Smart Approach to Innovative Education for 21st Century

14 October 2014

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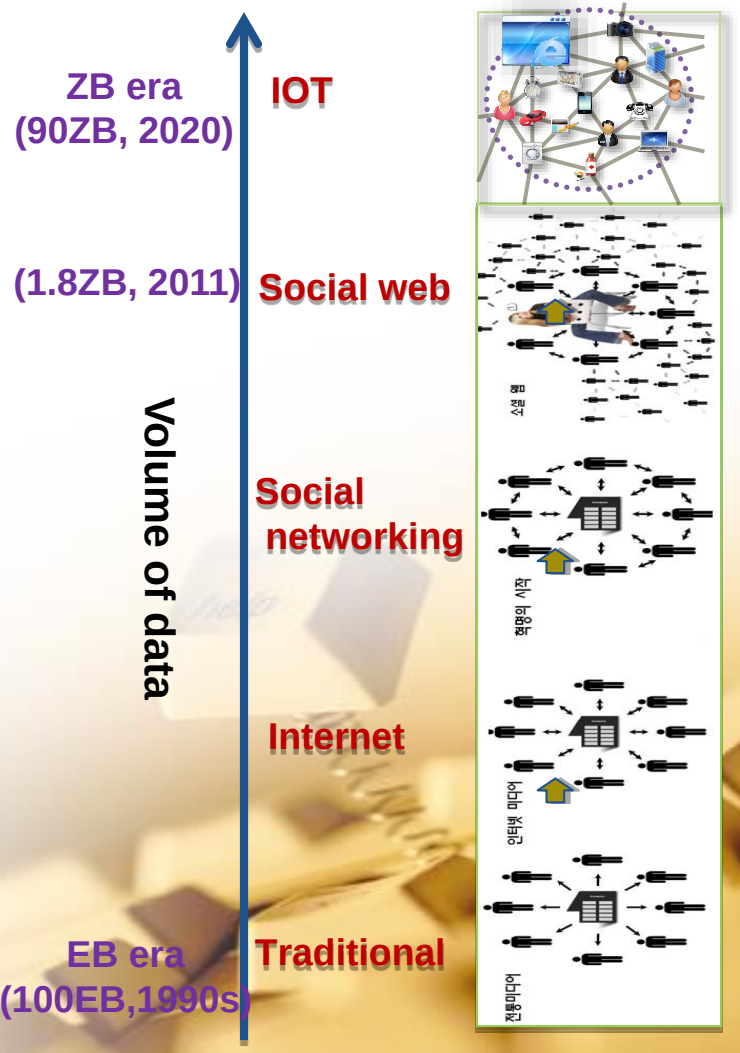
Contents

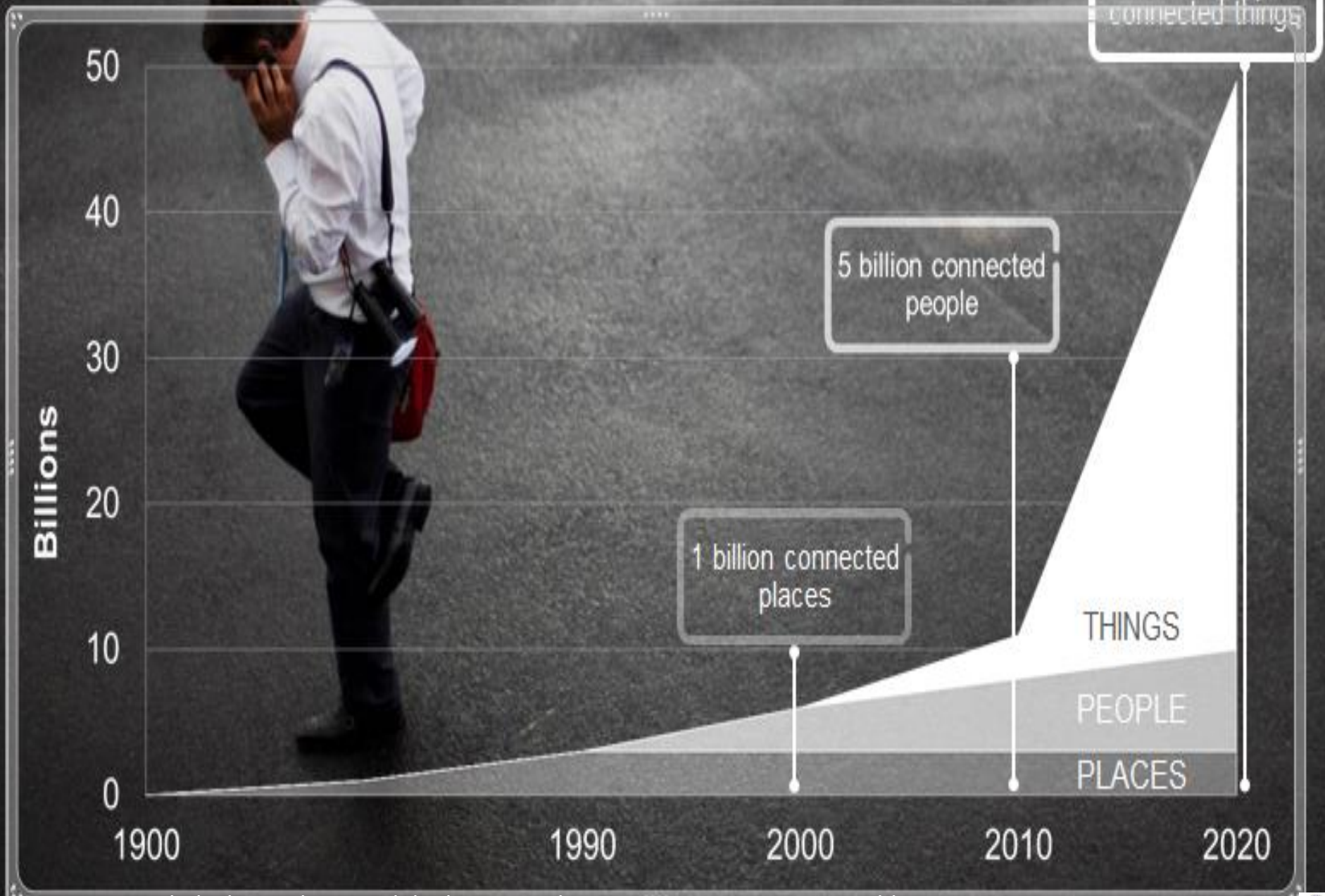
I. Background

Evolution of Conversation Media

Source : Brian Solism

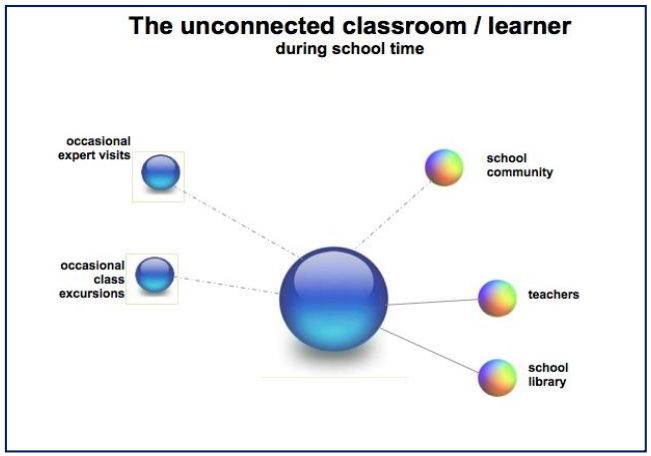


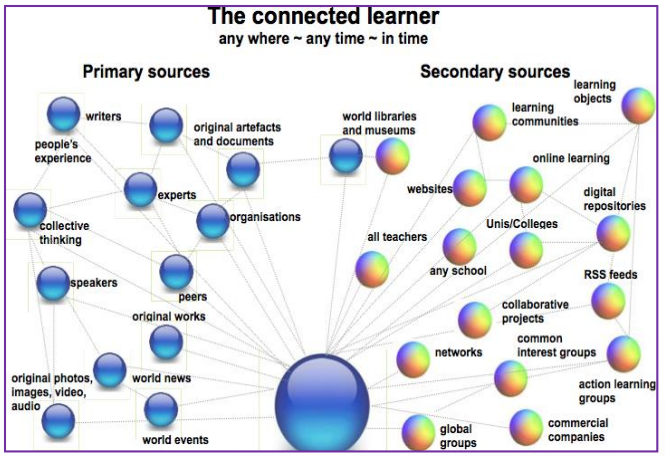
Connected World 3.0

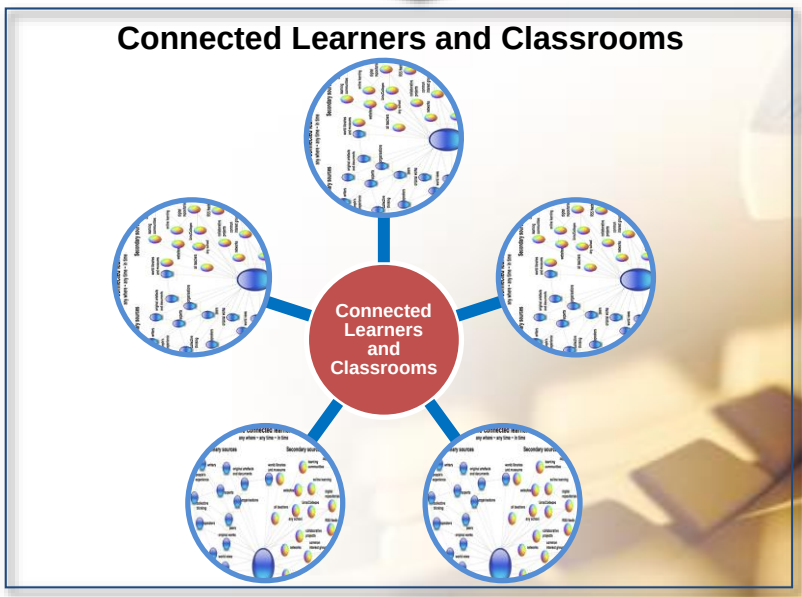


Source: Miguel Blockstrand, IoT mobile devices in the 4g era, ERISSON in IoT World Forum, 2013. 11.

