences*»)

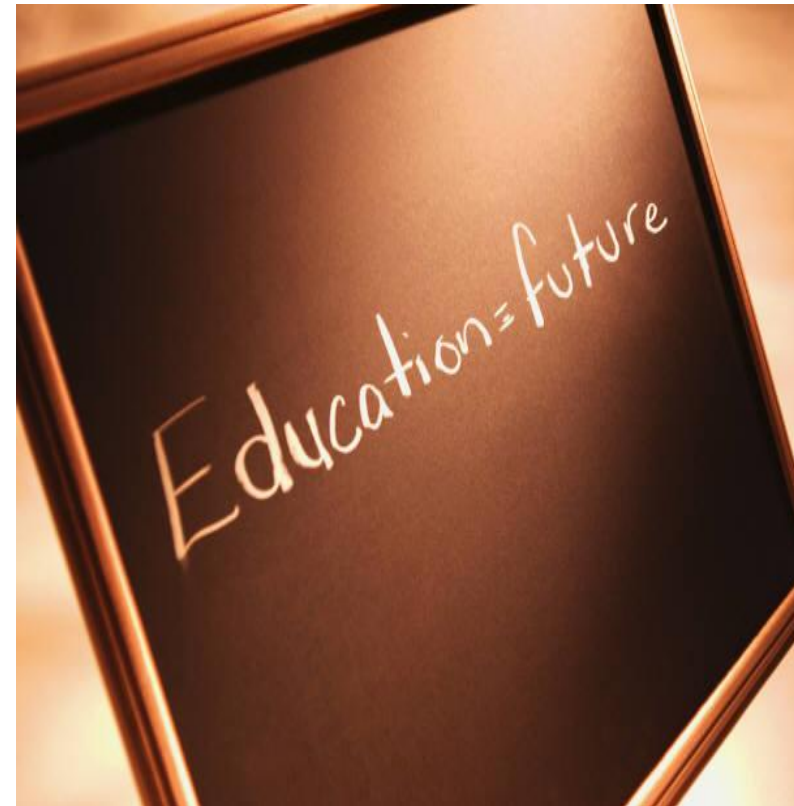
adopted to

individual students



Digital Technologies for Learning and Education

why ?





Digital Technologies as an enabler for
*incremental or disruptive **transformations***
to the way that individuals, groups and organizations
“learn” and the way to *“**assess**”* learning in 21st Century

Objectives: From acquiring new *“knowledge”* to develop new and relevant *“competences”*

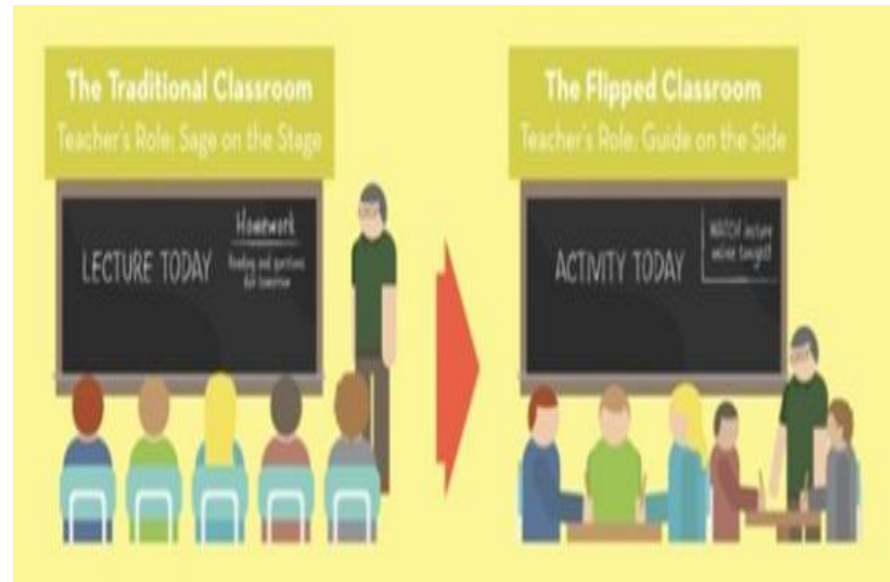
Methods: From *“classroom”* based teaching to *“context-aware”* personalized learning

Assessment: From *“life-long”* degrees and certifications to *“on-demand”* and *“in-context”* accreditation of qualifications



Digital Technologies for Learning and Education

how ?





