Improving the Quality of Learning: IT based Learning

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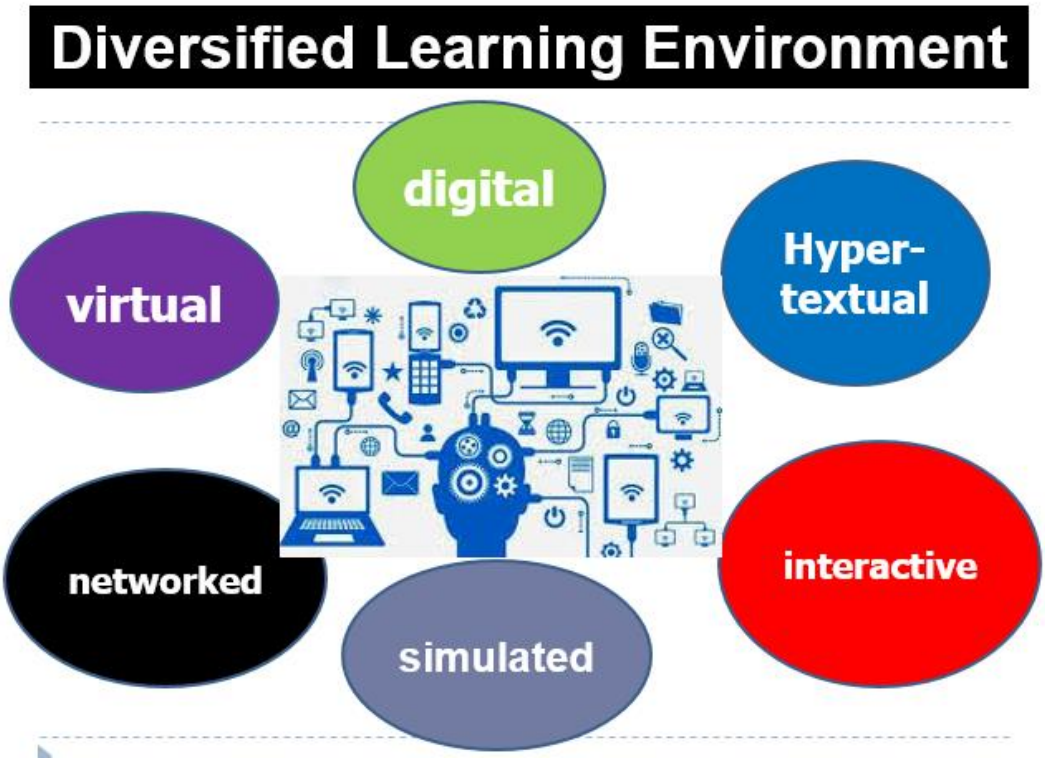
ABSTRACT

The emergence and advancement of ICT has sparked many calls for reform in education with the promises of improving the quality of learning. A number of 21st century learning frameworks have emerged in respond to the calls. This talk summarizes the common dimensions of 21st century learning and reports several case studies that measured students' perception of some aspects of 21st century learning. Challenges that teachers face in designing and implementing the ICT based lesson; and consequently reflecting and refining the learning packages will be discussed. In sum, our experiences of fostering 21st century quality learning reveal the importance of continuous co-construction of knowledge among teachers and researchers through the full cycle of reflective design and implementation.


Diversified Learning Environment
digital
virtual
Hyper-
textual
networked
interactive
simulated