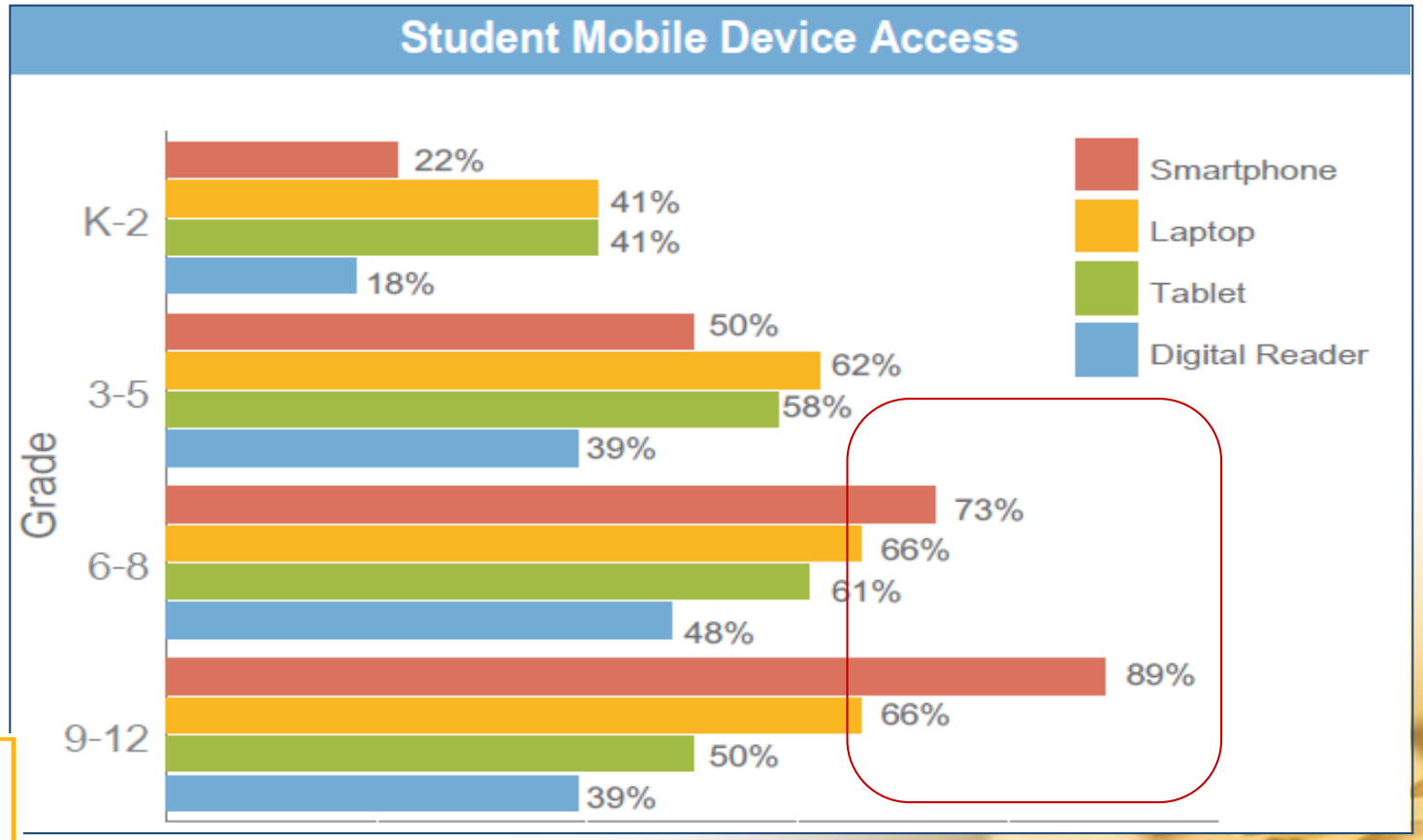
Education Becoming Mobile and Connected







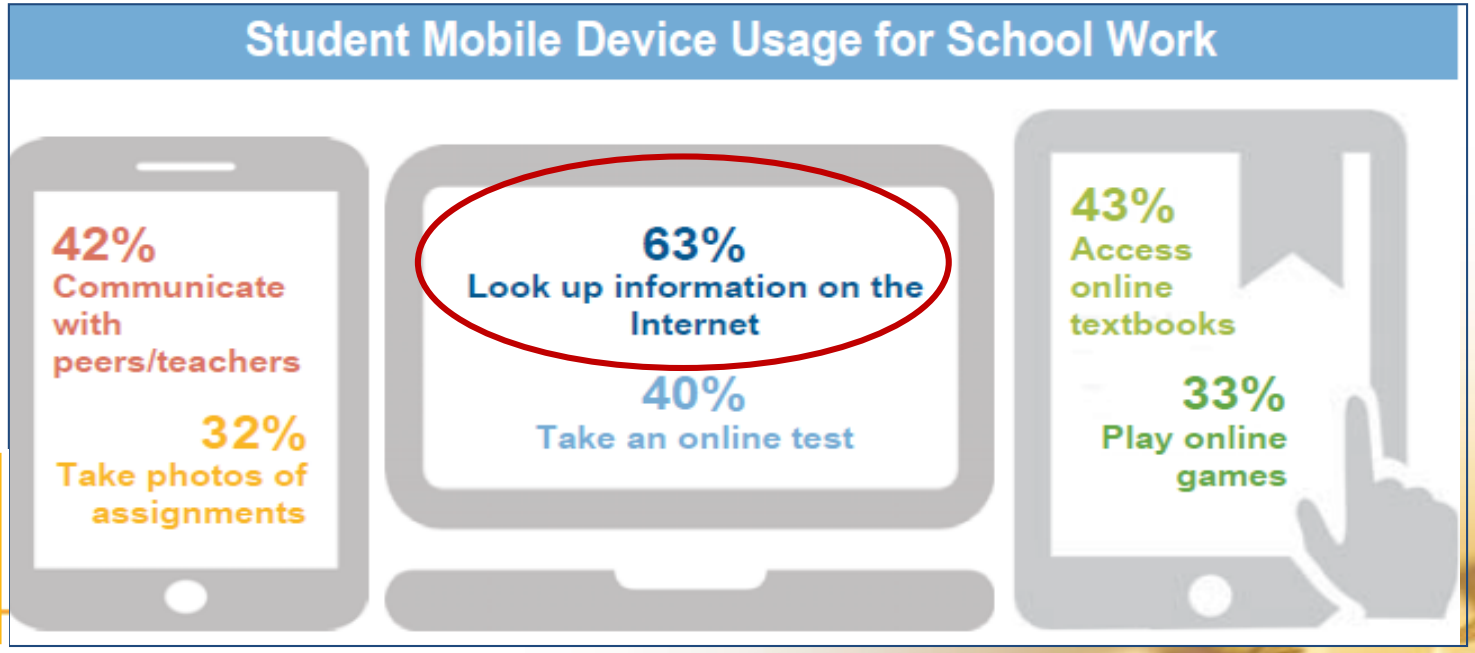
Student's Lives Change to be Mobile



Project Tomorrow
Speak Up

Source: Speak Up 2013 National Research Project. In fall 2013, over 403,000 online surveys from K-12 students, parents, and educators representing over 9,005 schools nationwide

