ADB Knowledge Sharing Program on ICT in Education

(11 November, 2016)

Shaping the Future of Education with Technology

- Comparison of Korea and Singapore for ICT in Education -

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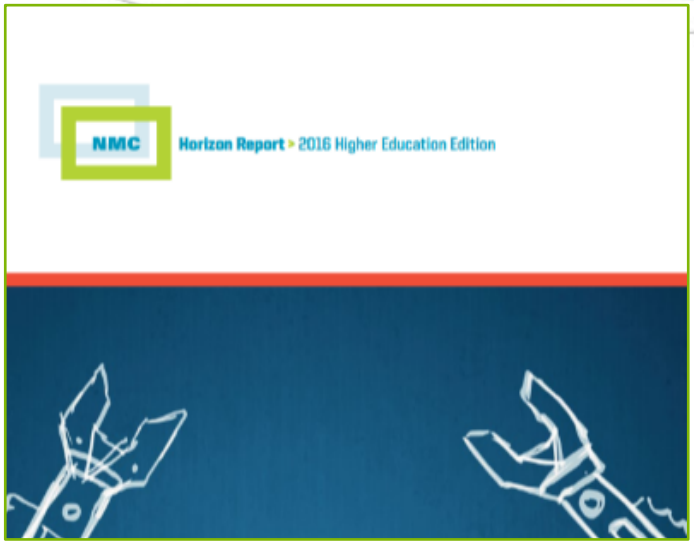
Overview

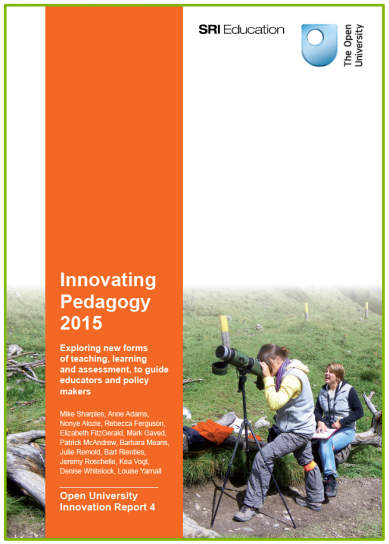
- The Future of Education
  - Theoretical perspectives
- Designing Future Schools
- Future Education Initiatives in Korea & Singapore
  - Policy plan and strategies
- Grand Challenges in Future Education
- Questions & Discussions

Artificial Intelligence

Future Education & Technology



http://www.nmc.org/nmc-horizon/



http://www.open.ac.uk/blogs/innovating/

Predicting the Adoption Horizon

- NMC Horizon Report 2016 http://www.nmc.org/publication-type/horizon-report/

K-12

1 year or less	2-3 years	4-5 years
Makerspaces Online Learning	VR Robotics	Artificial Intelligence Wearable Technology

Higher Education

1 year or less	2-3 years	4-5 years
BYOD Learning Analytics	AR/VR Makerspaces	Affective Computing Robotics

What is the image of the school that you want ?

Do you think schools would exist after 50 years later?


LIFE

Orestad College in Denmark

School of the Future (SoF) in Philadelphia, US

School of Science & Technology in Singapore

What are the commonalities in these schools?

“Paradigm Shift”

Future schools necessitate more than fancy buildings and sophisticated technologies.

We need to revisit our assumptions about

What is learning
What are the roles of schools, teachers, and students

1. The Future of Education

Theoretical Perspectives

The "Paradox" of Future Schools

What is "**Future**" in Future Schools?

- Tensions in two types of discourse

"Surface Resemblance" **"Utopian Thinking"**

The "Paradox" of Future Schools

- High resemblance between the present and the future
  - "it (futuristic education) deals in surface resemblances: Imagine what the future will look like on the surface; then make education mimic that surface" (Bereiter, 2002, p.224).
- Utopian Thinking
  - When our discourse of future schools becomes too idealistic