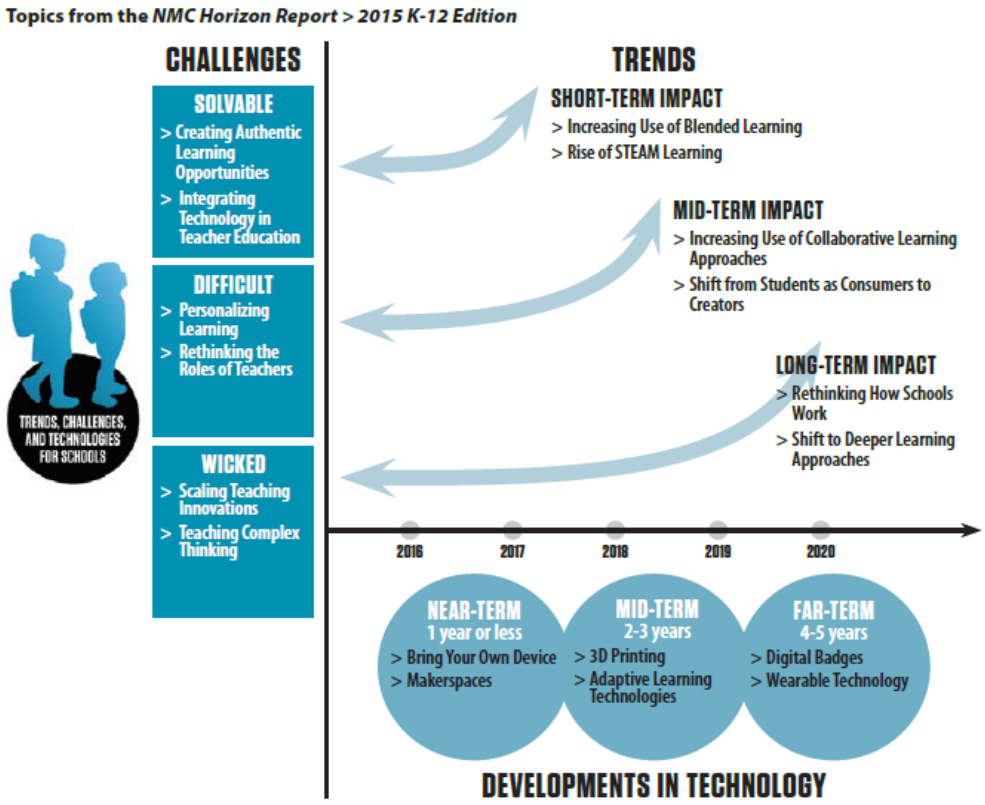
Top Ranked Trends Across Three NMC Horizon Research Projects

Technology Outlook for Singaporean K-12 Education 2012-2017	NMC Horizon Report 2012 K-12 Edition	Technology Outlook for Australian Tertiary Education 2012-2017
Enhanced electronic books are increasingly being used instead of traditional textbooks.	Paradigms in K-12 teaching are shifting to include online learning, hybrid learning and collaborative models.	People expect to be able to work, learn, and study whenever and wherever they want.
The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators.	The abundance of resources and relationships made easily accessible via the Internet is increasingly challenging us to revisit our roles as educators.	Increasingly, students want to use their own technology for learning.
Education paradigms are shifting to include online learning, hybrid learning and collaborative models.	As the cost of technology drops and school districts revise and open up their access policies, it is becoming increasingly common for students to bring their own mobile devices.	Education paradigms are shifting to include online learning, hybrid learning and collaborative models.

MNC Horizon report (2015, K-12)

Two long-term trends: rethinking how schools work in order to bolster student engagement and drive more innovation, as well as shifting to deeper learning approaches, such as project and challenge-based learning.

Bring Your Own Device (BYOD) and makerspaces …increasingly adopted by schools in one year's time or less to make use of mobile learning and cultivate environments where students take ownership of their education by doing and creating.


Topics from the NMC Horizon Report > 2015 K-12 Edition
CHALLENGES
SOLVABLE
> Creating Authentic Learning Opportunities
> Integrating Technology in Teacher Education
DIFFICULT
> Personalizing Learning
> Rethinking the Roles of Teachers
WICKED
> Scaling Teaching Innovations
> Teaching Complex Thinking
TRENDS, CHALLENGES, AND TECHNOLOGIES FOR SCHOOLS
TRENDS
SHORT-TERM IMPACT
> Increasing Use of Blended Learning
> Rise of STEAM Learning
MID-TERM IMPACT
> Increasing Use of Collaborative Learning Approaches
> Shift from Students as Consumers to Creators
LONG-TERM IMPACT
> Rethinking How Schools Work
> Shift to Deeper Learning Approaches
2016
2017
2018
2019
2020
NEAR-TERM
1 year or less
> Bring Your Own Device
> Makerspaces
MID-TERM
2-3 years
> 3D Printing
> Adaptive Learning Technologies
FAR-TERM
4-5 years
> Digital Badges
> Wearable Technology
DEVELOPMENTS IN TECHNOLOGY

Case Studies (Tan, L. ,2009)

Tiffany - The Blog Skin Creator (14 years old). About my interest:
I like to create my own blog skins for fun, using html language and software like Photoshop.