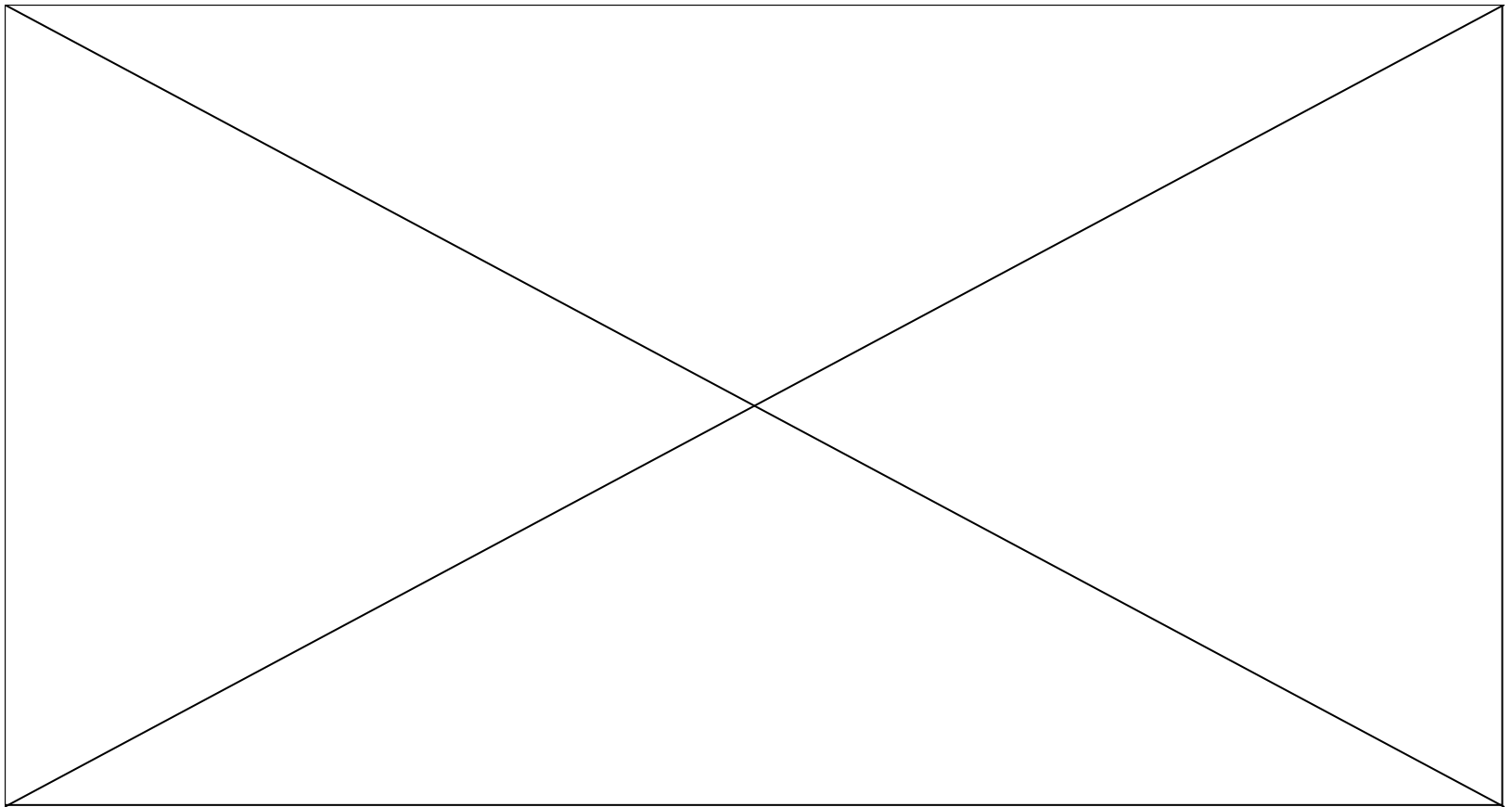
The Flipped Classroom





The Flipped Classroom

<http://www.youtube.com/watch?v=ojiebVw800g>





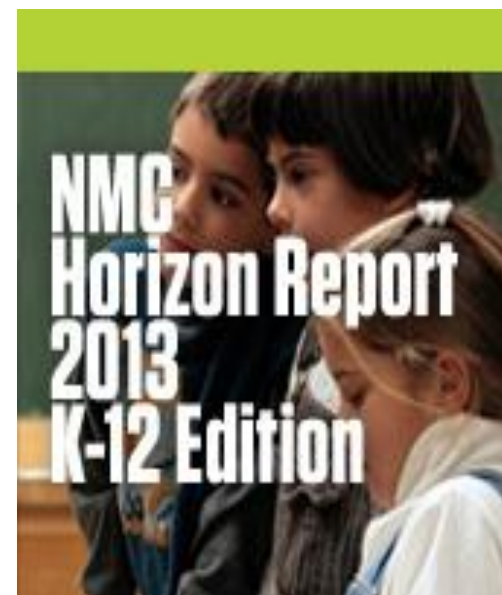
Digital Technologies for Learning and Education

which ?





- **open access** to
 - digital resources/practices
 - digital tools
 - digital courses/classrooms
- via **multiple devices**
 - smart phones – tablets - laptops
 - game engines
- supported by
 - **cloud** technologies and **cloud** infrastructure





Opening Up Education



Open Educational Resources (OERs)



OPEN EDUCATIONAL RESOURCES



OER or LOs Repositories

- web-based systems that
 - organize, classify, store and share OERs (or Learning Objects – LOs) and their associated metadata
- national – thematic
- include **limited explicit information** about the **learning and educational context of use** of their hosted OER



ASK *Advanced Digital Systems and Services for Education and Learning (ASK)*

OER Repositories Examples

OER Commons
Multimedia Educational Resource for Learning and Teaching

Home | Communities | Learning Materials | Member Directory | My Profile | About Us

Put your reviewed online learning and learning resources. Share advice and expertise about education with target colleagues. Be recognized for your contributions to quality education.