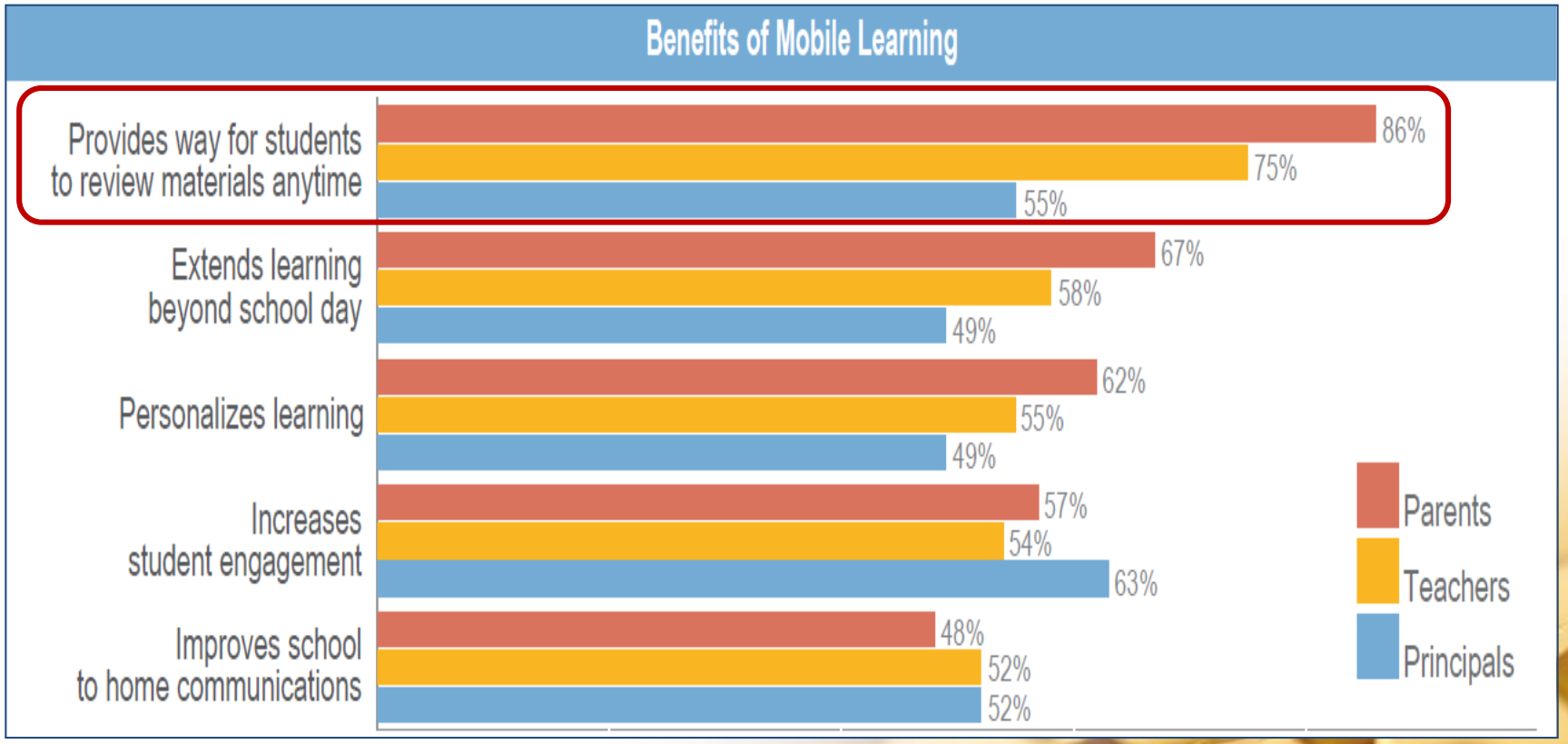
Use of Mobile Devices in School Work



Project Tomorrow Speak Up

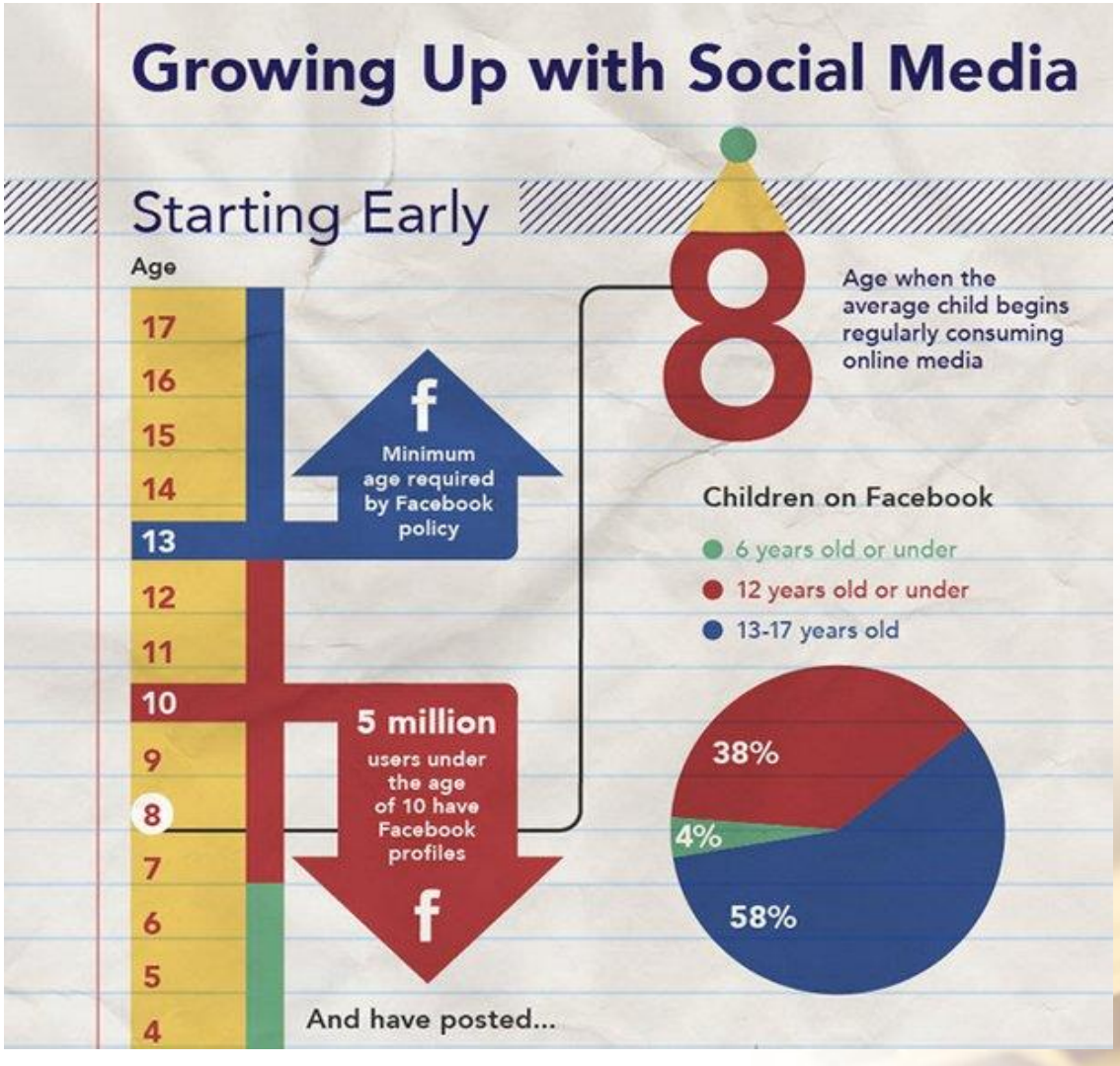
Source: Speak Up 2013 National Research Project. In fall 2013, over 403,000 online surveys from K-12 students, parents, and educators representing over 9,005 schools nationwide

Recognition on Benefits of Mobile Learning



Source: Speak Up 2013 National Research Project. In fall 2013, over 403,000 online surveys from K-12 students, parents, and educators representing over 9,005 schools nationwide

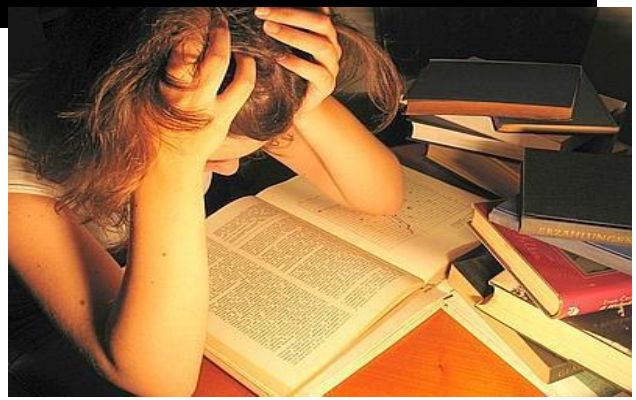
How the Digital Native are Grown Up



- 'Gen Xers' and (born between 1964-1980) and 'Millenials' (born between 1980-2000), use the Web in their daily lives
- Use the Internet to search for travel information:71%
- Download or stream video (59%), including 26% downloading video podcasts
- Visit MySpace regularly (56%)
- Share videos via YouTube (34%)
- Use Photobucket (26%), while 17% use Flickr (two photosharing Web sites)
- Write reviews about movies, music, etc. on-line (45%), with 10% writing their own blogs
- Only 14% report not participating in any social networking, sharing or community-oriented sites

Source: PhoKus Wright, "The NEXTgen Traveler™" , Cudebec, 2008

How to Bring Back Student's Big Smile



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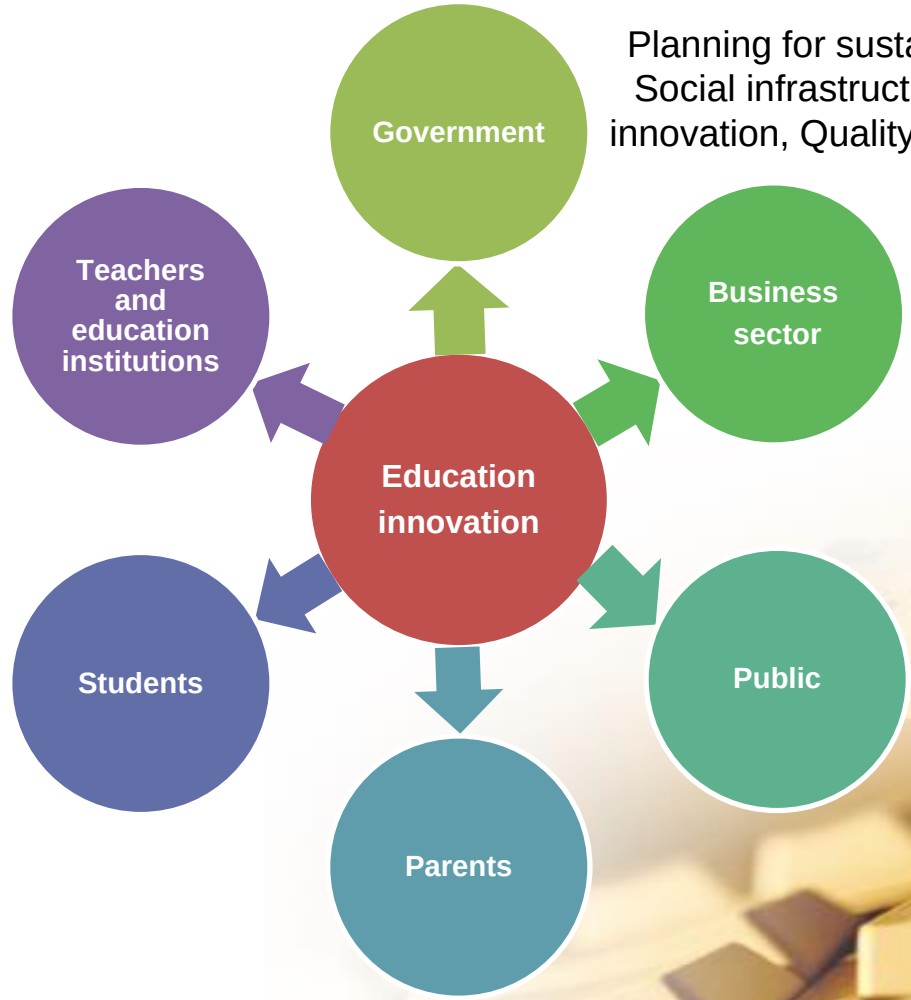
II. Issues of School Education

Why School Education Should be Innovated?