Ronald Toh - The Young Scientist (9 years old) About my interest: I like to read, draw and write about animals and insects. I like creating my own books, cards and games about them. I asked my mom how I could share my works with my friends and she showed me this cool app called Scoop It. You can find out more about it @ http://www.youtube.com/watch?v=Bnr6QKKcsII

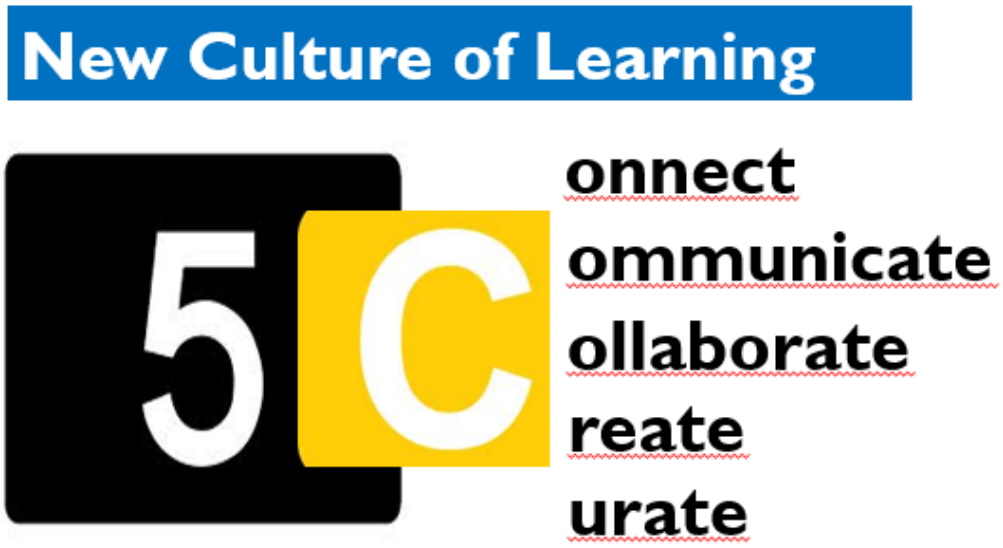
Amanda Tan - The Fan Fiction Writer (14 years old) The longest fan fiction I have written is …… about teenage troubles and romance. .. To date, I have written 21 long chapters and I am happy to receive 75 reviews. I am revising Chapter 22 now. Thanks to my reviewers who have given me wonderful ideas to make Chapter 22 even better!

More cases!

- Five stories from Thomas and Brown (2011), NCoL:
- Sam's story, Thomas Douglas lost his students, Googling the error, gaming across generations, diabetes online support

- 13 cases: https://www.ted.com/playlists/129/ted_under_20

Facets	*Dominant Way of Learning*	*Emerging/New Culture of Learning*
Assumption of learning	**Learning by acquisition**	**Learning by doing (the participatory culture)**
Learning goal	**Pre-determined trajectory**	**Learner-defined trajectory**
Technology Use	**Use technology for content learning （CAI）**	**Use technology to learn about, learn to do and to be (Cognitive tools)**
Targeted Learner	**Focus on the individual (independent learning)**	**Focus on the individual in the collective (collaborative learning; opportunistic collaboration)**
Learning context	**Emphasis on formal learning**	**Emphasis on the fusion of formal and informal learning**
Model of accessing information	**Push model of accessing information**	**Pull model of accessing information**
Instructional model	**Just-in-case instruction**	**Just-in-time instruction**
Curriculum	**Prescribed resources and curriculum**	**DIY media productions/ cognitive artifacts**
Modes of meaning-making	**Emphasis on language-dominant meaning making**	**Emphasis on multiple modes of meaning making**
Teacher-student relationship	**Expert-Novice**	**Participant-Expert**
Literacy model	**Knowledge telling model**	**Progressive knowledge construction**
Sites of learning	**Classroom as an insular knowledge space**	**Classroom as a node in the network of knowledge spaces**

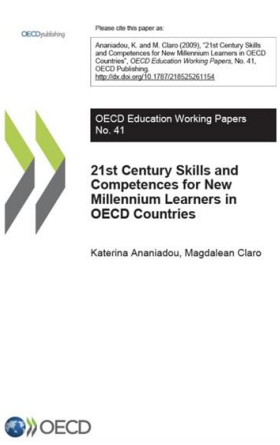


Measuring 21st century Learning

4P model: Perception, Process, Performance, and Product

What are the major frameworks?