28,092 materials, 1,481 new materials, 34,566 members, 785 new members

OER Commons, USA

MERLOT
Multimedia Educational Resource for Learning and Teaching

Home | Communities | Learning Materials | Member Directory | My Profile | About Us

Put your reviewed online learning and learning resources. Share advice and expertise about education with target colleagues. Be recognized for your contributions to quality education.

28,092 materials, 1,481 new materials, 34,566 members, 785 new members

MERLOT, USA

Learning Resource Exchange

Find resources | Highlighted resources | Log in

3,325 Learning Resource Exchange

ABOUT | HOW TO | USING LEARNING RESOURCES | TECHNICAL DOCUMENTATION | LINKS

Learning Resource Exchange, EU

The Learning Federation
Schools Online Curriculum Content Initiative

Home | About us | Contact us | Search | Sitemap | Page | TLF Groups

For jurisdictions: Planning, reports and research; Resource development process; Content management and distribution

For teachers: Monitor, collaborate and learn; Remote curriculum content; Catalogue; Access information; Software and hardware requirements

For developers, partners & publishers: Promote and support; Learn about our technology; Collaborate with us; License our content; Standards and specifications

Hot topic: Celebrate milestones

What's new: Find out what's new

Latest news: DataDenia awarded first website by AOTA

The Learning Federation, Australia

Jorum
Learning to Share

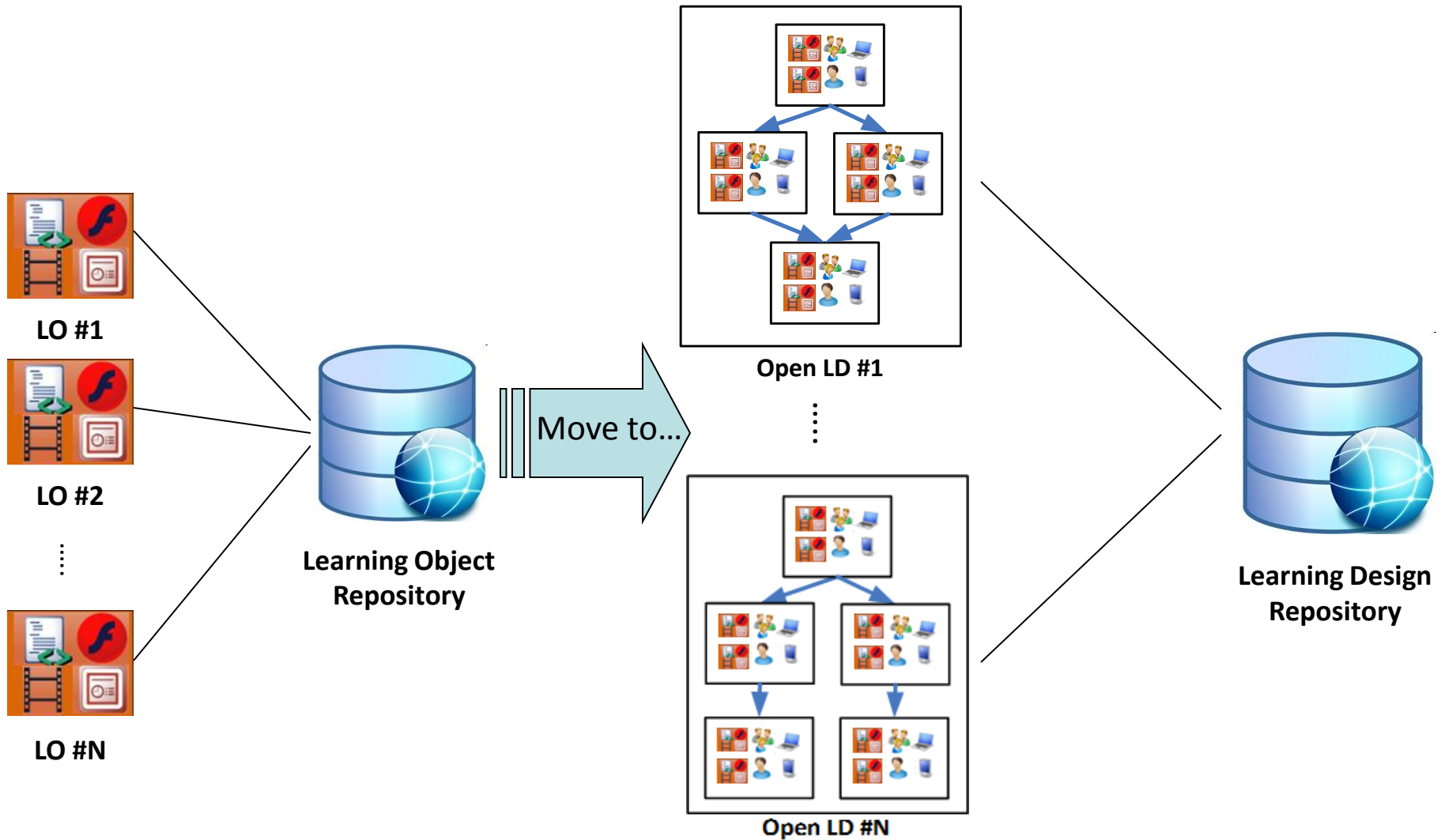
Home | Find | Share | Discuss | News | Help