- Address **desynchronization issues** between students and education systems
- Quality of **education outcomes** emerges a key issue
- New quality frameworks pay more attention to **evidence-based planning** rather than examination-dominated assessment
- **Education systems should be reformed** to accommodate the behavior and characteristics of **digital native students**: what, and how to educate students
- **Leveraging technology** is vital factor to reform education system: mobile network, Learning Analytics, OER, OCW, MOOCs, open platforms
- Schools and classrooms should be **reformed to accommodate changes** in education environment: smart school, future schools, restructuring classroom settings
- **Increasing demands** for convincing the stakeholders with the outcomes of education
- Significant numbers of students do not achieve the minimum levels of learning: **67 million children out of school** in 2009 (UNESCO UIS 2011)

More Demands from Stakeholders



Planning for sustainable growth, Social infrastructure, Education innovation, Quality HRD and HRM

Capacity building: media literacy, professional Competence

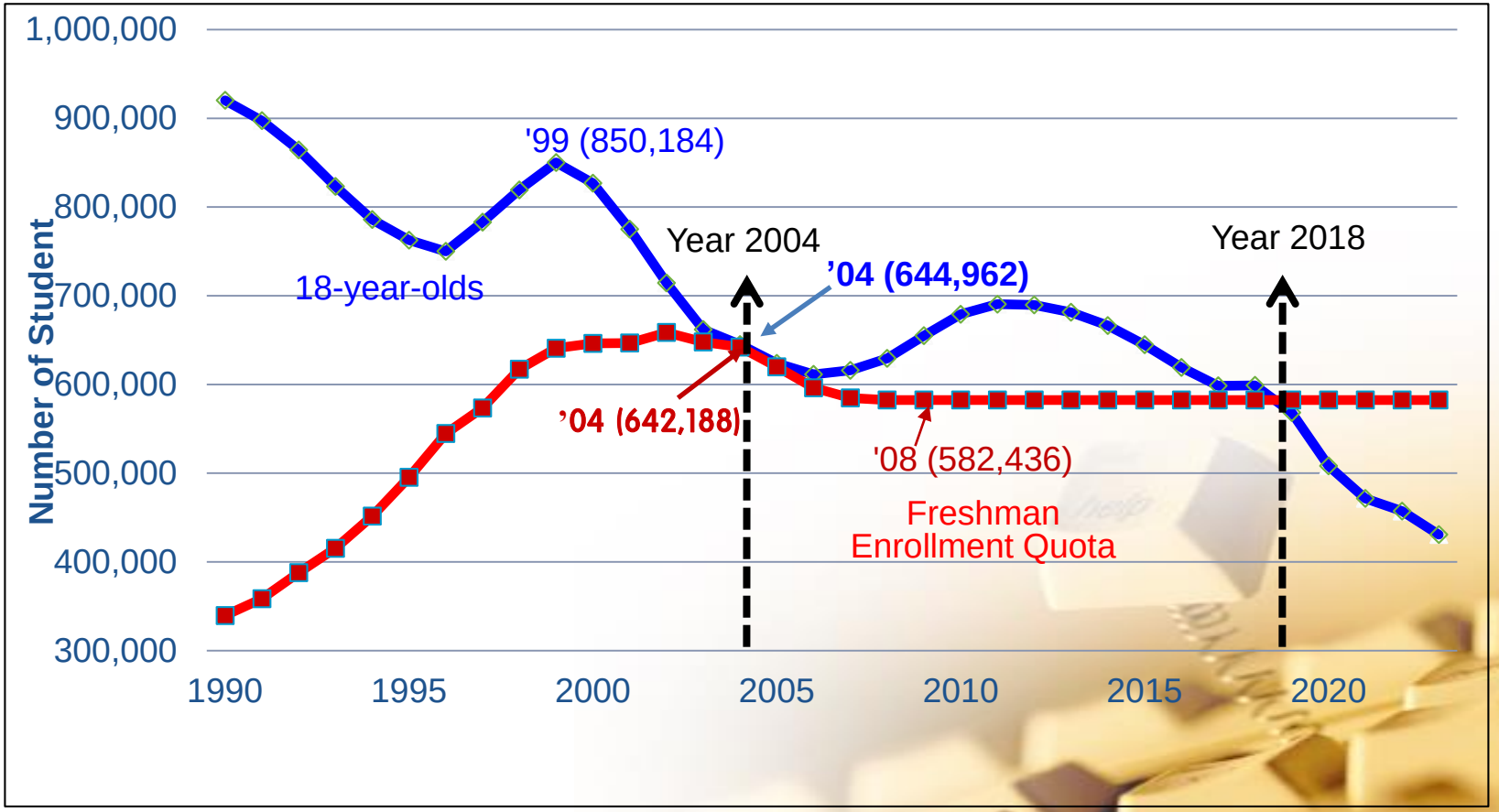
Competence-based Education, Globalization

Equity of education: participation, accessibility, and geographical location

Social inclusion, Education welfare

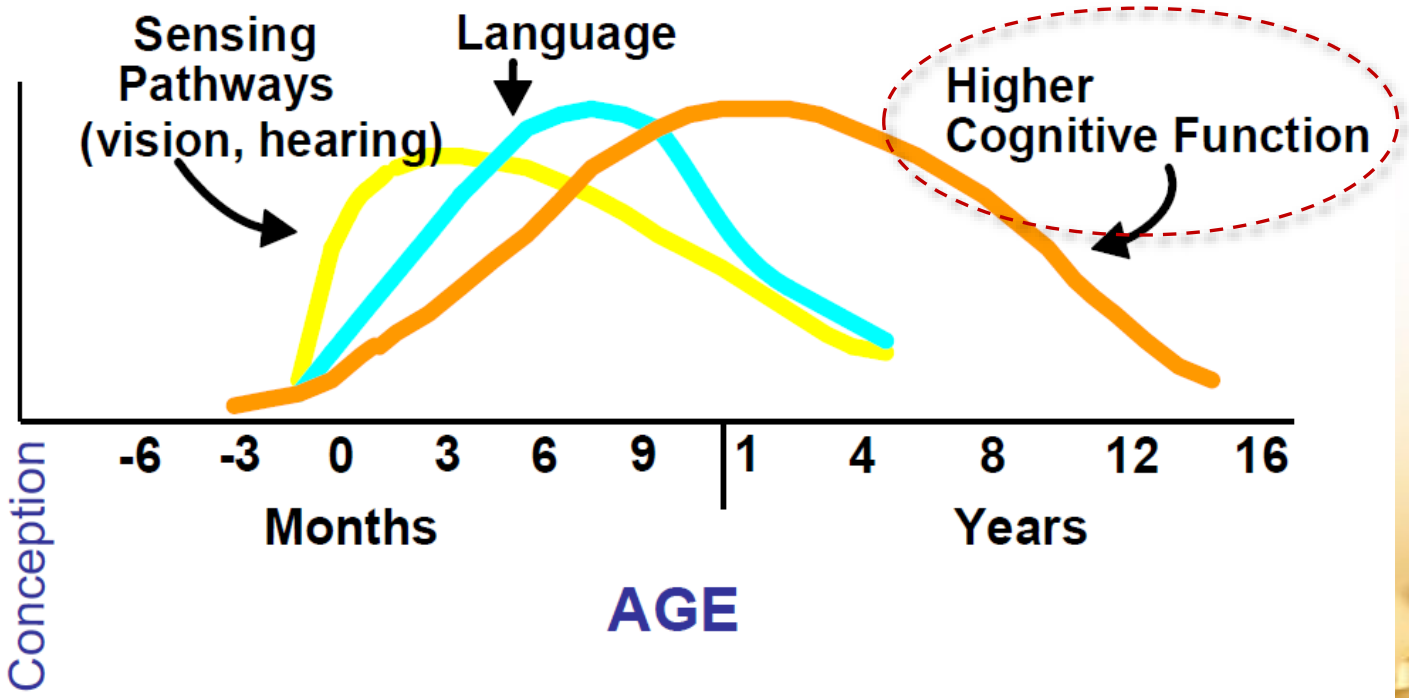
High quality of education, Education innovation, Global competitiveness

Demographic Changes of Students in Tertiary Education



Sources: MEST and KEDI, Education Statistics Yearbook 1990~2008 (http://std.kedi.re.kr/index.jsp)

Human Brain Development: Synapsis Formation



Source: Shonkoff, J. P. and D. A. Phillips, From Neurons to Neighborhoods: The Science of Early Childhood Development. Washington D.C.: National Academy Press, 2010

What Student's Competency is about

- **Knowledge acquisition, integration, construction, and application**
  - ✓ Dimensions: understanding knowledge from a range of disciplines; connecting knowledge to other knowledge, ideas, and experiences; constructing knowledge; and relating knowledge to daily life
- **Cognitive complexity**
  - ✓ Dimensions: critical thinking, reflective thinking, effective reasoning, and creativity
- **Intrapersonal development**
  - ✓ Dimensions: realistic self-appraisal, self-understanding, and self-respect; identity development; commitment to ethics and integrity; and spiritual awareness
- **Interpersonal competence**
  - ✓ Dimensions: meaningful relationships, interdependence, collaboration, and effective leadership.
- **Humanitarianism and civic engagement**
  - ✓ Dimensions: understanding and appreciation of cultural and human differences, social responsibility, global perspective, and sense of civic responsibility
- **Practical competence**
  - ✓ Dimensions: pursuing goals, communicating effectively, technical competence, managing personal affairs, managing career development, demonstrating professionalism, maintaining health and wellness, and living a purposeful and satisfying life

Source: The Role of the CAS General Standards, The Council for the Advancement of Standards in Higher Education (CAS), U.S.A.,2012.