iste nets·t
Effective teachers model and apply the NETS·S as they design, implement, and assess learning experiences to engage students and improve learning; enrich professional practice; and provide positive models for students, colleagues, and the community. All teachers should meet the following standards and performance indicators.
1. Facilitate and Inspire Student Learning and Creativity
Teachers use their knowledge of subject matter, teaching and learning, and technology to facilitate experiences that advance student learning, creativity, and innovation in both face-to-face and virtual environments.
2. Design and Develop Digital Age Learning Experiences and Assessments
Teachers design, develop, and evaluate authentic learning experiences and assessment incorporating contemporary tools and resources to maximize content learning in context and to develop the knowledge, skills, and attitudes identified in the NETS·S.
3. Model Digital Age Work and Learning
Teachers exhibit knowledge, skills, and work processes representative of an innovative professional in a global and digital society.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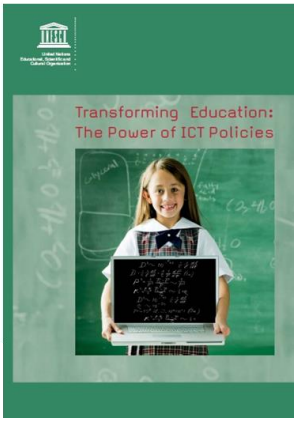
OECD


Transforming Education: The Power of ICT Policies

Strong agreement among the frameworks on these competencies

- Collaboration
- Communication
- ICT literacy
- Social, cultural skills
- Creativity
- Critical thinking
- Problem-solving
- Self-direction
- Learning to learn
- Etc.

Assessing multidimensional students' perceptions of twenty first-century learning practices

Theoretical support

In particular, Biggs (1987) proposed a theoretical framework to understand student learning which includes the presage-process-product (3P) of learning. This model explore the relationship between the individual characteristics, the teaching and learning context (presage factors), the subsequent learning processes stimulated by the context (process factors), and resulting learning outcomes (product factors) in the classroom.

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
Factor 1: self-directed learning (SDL), $M = 3.74$, SD = .89, $\alpha = 0.88$							
SDL1	0.80						
SDL2	0.76						
SDL3	0.73						
SDL4	0.72						
SDL5	0.59						
Factor 2: collaborative learning (CoL), $M = 3.55$, SD = .86, $\alpha = 0.80$							
CoL1		0.75					
CoL2		0.73					
CoL3		0.70					
CoL4		0.62					
CoL5		0.56					
Factor 3: meaningful learning with ICT (MLT), $M = 3.26$, SD = 1.11, $\alpha = 0.88$							
MLT1			0.79				
MLT2			0.76				
MLT3			0.70				
MLT4			0.65				
MLT5			0.64				
Factor 4: critical thinking (CriT), $M = 3.70$, SD = .83, $\alpha = 0.71$							
CriT1				0.72			
CriT2				0.66			
CriT3				0.55			
Factor 5: creative thinking (CreT), $M = 3.51$, SD = .90, $\alpha = 0.82$							
CreT1					0.74		
CreT2					0.73		
CreT3					0.71		
CreT4					0.55		
Factor 6: authentic problem-solving (APS), $M = 3.66$, SD = .92, $\alpha = 0.86$							
APS1						0.78	
APS2						0.73	
APS3						0.71	
APS4						0.64	
APS5						0.63	
Factor 7: knowledge creation efficacy (KCE), $M = 3.53$, SD = .88, $\alpha = 0.83$							
KCE1							0.75
KCE2							0.70
KCE3							0.67
KCE4							0.65
KCE5							0.54
Eigenvalue	11.93	1.38	2.42	1.00	1.06	2.01	1.44
% of Variance	37.28	4.31	7.59	3.13	3.30	6.28	4.50