Featured Resources: Bound investment; Period when there is plenty of data/information available on which to base decisions, but little chance to exercise influence

Learning to share: Find (Find thousands of resources from a wide variety of subject areas); Share (Share your learning and teaching resources with the Jorum community); Discuss (Discuss your experiences of using digital resources in your teaching, as well as advice on things to consider when creating learning and teaching materials to be shared)

Jorum, UK

From OERs to Open Educational Practices (OEPs) and OEP Repositories





ASK *Advanced Digital Systems and Services for Education and Learning (ASK)*

OEP Repositories

The Canadian LD Repository, Canada

LAMS Repository, Australia

iCOPER LD Repository, EU

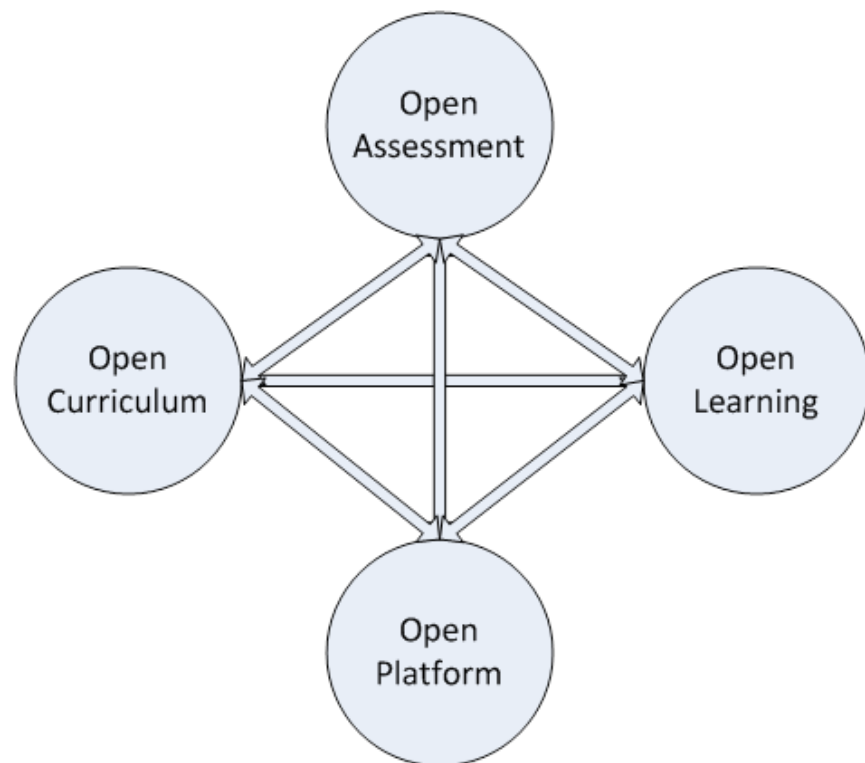
OSR LD Repository

COSMOS LD Repository, EU



Opening Up Education - Aspects of Openness

- **Open Curriculum:** learners can mix educational resources, learning activities, and/or educational courses for different disciplines to meet their needs. This places learners in charge of their own learning and ensures that they will learn what they need to meet their personal desires and requirements.
- **Open Learning:** teachers, experts and/or peers can share new ideas and new understanding during the learning process. This provides learners with opportunities for self-determined and independent learning.
- **Open Assessment:** instead of formal evaluation of learning results, previously led by accredited education providers, assessment of what learners have learned can be carried out by their teachers, others and peers during the learning process via peer to peer or crowd-sourced assessment with on-demand accreditation for learners.
- **Open Platform:** cloud-based provision and the use of open standards make it easier for different platforms and services to exchange information and data



European Commission (2011). Public consultation on opening up education - a proposal for a European initiative. Directorate-General for Education for Culture. Retrieved December 12, 2013, from http://ec.europa.eu/dgs/education_culture/documents/consult/open_en.pdf



From the Physical School Classroom to the Digital Cloud



Connecting Learning inside/outside Physical Classrooms through the Digital Cloud

- connect

Within Classroom-based activities	Outside Classroom-based activities	
	Within School	Outside School
via Cloud Digital Technologies		