Changing Focus of School Education

Industrial society

Standardized education

Uniform and Standardized education

Information based society

e-Learning

Introduction of digital technology Standardized, one-way education

Innovation in education

- Web 2.0: participation
- Process knowledge
- Book paradigm shift to digital textbook
- Changing to technology-intensive education environment
- Mobile technology
- New classroom settings
- Increasing awareness to open paradigms
- More outcomes based on evidence

2010s

SMART

Education

Competency based and Creative education

Policy Support for ICT in Education: Korea

Focus of Policies of ICT in Education

1970
Audio-Video Education

Built ICT Infrastructure
1996
Education of Computer and Internet

Facilitated ICT in Education
2000
ICT in Education

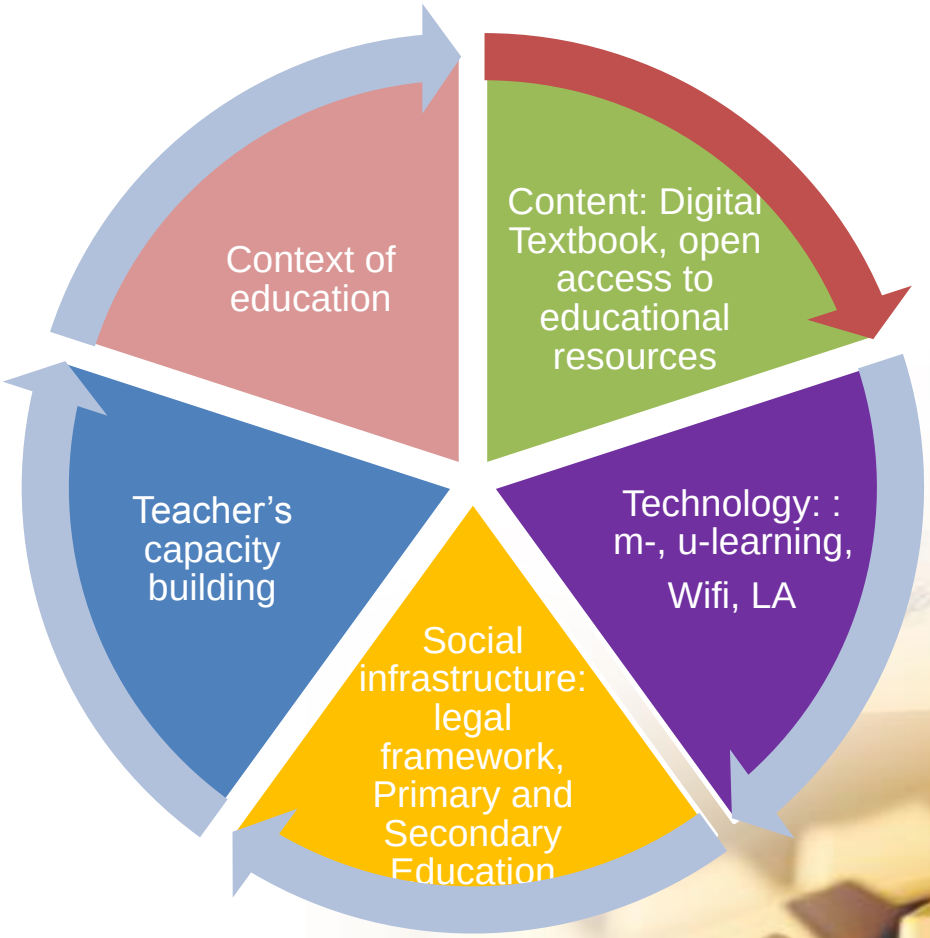
2004
E-Learning & U-Learning

Mobile Education Services
2011
Implementation of Digital Textbook

Just-in-Time & Person Education Services
2013
Establish and Practicing Smart Education

III. Bring Back Student's Big Smile: SMART Education in Korea

Ecosystem of Smart Education



What SMART Education is about

SMART education is not simply technolorizing education environment, but harnessing potentials of technologies, pedagogies, Digital Textbooks, open access to educational resources, and education research outcomes to change education creative, collaborative, personalized by addressing desynchronization issues between students and education systems.

Self-directed	Self-directed manner
Motivated	With fun
Adaptive	Suited for student's levels and aptitude
Resource-enriched	Rich materials
Technology-embedded	Learning by harnessing digital development

Source: Yoon Kyung Jung, Korea's Strengthening Teacher's ICT Competency, Central Asia Symposium on ICT in Education 2014

Evolving Goals of Education

21C learner competency

3R

- Reading
- Writing
- Arithmetic

4C + more

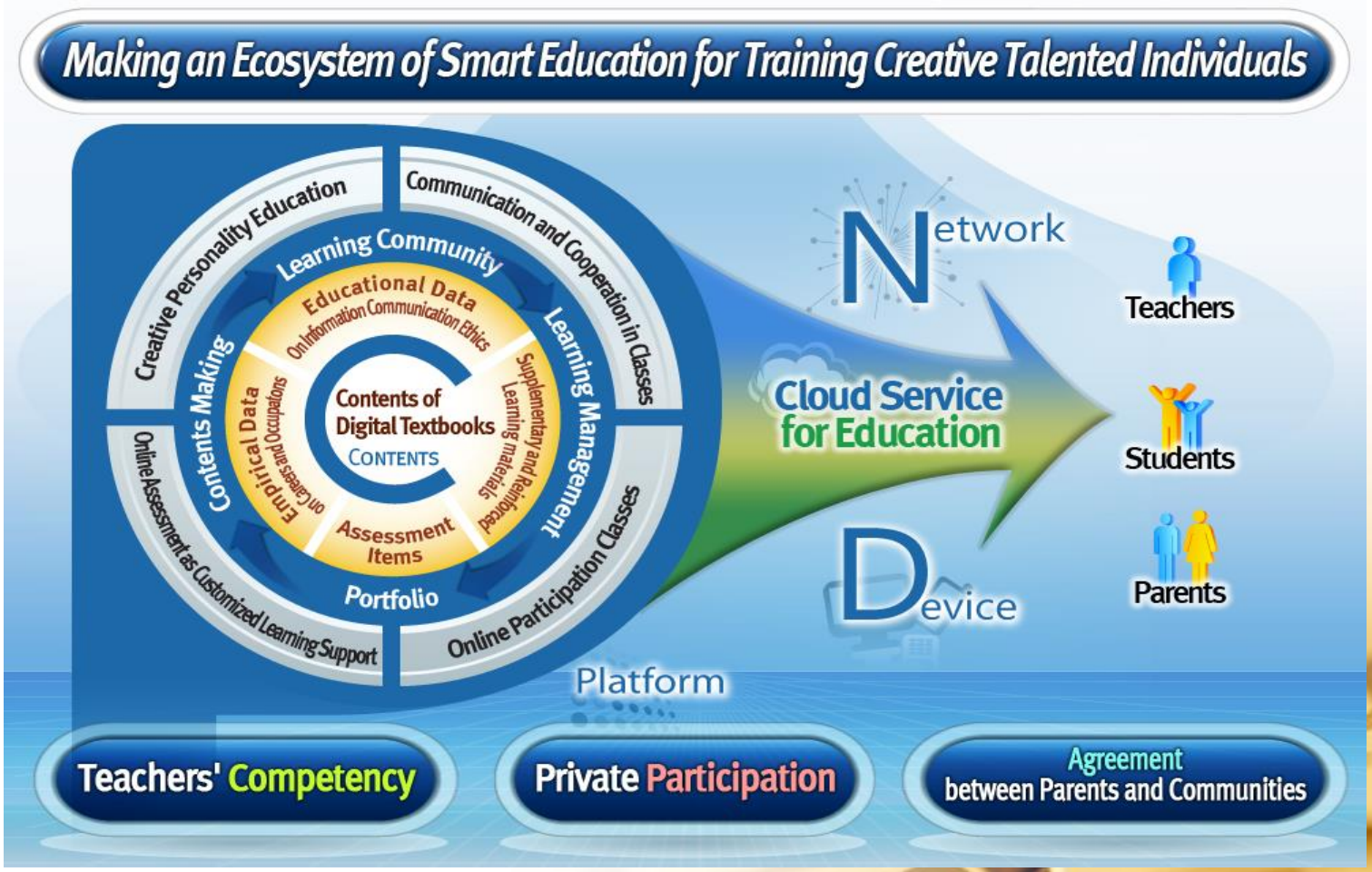
- Creativity & Critical thinking
- Communication skill
- Collaboration
- Global citizenship
- Media literacy