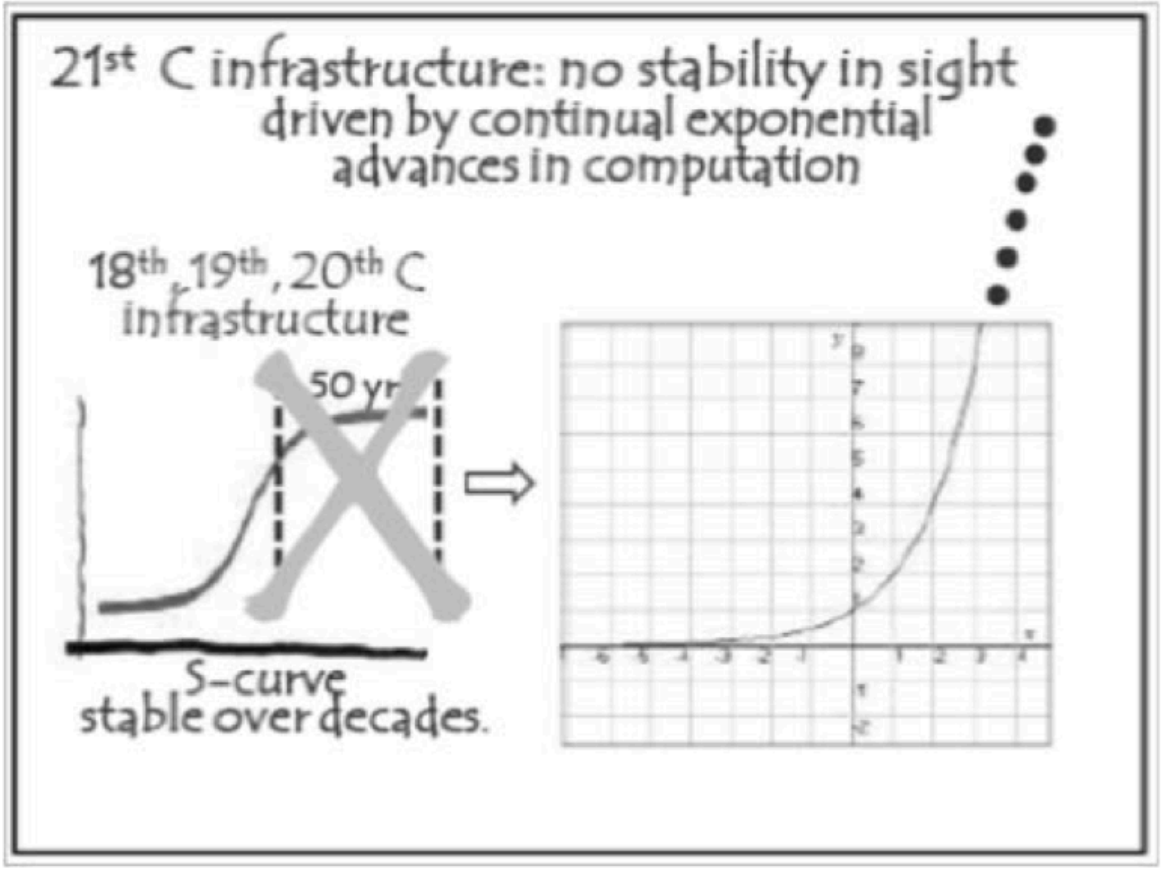
Surface-level change

Facets of Future Schools: Historical Legacy and Disposition

- The classroom of the present is a "genealogical" object that reflects its historical predecessors.
- Comparison of the Three Eras of Education (Collins & Halverson, 2009)

	1st era: Apprenticeship	2nd era: Universal Schooling	3rd era: Lifelong Learning
Responsibility	Parents	The Sate	Individuals and Parents
Expectations	Social reproduction	Success for all	Individual choice
Content	Practical skills	Disciplinary knowledge	Learning how to learn
Pedagogy	Apprenticeship	Didacticism	Interaction

The Big Shift

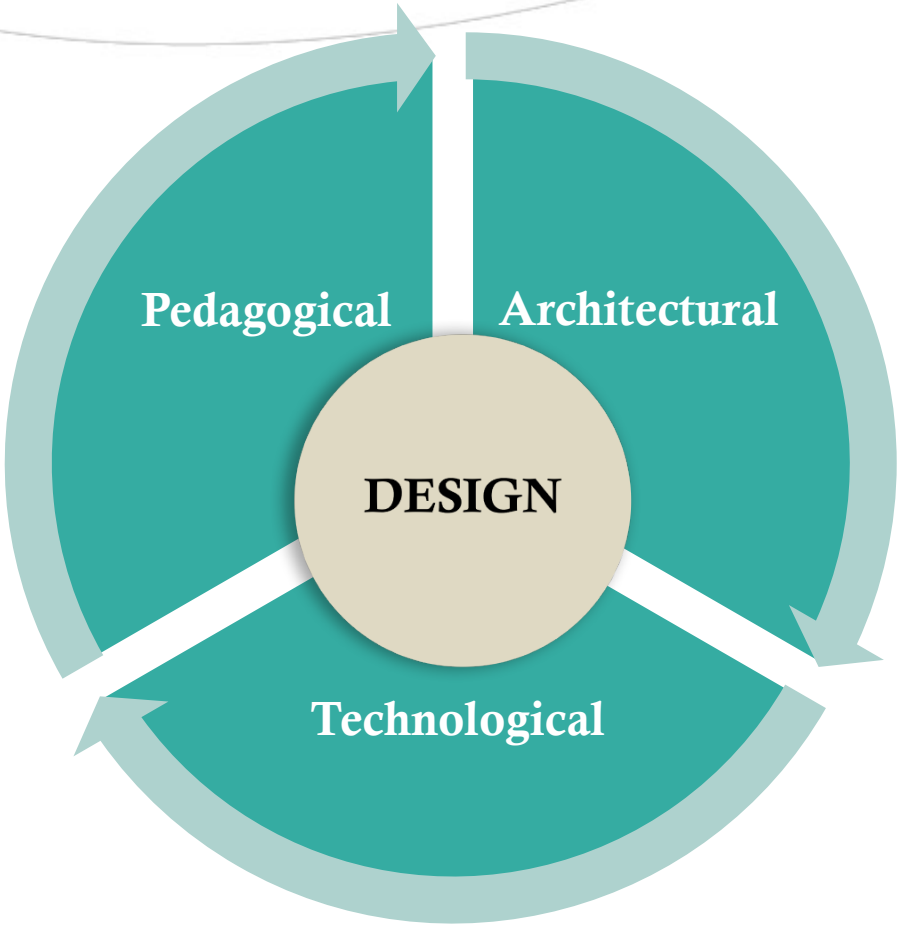


"adaptive expert"

John Seely Brown (2012) "Learning in and for the 21st Century"

Designing Future Schools

Designing Future Schools



Architectural Design

- "even the best technological or pedagogical ideas cannot be used to their full effect if they are not architecturally integrated into the classroom" (Schratzenstaller,2010, p.35).