- sharing

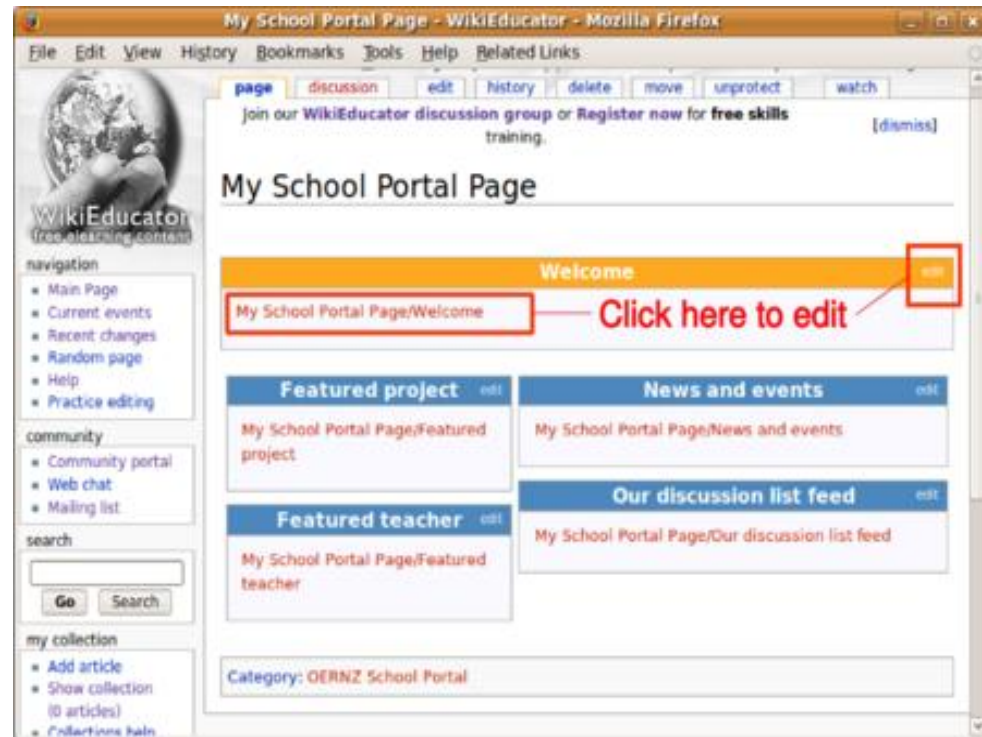
People		
Resources	Practices	Tools/Services
Interaction Data		



On School Premises

School Portal/CMS

- Schools use their own technology infrastructure for hosting their portals/CMSs
- Schools portals/CMSs based on open source solutions or custom-based solutions (possibly with an extra cost)

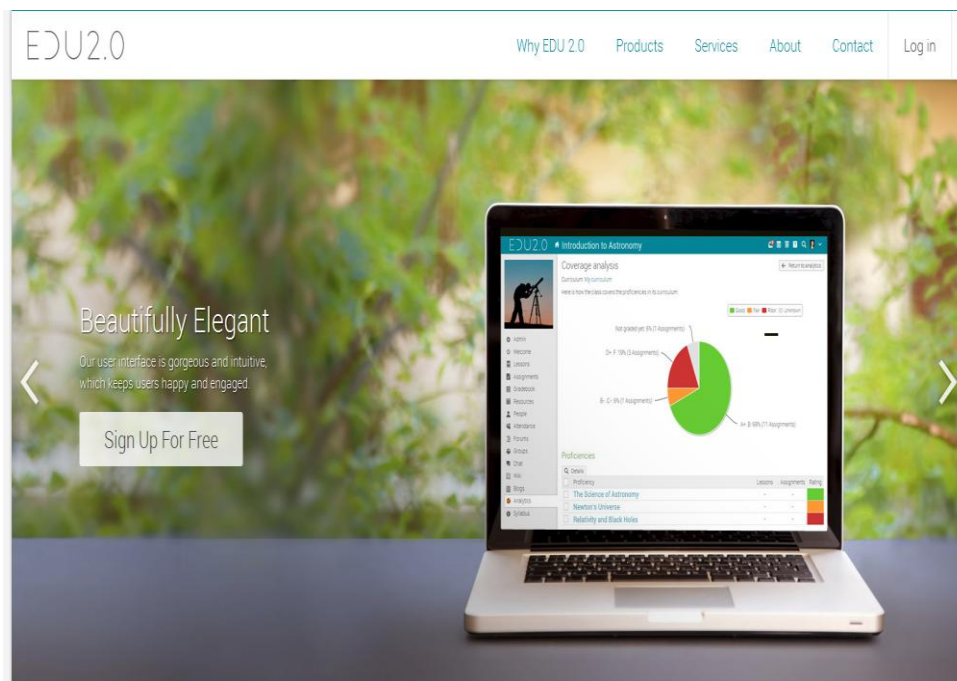




On Digital Cloud

School Portal/CMS as SaaS

- Cloud infrastructures, which offer (a) hosting power, (b) computing power
- Each school can easily create its own portal/CMS – Software as a Service (SaaS)
- No need for (a) programming skills and (b) cost for technology infrastructure procurement and maintenance





On School Premises

Teachers' Communities

- They are not easily organized
- Best practices can not be easily communicated among their members
- Collective knowledge not easily stored and maintained
- Local coverage
- Limited opportunities for professional development





On Digital Cloud

Web-Based Teachers' Communities

- Online collaboration tools such as Forums, Chats, Wikis, Virtual Worlds for retaining and advancing communities' knowledge
- Share and reuse educational practices (Open LDs) and educational resources (OERs)
- Beyond local restrictions, wider participation
- More opportunities for professional development





On School Premises

Physical Laboratories

- Space and time constraints
- Limited type of experiments
- Accessibility issues
- High equipment procurement and maintenance costs
- Safety issues