Source: Yoon Kyung Jung, Korea's Strengthening Teacher's ICT Competency, Central Asia Symposium on ICT in Education 2014

Considerations in Education Infrastructure

- **Student-centered approach** to address desynchronization issues
- **Open education platform** support informal, non-formal, and formal education
- **Education systems should get grow as ecosystem for** responding not to advances in technologies, but to new demands from stakeholders
- **Maximize potential of available resources** through decoupling contents with pedagogies: pedagogies x (content, education delivery, technology)
- **Sustainability, scalability, expandability and efficacy** of education infrastructure
- Practicing paradigms based on openness and networking: open access, open sourcing, open innovation, open platform, collective intelligence
- Pay attention to **international standards** for interoperability among education platforms

Ecological Approach of SMART Education

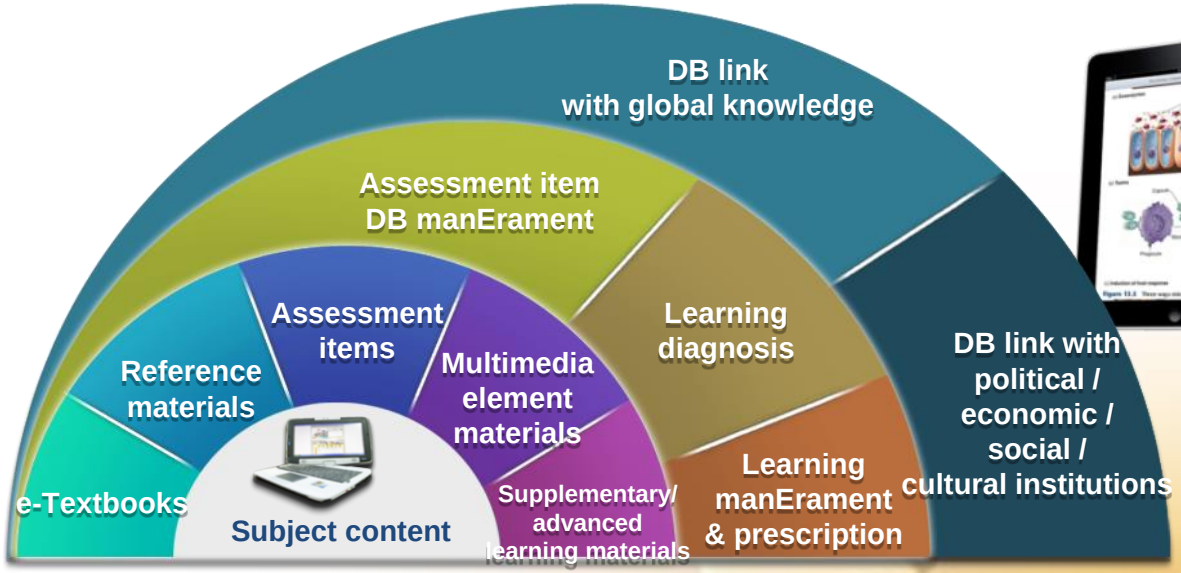


Source: Jin-Sook Kim, Implementation of Learning System using Digital Textbooks, Sept. 2013, Singapore.

What Digital Textbook Aims for

What is the Digital Textbook?

Digital textbook refers to teaching-learning material which contains various types of latest information, provides support tools for learners' expressive activities and learning assessment materials, and enables learning diagnosis and prescription.



Paper textbooks

- Limited content
- Hard to reflect latest info
- Limited learning activity

Rich learning materials | **Customized diagnosis-prescription** | **Learning expansion**

To changes not only contents of textbook but the context of education; pedagogy, students, teachers, classroom setting, and education system and environments

*Source: KERIS, Master plan of Smart School Project revised in 2011, Seoul, Korea

Trials for Digitalized Textbook

iPhone (2007. 6)

Android (2007. 11)

2007

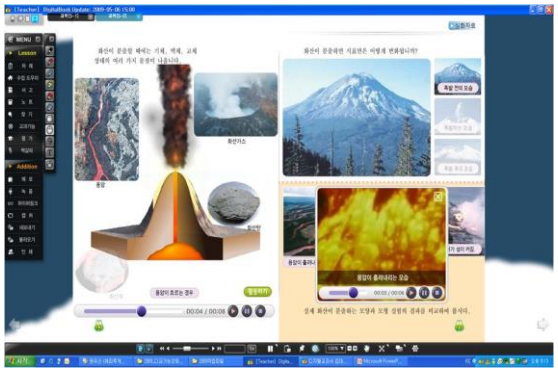
iPad (2010. 4)

2010

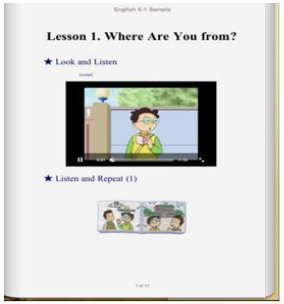
iBooks Textbook (2012. 1)

2013

Functional modeling in application



Downsizing and evolved with eBook technologies



Mobile and multi-screen on the cloud platform

(Textbooks in EPUB2)

Note: this perspective is not official opinion of Korean government and KERIS, but speaker's personal division to give implications on the digital textbook in Korea.

Content Development of Digital Textbook

Year	Classification		Subject	No. of Subjects (Types)
	School	Grade		
2008	Elementary	5	Korean language, Social studies, Science, Mathematics, Music, English	6
		6	Korean language, Social studies, Science, Mathematics	4
2009	Elementary	3 - 6	English (4 types in accordance with levels)	4
		4	Social studies, Science	2
	Middle	1	English, Science	2
2010	Elementary	5 - 6	Social studies, Science	4
2011	Elementary	5 - 6	Korean language, Mathematics	4

***Pilot schools: 12 (‘08), 112 (‘09), 132 (‘10), 63 (’11 - 12),144 (‘13), 500 (‘14): Science, Social studies, and English**

Source: KERIS, Master plan of Smart School Project revised in 2011, Seoul, Korea

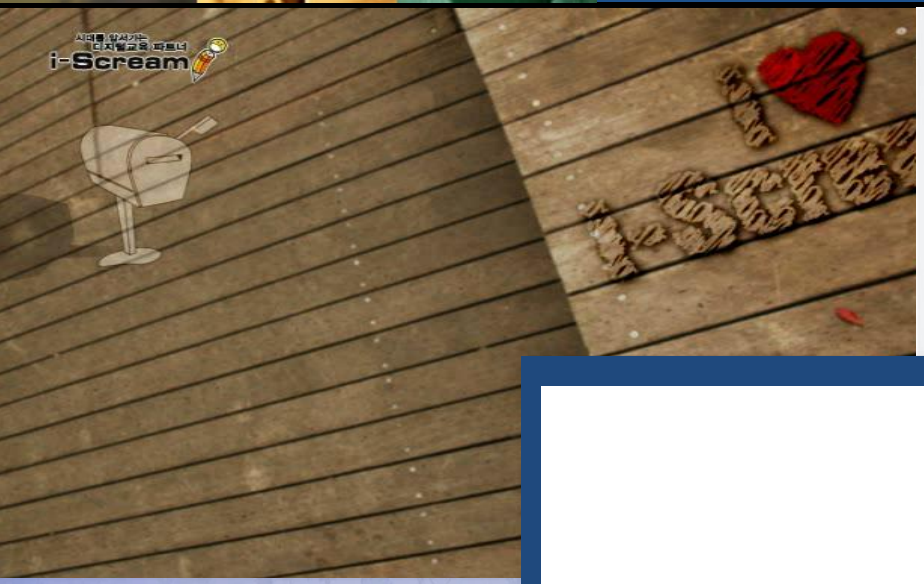
More Flexibility to Practicing Pedagogies in Smart Classrooms

Classroom based Teacher-led education

Technologies of a Typical SMART Classroom

Tablet PC	RFID	LED 46" monitors	SCSD board 22"/32“	Smog glasses (LED 46" 3X3)	Electronic podium	Kiosk	Projection system
Learning and collaboration device	Student’s presence and identification	Electronic bulletin board	Mobile studio	Collaboration space	English robot tutoring	Webcam	Real image:3D VR Beam : Video conferencing system

Technology Support for SMART Education



Ganbi

Smart School Platform

VISANG ESL

Digital English Lang

Technical Resources e-Education

Student's Big Smile Return to Classroom

Source: HJ Lee, 2014 Top Branded SMART Charmsaem Education, Charmsaem Elementary School, Sejong city, Korea
U-Smarter, Busan, Korea

Overview of Study of SMART Education Outcomes

- Population size of the study
  - ✓ Target group: 3 schools
    - One SMART education model school: experimental group
    - The others are regular schools (2): control group
  - ✓ Students participated:1,366 Students (4th- 6th graders of Primary Schools)
- Period of study (1 year): Dec. 2012 – Nov. 2013

Student's participation to smart classes

Category	Number of students	Ration (%)
Not used	7	2.4
1-2 times/week	113	39.2
3-4 time/week	106	36.8
Every day	62	21.5
Total	288	100.0

Student's use of smart devices

Category	Number of students	Ratio (%)
Formal class	136	52.92
Special activity class	75	29.18
Extra curricula class	40	15.56
After school class	0	0.0
Home	6	2.33
Total	257	100.0

Source: Bokyung Gae at all, Study of effects of SMART education- 3 Schools in Sejong City, KRC 2013-2, KERIS, Korea

More on Student's Outcomes Analysis (1)