- "High relationships" between architectural (spatial) design and types of discourse/interaction patterns


TECHNOLOGY ENHANCED LEARNING
Classroom of the Future
Orchestrating Collaborative Spaces
Kati Mäkitalo-Siegl, Jan Zottmann,
Frederic Kaplan and Frank Fischer (Eds.)
SensePublishers


FORGING EXCELLENCE
www.sstedu.sg
MATHS
PHTAM
cad room
multi purpose
multi purpose

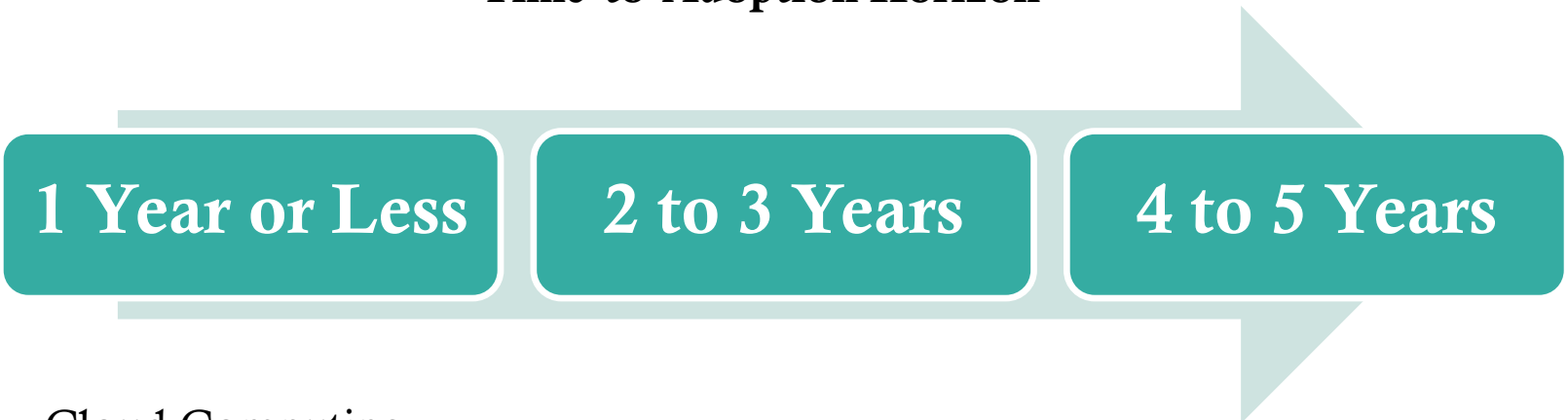
Technological Design

- Arrangement and utilization of technological tools and artifacts, both physical and virtual
- Problems of technology integration in schools
  - Inherent "incompatibility" between schools and technology (Collins & Halverson, 2009)
    - A culture of teaching: "stability"
    - Technology integration often requires dramatic changes to the stable structure

Technology in Future Education

2013 Horizon Report - K-12 Edition (Johnson et al., 2013)

Time-to-Adoption Horizon



From Add-on to Essential

Add-on
Linear

Essential

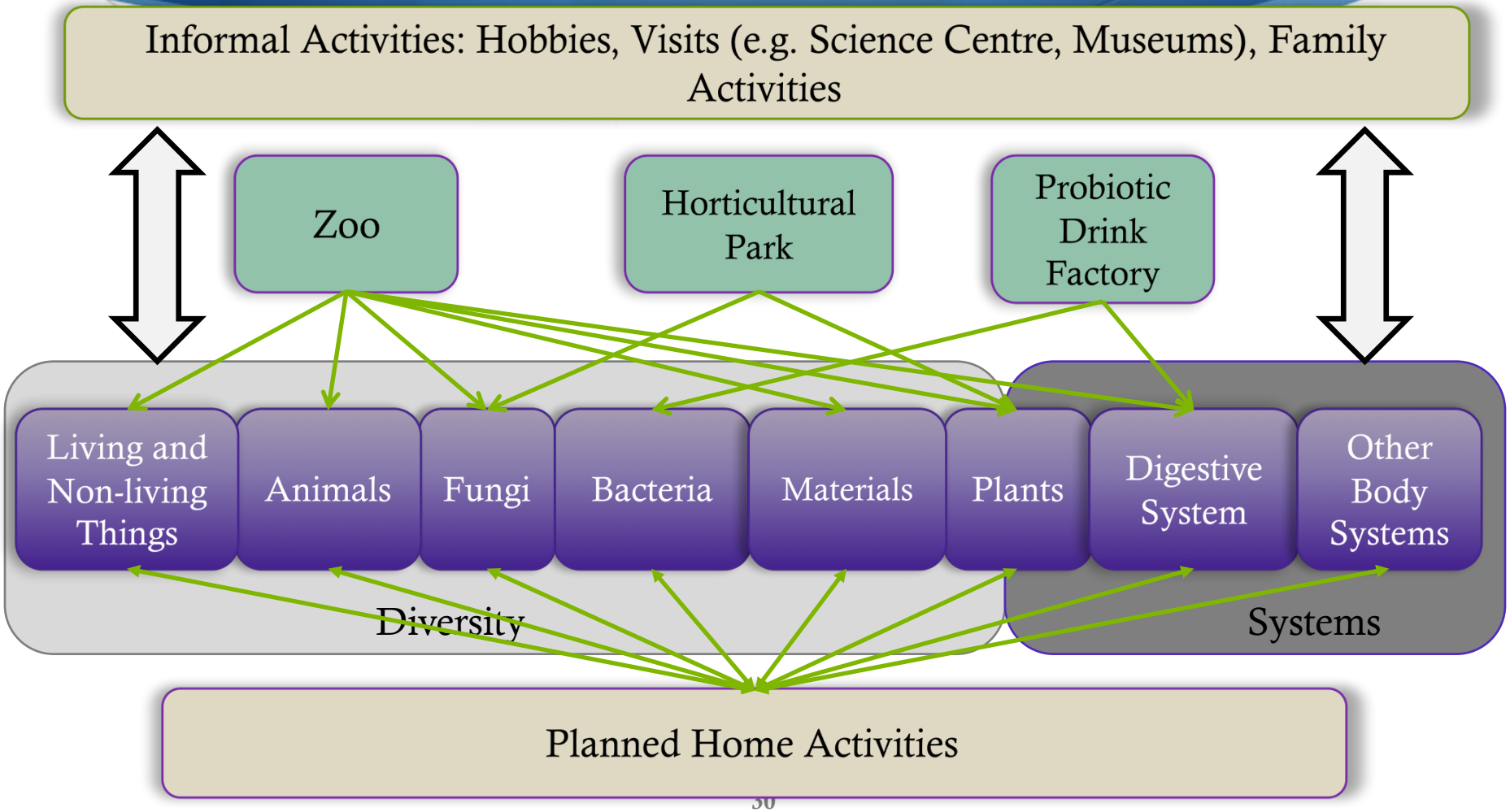
Multiple Patterns of Interaction

Norris & Soloway, 2010 at http://www.districtadministration.com/viewarticle.aspx?articleid=2405)