Total variance explained is 66.39 %; Overall $\alpha = 0.95$

CORRECTED PROOF

Scale	Item	Factor loading	*T* value	CR	AVE
SDL	SDL1	0.83	–	0.85	0.54
	SDL2	0.69	11.33		
	SDL3	0.68	11.11		
	SDL4	0.77	12.90		
	SDL5	0.70	11.49		
CoL	CoL1	0.75	–	0.85	0.53
	CoL2	0.76	11.44		
	CoL3	0.75	11.20		
	CoL4	0.71	10.65		
	CoL5	0.68	10.16		
MLT	MLT1	0.85	–	0.90	0.64
	MLT2	0.86	16.57		
	MLT3	0.84	15.83		
	MLT4	0.67	11.40		
	MLT5	0.75	13.33		
CriT	CriT1	0.78	–	0.77	0.53
	CriT2	0.71	10.73		
	CriT3	0.69	10.38		
CreT	CreT1	0.78	–	0.84	0.56
	CreT2	0.81	12.99		
	CreT3	0.73	11.50		
	CreT4	0.67	10.47		
APS	APS1	0.77	–	0.85	0.53
	APS2	0.68	10.52		
	APS3	0.65	10.04		
	APS4	0.76	11.98		
	APS5	0.78	12.38		
KCE	KCE1	0.79	–	0.87	0.64
	KCE2	0.78	12.82		
	KCE3	0.74	12.12		
	KCE4	0.76	12.40		
	KCE5	0.68	10.95		

CORRELATION

Table 3 Correlations among the seven scales (N = 482)

	SDL	CoL	MLT	CriT	CreT	APS	KCE
SDL	1	0.53**	0.52**	0.58**	0.50**	0.61**	0.51**
CoL		1	0.56**	0.51**	0.50**	0.53**	0.44**
MLT			1	0.50**	0.54**	0.52**	0.53**
CriT				1	0.54**	0.58**	0.52**
CreT					1	0.55**	0.68**
APS						1	0.59**
KCE							1

** p \ 0.01

SEM

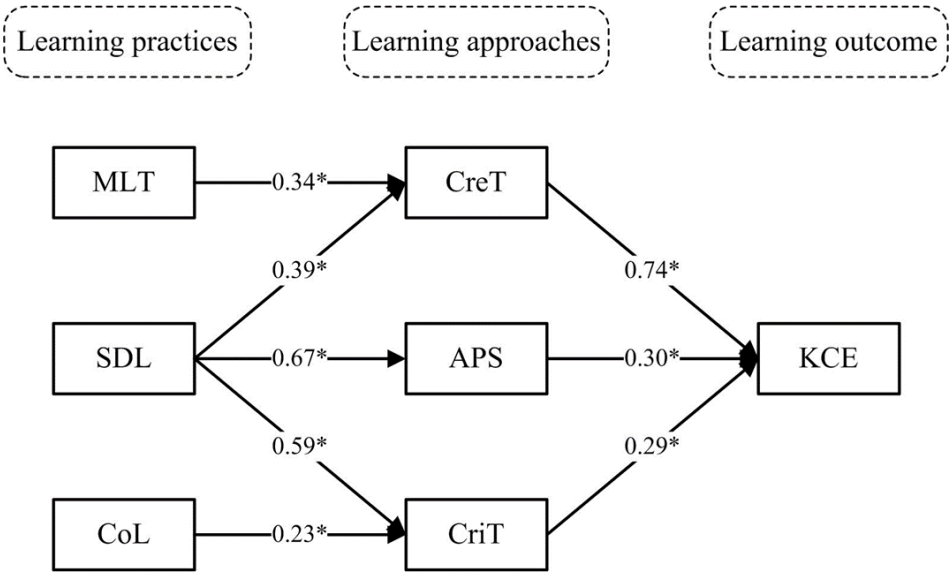
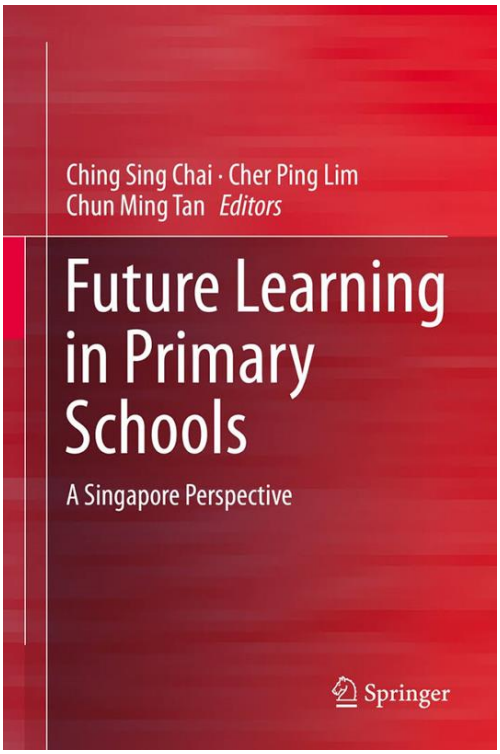