Dependent Variables		Subordinate Variables	Group with better outcomes	Sig.
Level of Happiness		Subjective wellbeing (+)	experimental group	p<.001
		Life satisfaction (+)	experimental group	p<.001
		Relationship satisfaction (+)	experimental group	p<.01
		Overall satisfaction (+)	experimental group	p<.01
		Overall happiness (+)	experimental group	p<.01
Social relationship		Social norm	experimental group	-
		Favorable impression (+)	experimental group	p<.01
		Social inexperience	control group	-
	Creative personality	Creative personality (+)	experimental group	
Creativity	Creativity	Fluency	control group	p<.001
		Originality	control group	p<.001
		Abstraction of the titles	experimental group	-
		Accuracy	control group	-
		Resistibility	control group	-

Source: Bokyung Gae at all, Study of effects of SMART education- 3 Schools in Sejong City, KRC 2013-2, KERIS, Korea

More on Student's Outcomes Analysis (2)

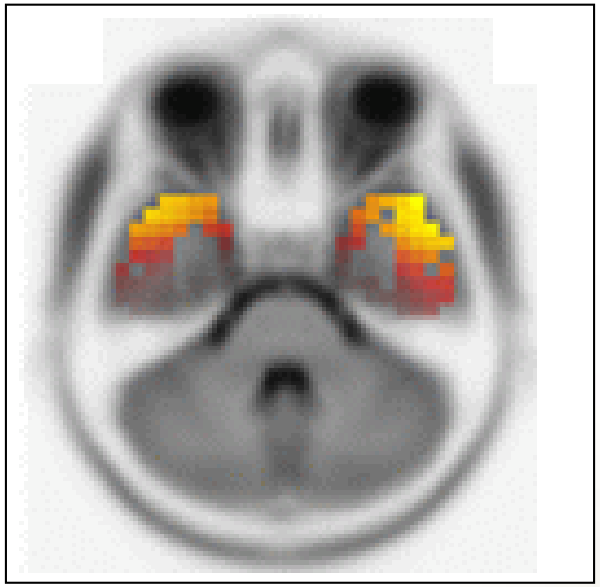
Dependent Variables		Subordinate Variables	Group with better outcomes	Sig.
School education	Attitude of learning	Attitude of education (+)	experimental group	p<.001
	Satisfaction with learning atmosphere	Satisfaction with learning atmosphere (+)	experimental group	p<.001
		Teacher's support for students (+)	experimental group	p<.01
	Teacher's learning support	Support for student's problem solving (+)	experimental group	p<.01
		Overall happiness (+)	experimental group	p<.01
Characteristics of learning	Self efficacy	Self efficacy (+)	experimental group	-
	Collaborative learning attitude	Preference on collaborative learning	experimental group	-
		Preference on competition based learning (+)	experimental group	p<.05
	Self-paced learning	Cognition control (+)	experimental group	p<.001
		Activity control (+)	experimental group	p<.001
Academic achievement identified		Korean language (+)	experimental group	p<.05
		English	experimental group	-
		Mathematics (+)	experimental group	p<.05
		Sociology	experimental group	-
		Science	experimental group	-
Health condition	Mental health	Negative symptom	experimental group	-
		Positive symptom (+)	experimental group	p<.05
	Eye sight	Left eye (+)	experimental group	-
		Right eye	experimental group	-

Source: Bokyung Gae at all, Study of effects of SMART education- 3 Schools in Sejong City, experimental groupKR-C 2013-2, KERIS, Korea

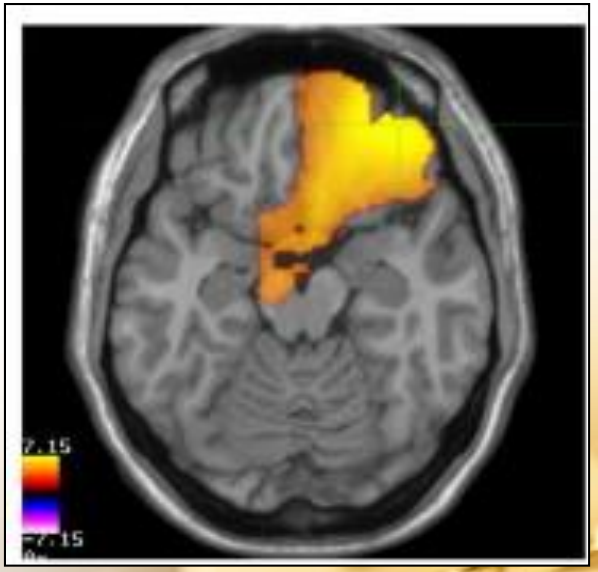
Comparison of Student's Brain Activation During Digital Textbook vs. Digital Game

- MEG theta power in insula and orbitofrontal cortex increases during gambling near-misses and is associated with BOLD signal and gambling severity.

Digital Textbook



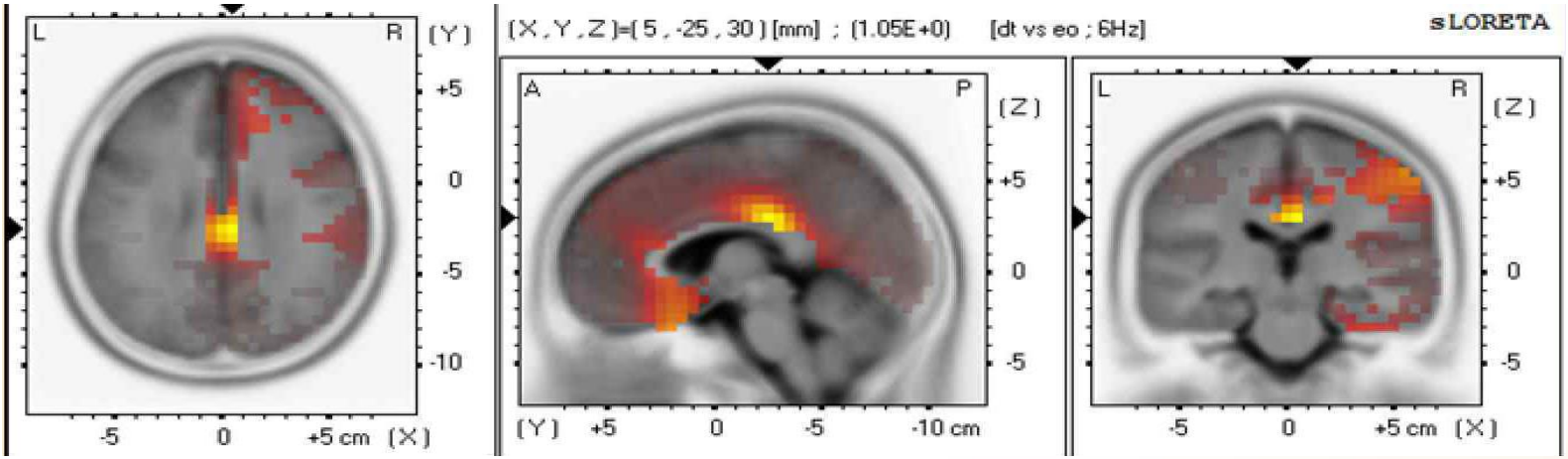
Digital Game



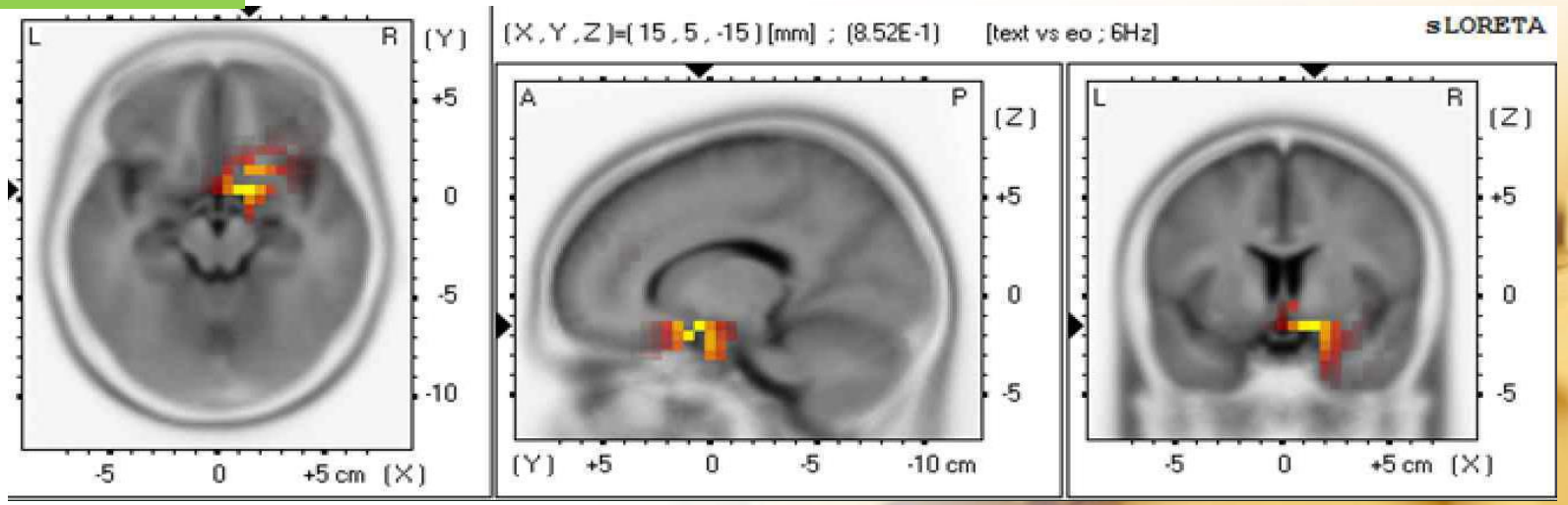
Source: Dymond, S., Lawrence, N. S., Dunkley, B. T., Yuen, K. S., Hinton, E. C., Dixon, M. R., Cox, W. M., Hoon, A. E., & Munnelly, A. (2014)