Pedagogical Design

- Planning and enactment of teaching and learning practices
- Teacher' role in future schools
  - Should be more than a facilitator
  - Skillful at "orchestration" (Dillenbourg & Jermann, 2010)
    - Coordinate complex forms of learning activities & diverse arrangement of physical and virtual tools
- Students' role in future schools
  - Growing importance of informal learning & Peer learning culture

Putting the P3 Science Curriculum Together



MLE Lesson Package For learning Plant Systems

Goals of Lesson

Experiment (video)

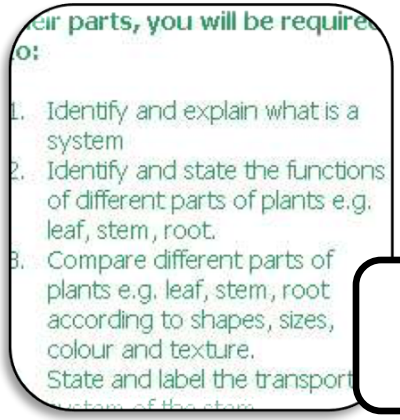
PiCo Map

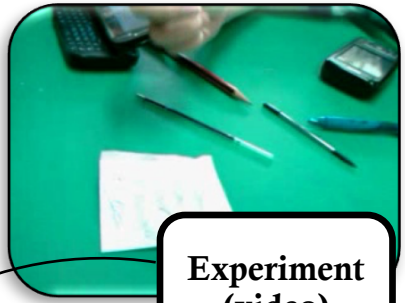
KWL

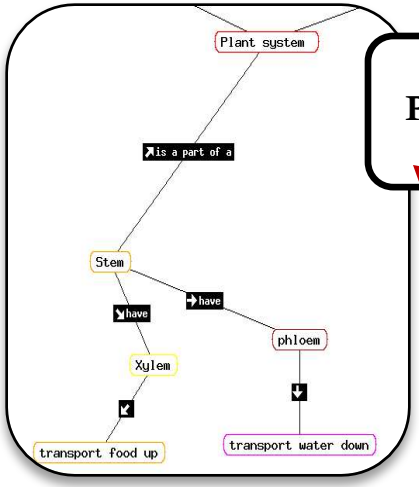
Comparison Table

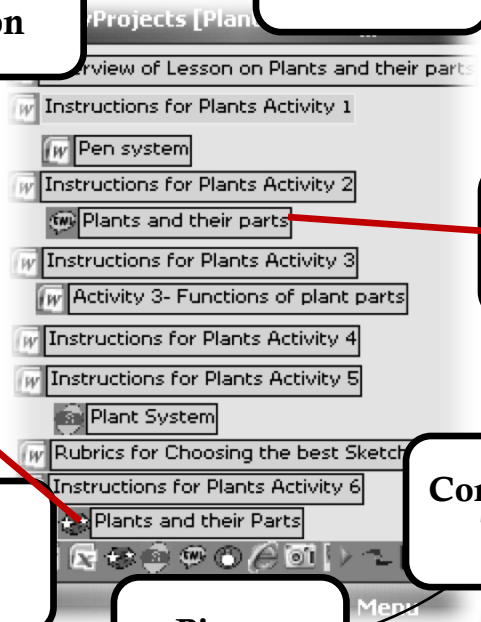
Sketchy

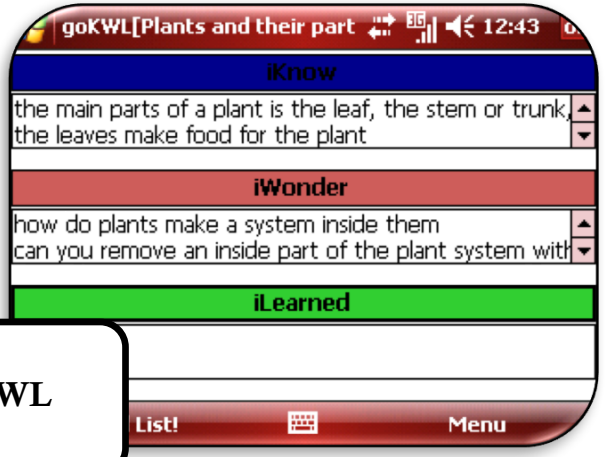
Picture Taking

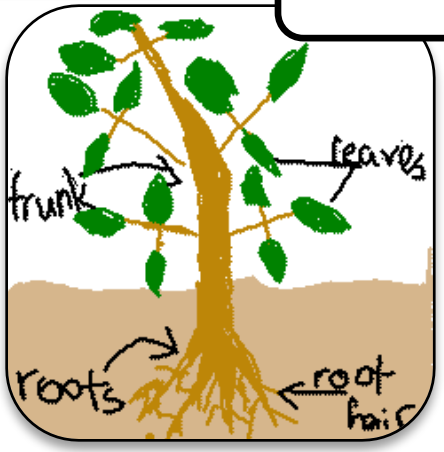


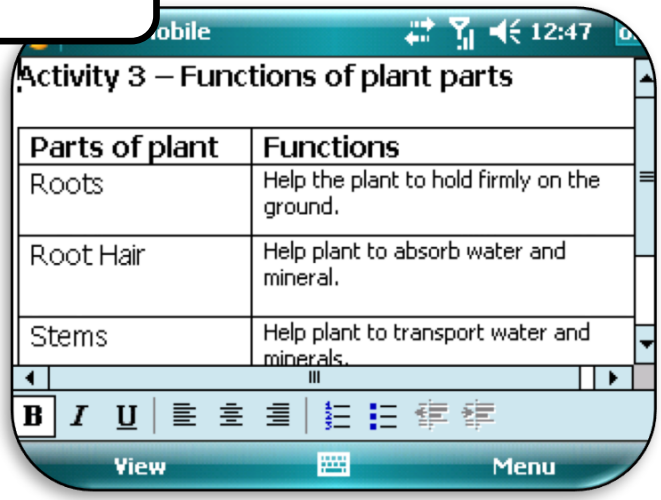












SMART Education Initiative in Korea

Designing Future Education

ICT Infrastructure in Korea