On Digital Cloud

Online Laboratories (Virtual, Remote)

- Availability beyond time and space constraints
- Access to state-of-art experiments (high energy physics, remote telescopes)
- Provisions for people with physical disabilities
- No cost for equipment
- Simulate abnormal situations of experiments (virtual labs)
- Repeat experiments without constraints





Large-Scale Implementation of Technology-supported Educational Innovations: Initiatives in-progress



In Europe



Open Discovery Space (ODS) Project

<http://www.opendiscoveryspace.eu/>

- **Open Discovery Space** - *A socially-powered and multilingual open learning infrastructure to boost the adoption of e-Learning Resources*
- to support mainstreaming by orchestrating open access to more than **1,5M OERs/OEPs** from **75** active existing LORs/LDRs in Europe
- **15,3M€** (*public and private*) investment
- Started April 2012

The screenshot shows the Open Discovery Space website interface. At the top, there are navigation links: Home, Project, Blog, Documentation, Events, Affiliated Partners, Community, and Contact. Below this, there are four main categories represented by colorful boxes with cartoon characters: CONTENT PROVIDERS (red), PARENTS (orange), POLICY MAKERS (dark blue), and TEACHERS (yellow). A 'Welcome to Open Discovery Space' message is displayed below these categories. A video player is visible, showing a man speaking into a microphone. To the left, there is a 'Latest Tweets' section with a Twitter logo and two tweets: one from @ods_eu about the LINQ 2014 deadline and another from @citadel_eu about apps for dummies.



ODS Portal

<http://portal.opendiscoveryspace.eu/>

- Search/Share OERs/OEPs on the Cloud with a wide network of teachers and practitioners
- Create/participate to Teachers' Communities (national, thematic) – Access to a number of online collaboration tools
- Develop my own School Portal on the Cloud and share my school resources (OERs/OEPs)

The screenshot shows the ODS Portal interface. At the top, there is a search bar and navigation links for 'About Us', 'English', 'Login', and 'Register'. Below the search bar, there are tabs for 'Communities', 'Users', and 'Do you need support?'. The main content area features a map of Europe with several red location pins. To the right of the map, there are sections for 'Schools' and 'Events', with a list of events including 'ODS PR-Workshop' and 'ΣΕΜΙΝΑΡΙΟ ΔΙΔΑΚΤΙΚΗΣ ΤΗΣ ΦΥΣΙΚΗΣ: 1) Παρουσίαση έργου Open Discovery...'. Below the map, there are three columns of statistics: 'Resources' (661770 Total Resources Available), 'People' (1684 Connected Teachers), and 'Communities' (262 Teacher Communities). Each column also lists featured resources, top contributors, and top communities.

ODS Portal

<http://portal.opendiscoveryspace.eu/>

The screenshot shows the ODS Portal interface. At the top left is the logo for 'OPEN DISCOVERY SPACE'. To the right, there are links for 'Panagiotis Zervas', 'About Us', 'English', and 'Logout'. Below this is the tagline '"A community for Teachers by Teachers"'. A search bar is present, followed by navigation links: 'Communities', 'Users', 'Do you need support?', 'My Area', and an email icon. The main content area shows the school's profile for '2nd Primary School of Agios Nikolaos, Lassithi, Crete', including a profile picture, a 'Join' button, and a 'Share this' button. Below the profile, there is text in Greek: '2ο Ολοήμερο Δημοτικό Σχολείο Αγίου Νικολάου Λασιθίου (ΕΑΕΠ)' and 'This is a schools community of 2nd Primary School of Agios Nikolaos, Lassithi, Crete'. There are also links for 'Parent Community' and 'Πρόγραμμα για τη Σχολική Καινοτομία'. At the bottom, there are three icons representing 'Educational Content', 'Lesson Plans', and 'Learning Scenarios'. Below these are three more icons representing 'GROUPS', 'ACTIVITIES', and 'EVENTS'.

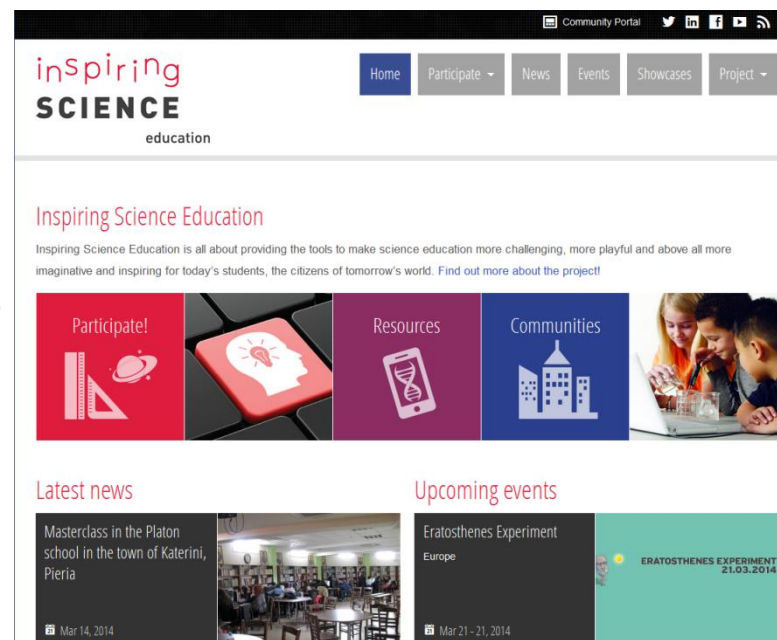
Develop my own School Portal on the Cloud and share my school resources (OERs and Open LDs)