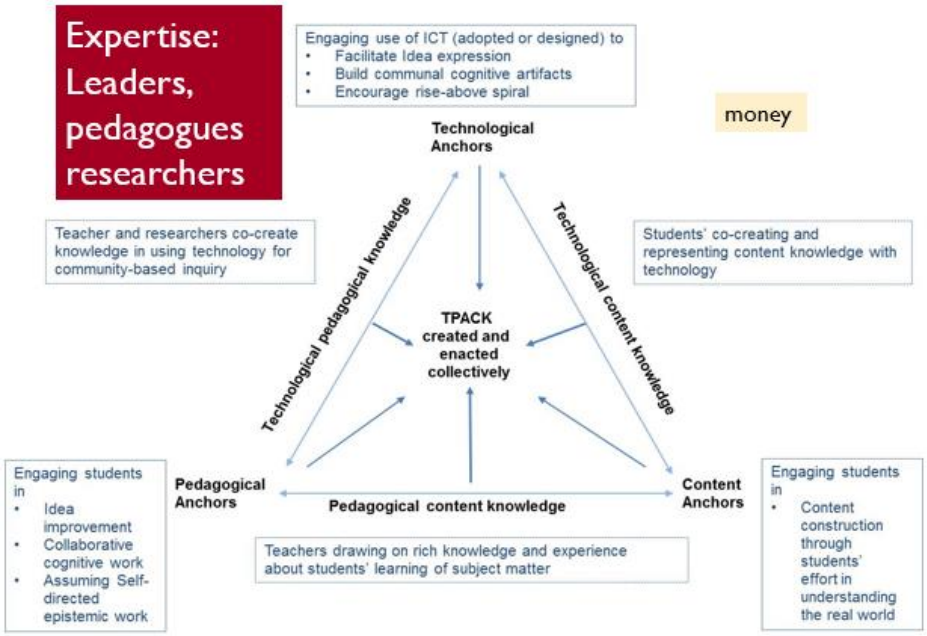
Figure 2. The final model of structural relationships between learning practices, learning approaches, and learning outcomes.

The journey to improved quality learning: Nan Chiau Primary School



- https://books.google.com.sg/books?id=tQe5CgAAQBAJ&printsec=frontcover#v=onepage&q&f=false
- Hard work
- Iterative design

The means to innovate IT based learning



More cases: Social Studies

	Experimental (n =76) vs. Comparison (n =126) classes	Mean	SD	*t*-value	Cohen's d
SDLT	Experimental	5.20	1.30	9.53***	1.42
	Comparison	3.12	1.61		
CLT	Experimental	4.97	1.38	7.79***	1.03
	Comparison	3.27	1.70		
AL	Experimental	5.39	1.45	1.10	0.16
	Comparison	5.15	1.51		
WI	Experimental	4.96	1.47	2.63**	0.38
	Comparison	4.43	1.33		
KC	Experimental	5.26	1.39	3.55***	0.52
	Comparison	4.53	1.44		

QUALITATIVE CONTENT ANALYSIS

Table 6.The distribution of students' notes according toquestion types and answer levels

View		Category	Frequency (%)
First three months	Question types	Basic information questions	84 (57.1%)
		Wonderment questions	63 (42.9%)
	Answer levels	Level 1	93 (93.9%)
		Level 2	5 (5.1%)
		Level 3	1 (1.0%)
		Level 4	0 (0%)
Last three months	Question types	Basic information questions	68 (40.7%)
		Wonderment questions	99 (59.3%)
	Answer levels	Level 1	287 (80.6%)
		Level 2	57 (16.0%)
		Level 3	12 (3.4%)
		Level 4	0 (0%)

More results

- Science: Better in open-ended questions
- Chinese: Growth in vocabularies
- Mathematics: Weaker students progress to the level of stronger students
- English: Stronger perception on critical thinking, creative thinking, oral communication (P2)

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