100%	PC & Internet in every school
1st	Ranked 1st in the high-speed Internet subscription rate
5:1	1 PC per 5 students
100%	1 PC per teacher
73%	Schools have ICT departments
69%	Students log onto school homepages everyday

Positive Indicators

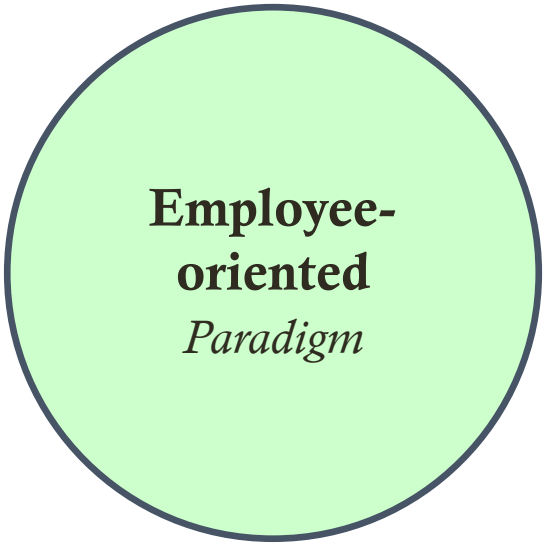
- Korean students demonstrated high levels of academic achievement in international comparison assessment (e.g., PISA, TIMSS)
  - PISA DRA (Digital Reading Assessment) average score in 2009 Korea 588, OECD: 499
- Strong ICT Infrastructure
  - Ratio of students per personal computer in 2010 Elementary 6:1, Middle 5:1, High 6:1
  - Ratio of PC per teacher 1.3:1
- Students' high ICT literacy level

Yet, Problems in the Context of 21st Learning

- Low levels of motivation for learning
- Exam-oriented practices in school
- Lack of students' creativity and self-directed learning
- Lack of customizable learning systems

Paradigm Shift in Education

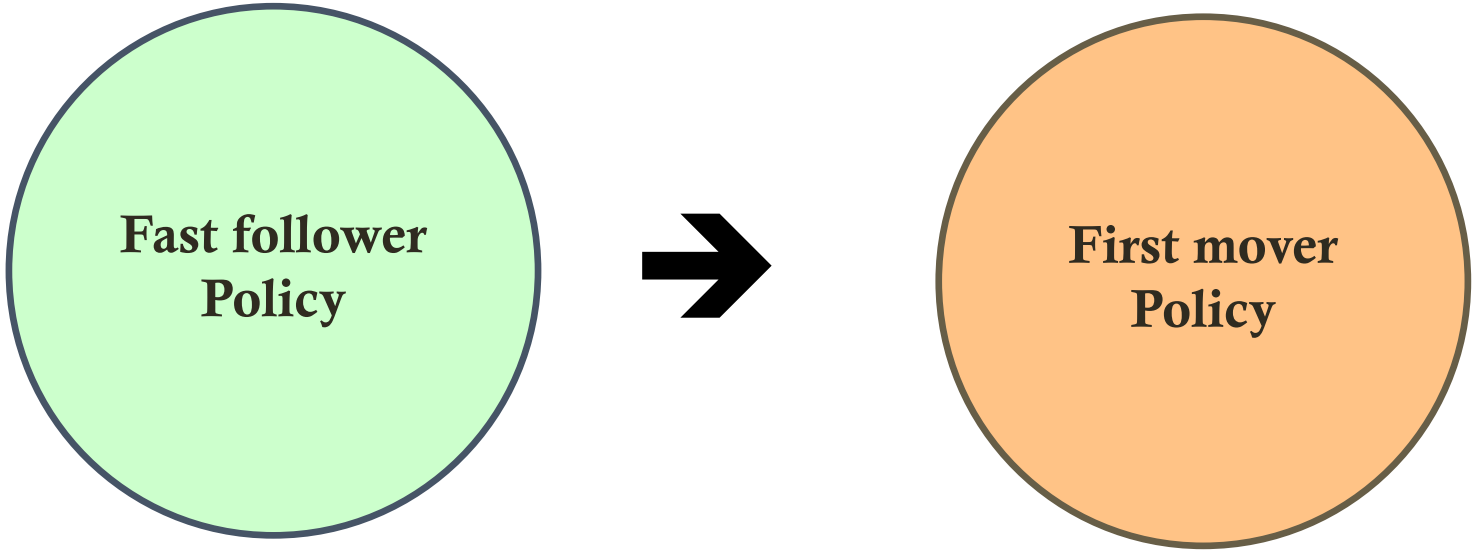
Two paradigms of education (Zhao, 2012)