Inspiring Science Education (ISE) Project

<http://inspiring-science-education.org/>

- **Inspiring Science - Large Scale**
Experimentation Scenarios to Mainstream eLearning in Science, Mathematics and Technology in Primary and Secondary Schools
- large-scale pilots to stimulate innovative use of cloud-based tools and resources for STEM
- Target users: **5,000 primary and secondary schools** in 15 European Counties.
- **9,8M€** (public and private) investment
- Started April 2013





ISE Portal

<http://portal.opendiscoveryspace.eu/beta/ise>

- **Design** Lessons/Scenarios by using existing resources and tools (such as online labs, AR/VR tools) and store them on the cloud
- **Deliver** Lessons/Scenarios to students.
- Collect **Educational Data** for student assessment

The screenshot shows the 'inspiring SCIENCE education' website. At the top, there is a search bar and navigation links for 'Communities', 'Users', and 'Do you need support?'. Below the search bar is a map of Europe with red location pins over Italy and Greece. To the right of the map, there are news items such as 'Erastosthenes Experiment' and 'Εικονική επίσκεψη 5 ελληνικών σχολείων στο CERN'. At the bottom, there are three columns of statistics: 'Communities' (19 Teacher Communities), 'People' (64 Connected Teachers), and 'Resources' (84571 Total Resources Available).

ISE Portal

<http://portal.opendiscovery.space.eu/beta/ise>

inspiring **SCIENCE** education

Lessons / Scenarios Educational Material

Alexandros Trichos

Create new Lesson

Create new Lesson - Step 2 of 6

1 Language(s) 2 General Info 3 Learning Context 4 Subject Domain 5 Additional Information 6 Confirmation

General Info

Title*

Provide Title

Short Description


Provide short description

Keyword(s)

Provide Keyword(s)

Status Draft

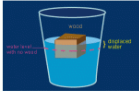
Space



Mechatronic experiment

Students can experiment with motion control through the manipulation of an electromotor.

Space



Sinking or floating?

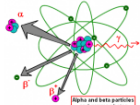
In science, buoyancy is an upward force exerted by a fluid that opposes the weight of an...

App

Drop files to upload

This app allows students to upload files to the ILS. For instance, students can upload their assignments and reports...


Lab



Radioactivity lab

The Radioactivity Lab examines the intensity of radiation over distance, demonstrating the effects of the inverse...

Lab



Splash: virtual buoyancy laboratory

In Splash students can create objects from object properties like mass, volume, and density, and drop these objects...

App

Sysquake Mobile

Matlab in a Google Gadget!

Design Lessons/Scenarios by using existing resources and tools on the cloud (such as online labs, AR/VR tools)

ISE Portal

<http://portal.opendiscoveryspace.eu/beta/ise>

The screenshot displays the ISE Portal interface. At the top, there is a navigation bar with the 'iS_e' logo, a font size selector (Aa), a help icon (?), a search icon (magnifying glass), and a language selector (ENG). Below the navigation bar, the main content area is titled 'THE UNIVERSE' and features a progress indicator 'A+'. The interface is divided into several stages: QUESTION, INVESTIGATION, EXPLANATION, TRANSFER OF EXPLANATION (highlighted in blue), REFLECTION, and ASSESSMENT. Under the 'TRANSFER OF EXPLANATION' stage, there are two steps. 'STEP 1' includes a video player showing a space scene with a green play button and a text block titled 'The Universe' containing placeholder text. 'STEP 2' is titled 'The Big Bang Theory' and includes a video player. At the bottom of the interface, there are 'BACK' and 'NEXT' navigation buttons.

Deliver lessons/scenarios to your students and monitor their progress



Elsewhere in the World



INDIA

- Built a **School in the Cloud** Initiative (based on Self-Organised Learning Environment, SOLE), Prof Sugata Mitra

CHINA

- Ministry of Education National Program on Application of e-Learning in the Social Computing Environment: e-Textbook and e-Schoolbag Initiatives

ARAB League Educational, Cultural and Scientific Organization (ALECSO)

- Cloud Computing Services in Education and Arab Open Educational Resources



Technical – Pedagogical – Organizational Challenges



Different Levels of Technology-Supported Educational Innovations

- **Level 1:** simple technological shift from local hosting to the cloud – practical added-value but not transformative [Infrastructure]
- **Level 2:** enhance classroom based activities with access to a wider set of resources/tools – incremental school based innovation [Resources – Teachers Competences]
- **Level 3:** orchestrate personalized learning experiences inside but mainly outside the school classroom – transformative innovation [Educational Policies and Organizational Changes]