Activation of Student's Brain: Digital Textbook vs. Paper Book with Delta of 30-50Hz

Using Digital Textbook



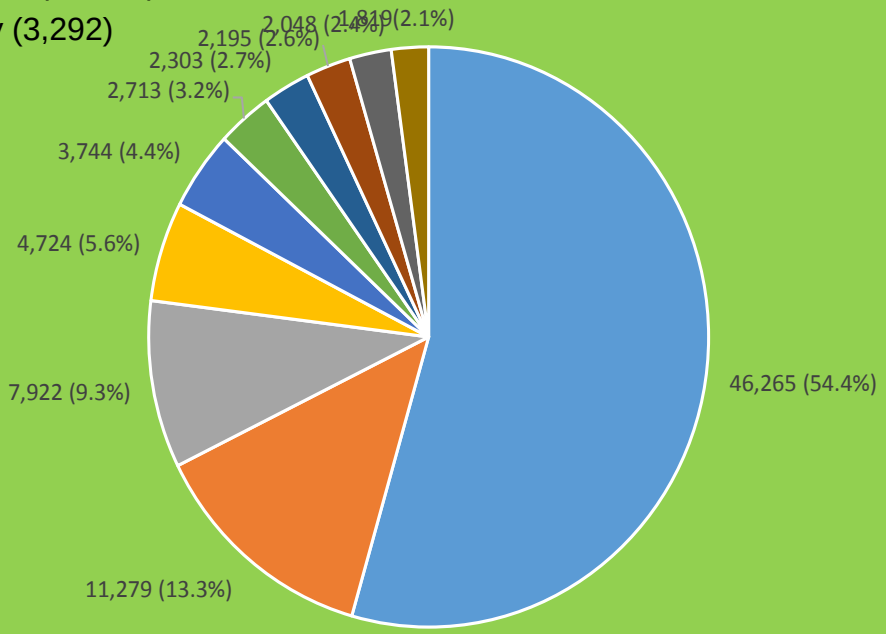
Using Paper Book



Source: Research on the effect of brain function using digital textbook, KERIS Research Report, KR-2014-3.

SMART Education for Students with Disabilities

- Development smart learning platform for university students with disabilities in Dec 2011
- Number of students for special education in 2012: 85,012
  - ✓ Enfant with disabilities (403)
  - ✓ Kinder garden (3,675)
  - ✓ Primary school (34,458)
  - ✓ Middle school (21,535)
  - ✓ High school (21,649)
  - ✓ University (3,292)



Source: Smart Education for Students with Disabilities, 2012, KNISE, Seoul, Korea

Teacher's Competencies for SMART Education

- Teacher's competency for SMART education consist of 13 areas and 61 indicators: basic competencies (6), professional competencies (7)

Basic Competencies (6)

Personal attributes fundamental to practice of SMART education

- Creative problem-solving
- Social ability
- Flexibility
- Technology literacy
- Ethics
- Passion

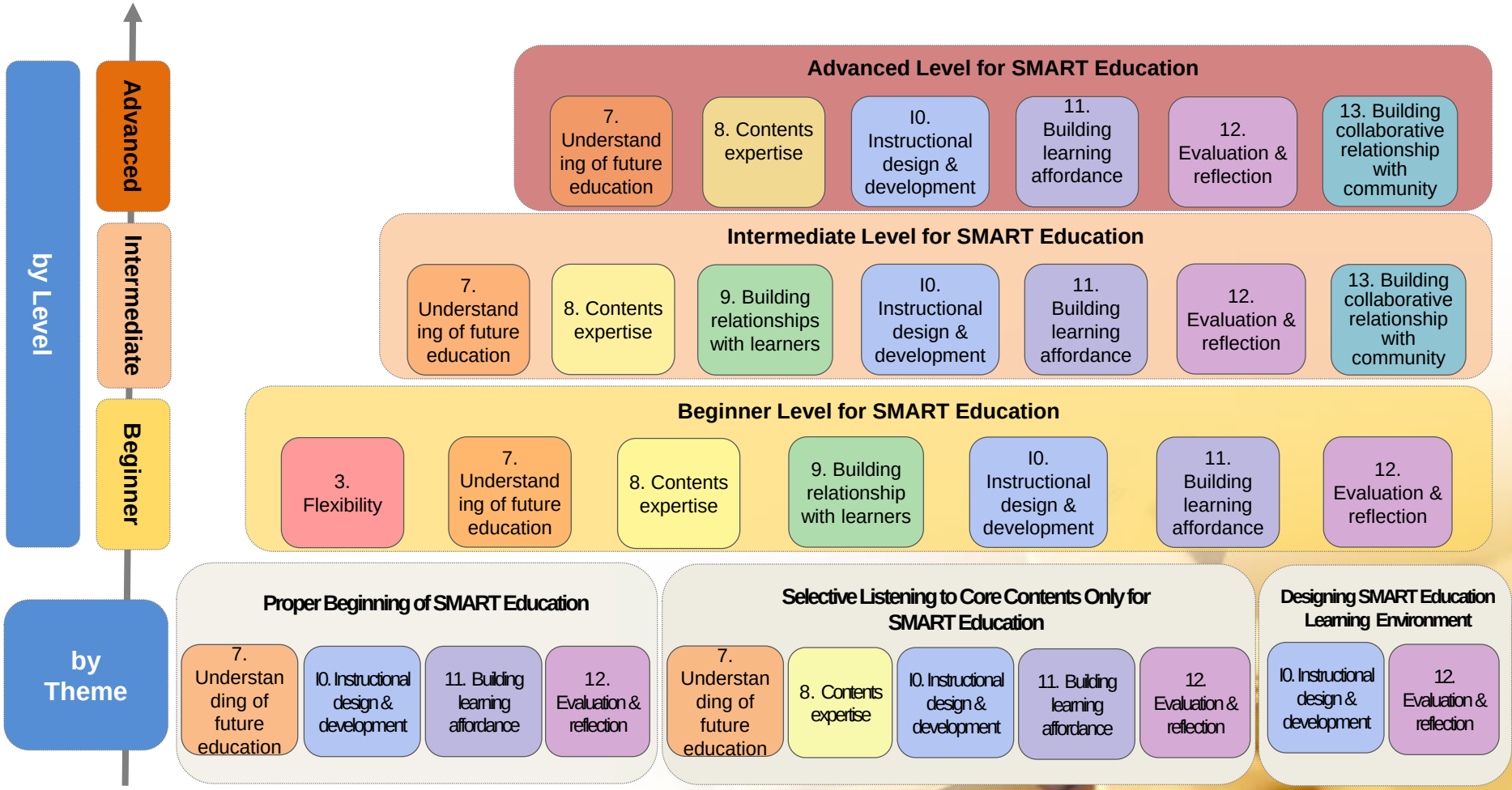
Professional Competencies (7)

Specific educational tasks and activities intended to implement SMART education

- Understanding of future education
- Contents expertise
- Building relationships with learners
- Instructional design and development
- Building learning affordance
- Evaluation and reflection
- Building collaborative relationship with community

Source: Yoon Kyung Jung, Korea's Strengthening Teacher's ICT Competency, Central Asia Symposium on ICT in Education 2014

Teacher's Capacity Building for SMART Education



Source: Yoon Kyung Jung, Korea's Strengthening Teacher's ICT Competency, Central Asia Symposium on ICT in Education 2014

Teacher Training Modules for SMART Education

Teacher Competencies

Basic Competencies

Creative problem-solving	1
Social ability	2
Flexibility	3
Technology literacy	4
Ethics	5
Passion	6

Professional competencies

Understanding of future education	7
Contents expertise	8
Building relationship with learners	9
Instructional design & development	10
Building learning affordance	11
Evaluation & reflection	12
Building collaborative relationships with community	13

Teacher Training Modules for SMART Education

1	Concept of future education & teacher's role
2	Concept of SMART education
3	Teacher competency for the practice of SMART education
4	Understanding 21C learner & strategies for promoting the competency
5	Participating in digital ecosystem
6	Class observing copyrights
7	Information & communications ethics
8	Smart lesson plan for digital native
9	Building rapport with learners through SMART education
10	Organize creative SMART education programs
11	Constitute primary theme-centered SMART curriculum
12	Curricular plan by SMART education level
13	Learning smart learning tools
14	SMART learning environment design
15	Collaborative learning design for communication
16	Learning design for lively experience
17	Self-directed intelligence-type customized learning design
18	Using digital textbooks
19	Immerging into the sea of SMART content
20	Comprehensive design for school SMART education system
21	SMART education design for outside the school
22	Features and methods of SMART education assessment
23	Learning process-centered evaluation for 21C competency
24	SMART education and on-site studies
25	Strategies for implementing and facilitating SMART lessons
26	Method of monitoring learning process
27	How to cope with problems in SMART class
28	Constant cultivation of expertise for SMART education

IV. Conclusion

Conclusion

- **Evidence-based quality framework** is critical factor to quality of education
- The study of SMART education outcomes shows **positive affects** on 21st century skills for students
- **Education ecosystem** emerges to challenge issues of education
- **Social infrastructure** is an important success factors to education ecosystem
- **Sustainability, scalability, and efficacy** are key considerations in establishing ecological education infrastructure
- **Teacher's capacity building** gains more attention

Thank You
감사 합니다

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