Transmission of knowledge
Mass Education
Standard curriculum for employment

Emphasis on individuals' creativity and talents

Why Korea Needs Paradigm Shift in Education



Employee-oriented Education Paradigm

Need to simply follow established models and existing innovations

Entrepreneur-oriented Education Paradigm

Need to find problem spaces and to create innovations

SMART Education: Designing Future Classrooms

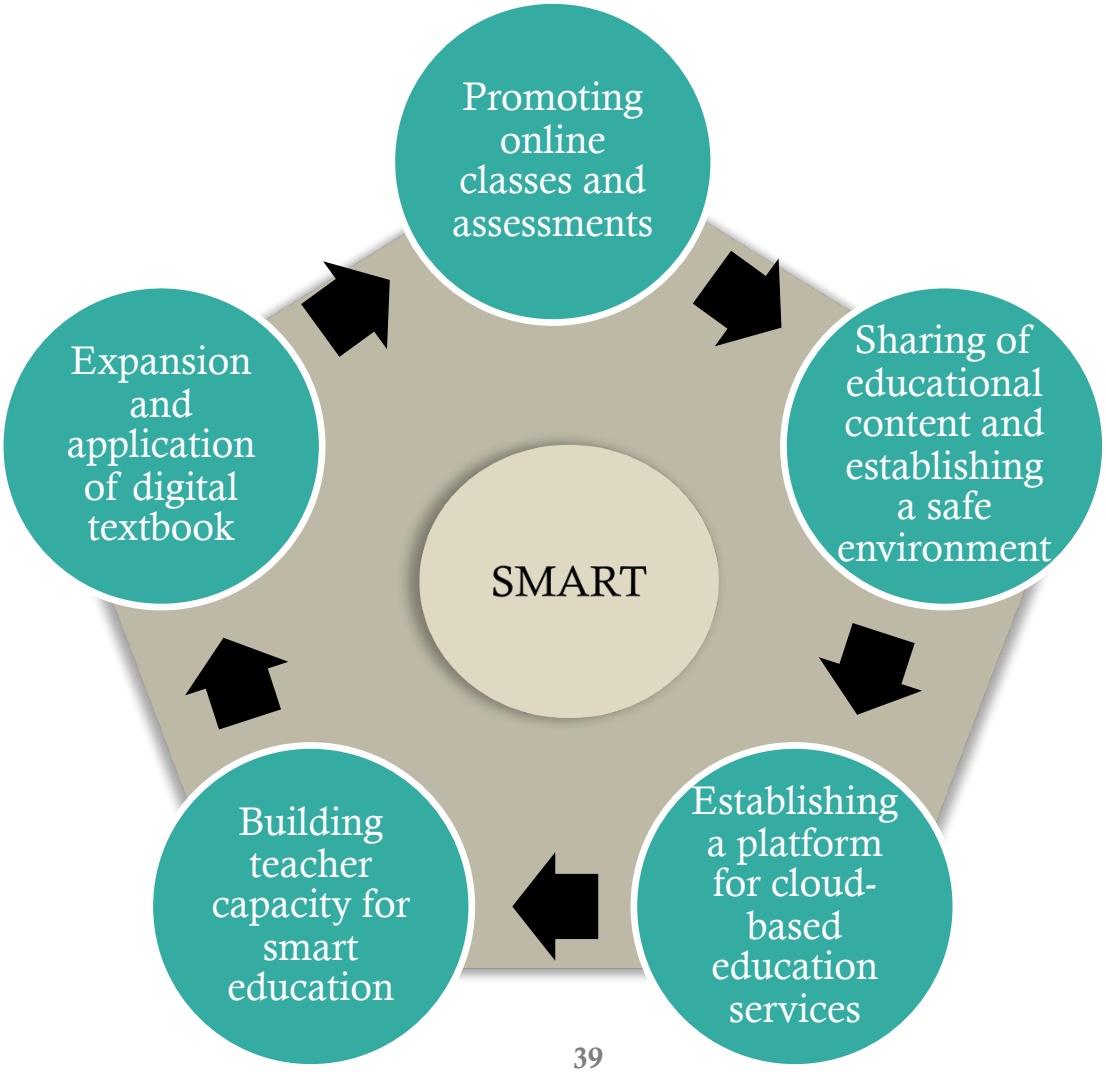
Vision

"Fostering next generation global leaders who are equipped with creativity and well-rounded character"

Definition

S Self-directed	M Motivated
A Adaptive	R Resource-free
T Technology embedded	

Framework



Paradigm Shift in Educational Content. Method, Assessment & Environment

Digital Textbook

Image source: http://www.etnews.com/news/etc/1942709_1624.html

First Smart School in Korea

Charmsaem Elementary School in Sejong City http://www.charmsaem.es.kr/wise/

Image source http://www.fogvil.com/21

K-MOOCs


K-MOOC
K-MOOC란?
대학목록
강좌목록
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최고의 대학, 최고의 강의!
한국형 온라인 공개강좌 K-MOOC 에서
시작하세요.
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Korean Massive Open Online Course
K-MOOC
참여 대학
경희대학교
고려대학교
부산대학교
서울대학교
성균관대학교
연세대학교
이화여자대학교
포항공과대학교
KAIST
한국과학기술원
한양대학교
전체 강좌
논어
사람 사이를 트는 지혜
성균관대학교
COS2034.01x
논어
이화여자대학교
EW10164K
현대물리학과 인간사고의 변혁
SOCIETY
이화여자대학교
EW10771K
인간행위와 사회구조
이화여자대학교
EW11151K
영화 스토리텔링의 이해