Smart integration of *Physical Learning Spaces and the Digital Cloud*

- connect

Within Classroom-based activities	Outside Classroom-based activities	
	Within School	Outside School
via Cloud Technologies		

- sharing

People		
Resources	Practices	Tools/Services
Interaction Data		



Smart integration of *Physical Learning Spaces* and the *Digital Cloud*

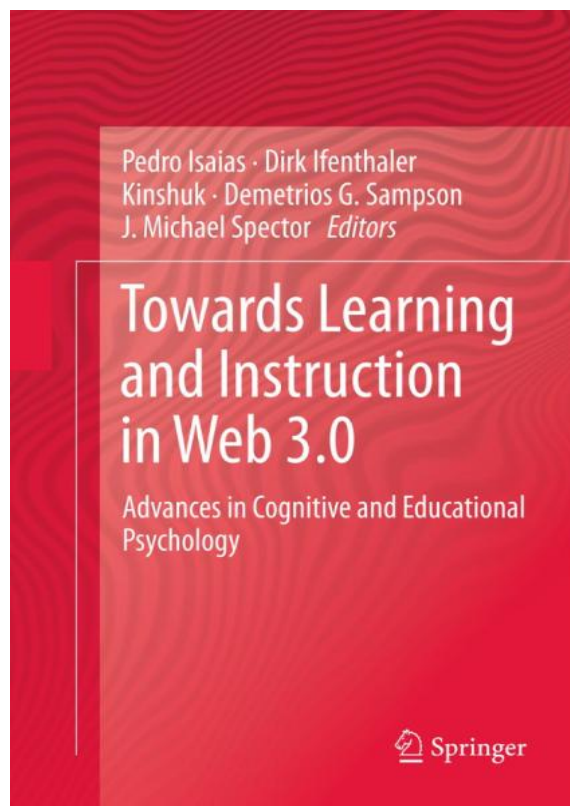
Methods and Tools

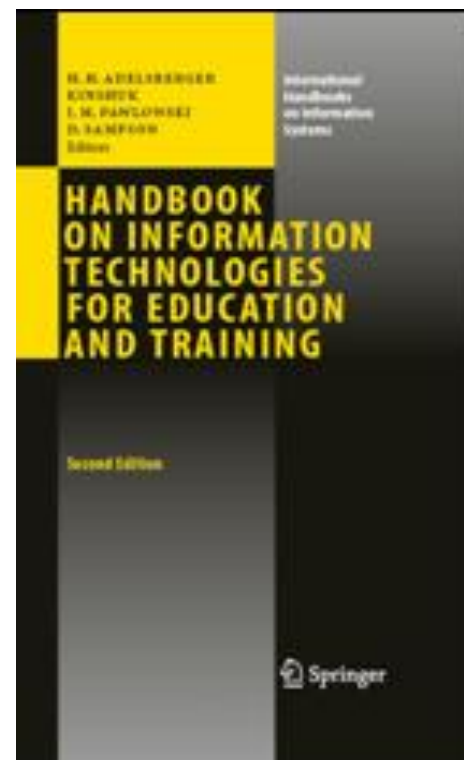
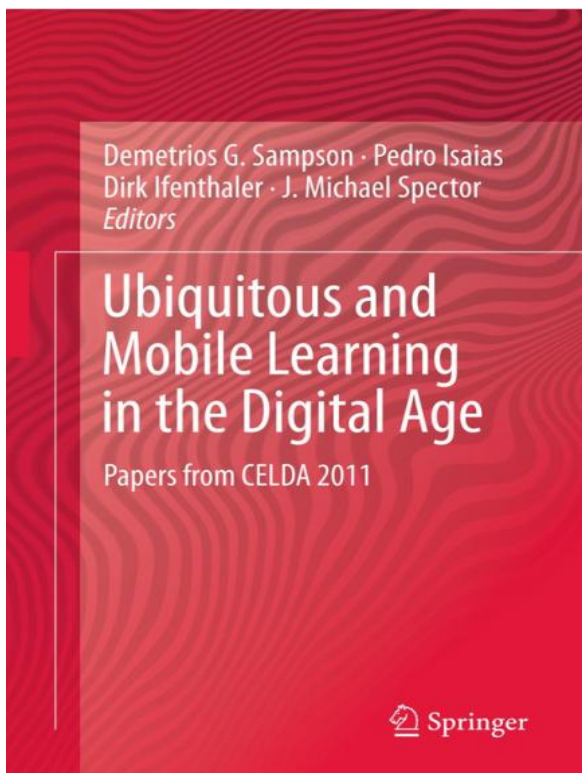
- **Orchestrate Educational Activities** (teaching – collaboration - scaffolding - feedback – assessment)
- **Collect and Analyze** Educationally Meaningful **Data** from all these activities
- In a **Smart Learning Environments** which integrate *Physical Learning Spaces* and the *Digital Cloud*



ICALT2014: The 14th IEEE International Conference on Advanced Learning Technologies - *Advanced Technologies for Supporting Open Access to Formal and Informal Learning*
7-10 July 2014 Athens, Greece

225 papers – 300 participants – 40 countries
<http://www.ask4research.info/icalt/2014/>







... stay in contact ...

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