MOOCs in Japan & China

Future School Initiative in Singapore

Big Picture: Systemic Change

Macro-level	• Ministries, Policy makers • Strategic planning for sustainability and scalability
Meso-level	• Research Institutions, IT companies, NGOs • Recontextualization of pedagogical discourse
Micro-level	• School Administrators, Teachers, Students, Parents • Construction of classroom-based interaction

ICT Policy: Strategic & Systematic Movement

Masterplan 3 (2009-2014): Pushing the Frontiers

- 21st Century Learning Skills: Collaborative Learning & Self-directed Learning
- Learning in and out of school

Masterplan 2 (2003-2008): Consolidating the Insights

- Effective & pervasive use of ICT for "Engaged Learning"
- Encouraging higher-levels of ICT integration

Masterplan I (1997-2002): Getting the Fundamentals Right

- Provision of basic ICT infrastructure in schools
- Equipping teachers with basic ICT competency

Masterplan for ICT in Education (MP4) – 2015-2020

ICT IN EDUCATION SINGAPORE

Vision

Future-ready & Responsible Digital Learners

Outcome Goal

Quality Learning in the Hands of Every Learner-Empowered with Technology

Enablers

Teachers as Designers of Learning Experiences & Environments

School Leaders as Culture Builders

Implementation focuses on ....

Integrating ICT into curriculum & assessment

Designing quality online resources

Developing Cyber Wellness & New Media Literacies

Providing professional development & facilitating learning communities

Innovating & developing good practices for ICT in education

Providing infrastructure to support anytime, anywhere learning

Systematic Transformation of Schools with Technology

Tiered Approach for Scaling and Sustaining Innovative Practices in Schools (from Koh & Lee, 2008, p.87)

FutureSchools@Singapore

- Since 2008,eight schools have been selected as Future Schools
- Each future school(FS) is funded through the Interactive Digital Media (IDM) in education program by the National Research Foundation to conduct "school-based research and development"
  - Partnership
  - Ownership
  - Capacity building
- Current status: Transitory period
  - "Seeding Ideas" to "Spreading innovations"

EduLab: Spreading Innovations

- Recent initiative to address the issue of scalability and sustainability by building strong teacher professional learning communities (PLC) through close school partnerships
- "Living lab"
  - Space where teachers can experiment with new technologies and pedagogical ideas prior to implementing in classrooms
- "Co-evolutionary Approach"
  - Partnering future schools with other schools that lag behind in its ICT integration
- "Empowering Teachers"
  - EduLab at the Academy of Singapore Teachers (Edulab@AST): An institution solely dedicated to train in-service teachers

http://iresearch.edumall.sg/iresearch/slot/u110/edulab/index.swf

Professional Learning Communities (PLC)

- "Empowering Teachers"
  - An institution solely dedicated to train in-service teachers

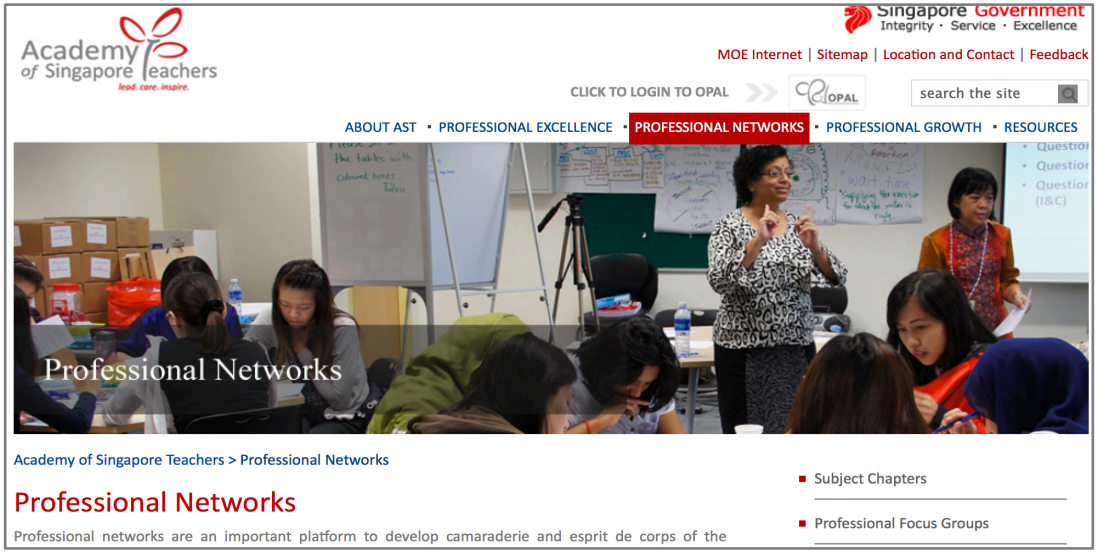


Image source: http://www.academyofsingaporeteachers.moe.gov.sg/

FS@Singapore: Initial Success

- Explicit effort to address the issue of scalability and sustainability
- Emphasis on empowering teachers through teacher communities
- Synergistic effect from the close partnership across multiple actors (e.g., MOE, higher education researchers, industry, etc.)

Singapore – Smart Nation

Smart Nation Vision For Singapore

December 4, 2014

Singapore must take full advantage of its extensive and systematic use of technology, particularly IT, says PM Lee.

Prime Minister Lee Hsien Loong has officially unveiled a wide range of collaborative government initiatives to transform Singapore into a Smart Nation.

A Smart Nation Programme Office to be set up within the Prime Minister's Office aims to bring citizens, the government and industry players together to identify issues, co-develop solutions, prototype ideas and deploy them effectively. Dr Vivian Balakrishnan, the Minister for Environment and Water Resources, will oversee this unit.

TECH NEWS | SMART NATION | STARTUPS | DIGITAL GOVERNMENT | TRENDS | ANALYSIS & OPINIONS

Home / Tech Scene & News / Tech News / Trends / Singapore aims to nurture robotics skills among young

TRENDS

Singapore aims to nurture robotics skills among young

7 AUGUST 2014

Singapore aims to nurture robotics skills among young

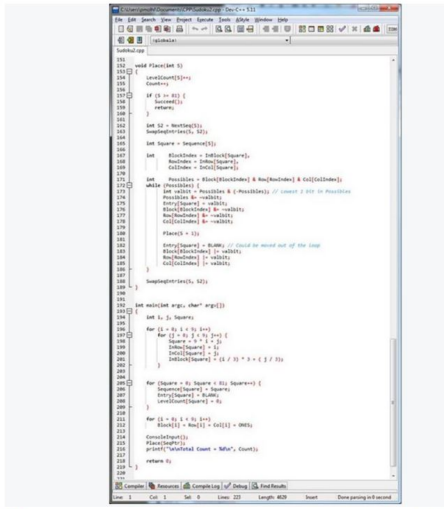
Young minds in Singapore will have more opportunities to pick up robotics skills through a series of training courses, designed especially to help mentor students in this emerging field.

To be provided through the new Robotics & Maker Academy (RMA) initiative, these activities will revolve around coding and robotics and are expected to cover some 10,000 students in 30 primary and secondary schools.

The Infocomm Development Authority of Singapore (IDA) and Singapore Polytechnic (SP) will co-fund the RMA with a total of S$2.8 million, which will span over three years through to June 2017.

Timeline Photos

Back to Album · Lee Hsien Loong's Photos · Lee Hsien Loong's Page



Lee Hsien Loong

I told the Founders Forum two weeks ago that the last computer program I wrote was a Sudoku solver, written in C++ several years ago (http://bit.ly/1DMK5Zk). Someone asked me for it. Here is the source code, the exe file, and a sample printout - http://bit.ly/1zAXbua

Album: Timeline
Shared with:
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SINGAPORE — THE STRAITS TIMES

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SINGAPORE › Courts & Crime | Education | Housing | Transport | Health | Manpower | Environment

IT talent in short supply amid Smart Nation push

Recommended by outbrain

Change in MOE's Computing Curriculum

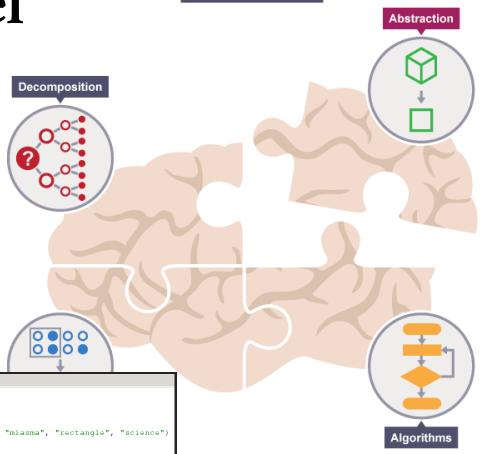
GCE 'O' Level 2016

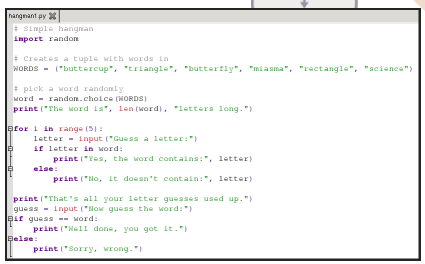
Using Computers and Technology with awareness of its impact in society

Subject called **Computing Studies**

GCE 'O' Level 2018

Computational Thinking





```
# Simple hangman
import random

# Creates a tuple with words in
WORDS = ("buttercup", "triangle", "butterfly", "miasma", "rectangle", "science")

# pick a word randomly
word = random.choice(WORDS)
print("The word is", len(word), "letters long.")

for i in range(5):
    letter = input("Guess a letter:")
    if letter in word:
        print("Yes, the word contains:", letter)
    else:
        print("No, it doesn't contain:", letter)

print("That's all your letter guesses used up.")
guess = input("Now guess the word:")
if guess == word:
    print("Well done, you got it.")
else:
    print("Sorry, wrong.")
```

Coding with Python

Subject called **Computing**

Future Education: Grand Challenges

Grand Challenge #1: Technology vs. Pedagogy Driven

- Often times, our thinking about future schools is technology-driven, with a hope that technology will revolutionize teaching and learning.

- Tight coupling of technological and pedagogical design

Grand Challenge #2: Evidence of School Transformation

- "Transformation, No Evolution" (Pea, 2011)
  - Action plan for *revolutionary transformation rather than evolutionary tinkering*.
- Critical need to develop a holistic way to trace and evaluate the transforming process of schools at the meta-level.
- Lessons learned and common challenges need to be clearly articulated and shared to inform the rest of schools on the similar trajectory.

Grand Challenge #3: Architectural Design Challenge

- High relationship between the spatial design and human interaction/discourse.
- Yet most schools use existing building structures and facilities without much modification.

Grand Challenge #4: Assessment for Future Learning

- The ways of assessing learning in schools remains mostly unchanged at the macro level.
- The transformation of assessment is often beyond schools' control.

How to turn the classroom of the future to the classroom of the present?

Toward Designing Knowledge Creation Spaces

- Moving beyond surface-level changes
- Changing Metaphor of Future Schools
  - Past: Knowledge as a container
  - Schools as "Knowledge Creation Spaces"
  - Architectural, technological, & pedagogical design that support students to work with knowledge or conceptual artefacts
- Schools as Knowledge Creation Spaces
  - Not necessarily about fancy buildings and sophisticated technologies
  - Clear articulation about educational goals
  - Gradual transformation by design experiment

References

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Thank You

Questions & Discussions