



Learning and Assessment for
DIGITAL CITIZENSHIP

Funded by HK Research Grants Council under the Theme-
based Research Scheme [Project No. T44-707/16-N]



Faculty of
Education

教育
學院

Assessing digital competence

Nancy Law
University of Hong Kong



Learning and Assessment for
DIGITAL CITIZENSHIP

Assessing digital competence:

Why should we be concerned?



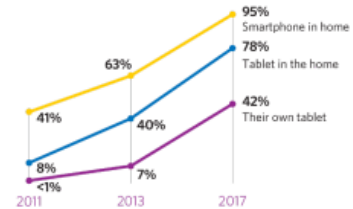
Digital citizenship is the responsible use of technology to learn, create, and participate.

The Digital Landscape by the Numbers

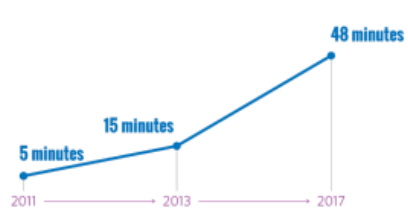
Here is what we know about kids' use of technology.

Kids 0-8

Mobile devices in the home, 2011-2017
Among 0- to 8-year-olds, percent with each device



Mobile media time has tripled—again.
Among 0- to 8-year-olds, average amount of time spent on mobile devices per day



Tweens (8-12) and Teens (13-18)

Tween Daily Screen Time

6 hours

5:55 Total Hours
4:36 Hours of Screen Time

Teen Daily Screen Time

9 hours

8:56 Total Hours
6:40 Hours of Screen Time

Teens think they're being manipulated.

72%

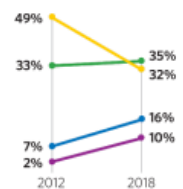
Of teens believe that tech companies manipulate users to spend more time on their devices.



Teens don't value face-to-face communication with friends as much as they used to.

Teens favorite way of communicating, 2012 vs. 2018

- IN PERSON
- TEXTING
- SOCIAL MEDIA
- VIDEO-CHATTING



Sources: (Rideout, 2015); (Rideout, 2017); (Rideout & Robb, 2018)

NEWS & MEDIA LITERACY
We are critical thinkers & creators.

RELATIONSHIPS & COMMUNICATION
We know the power of words & actions.

MEDIA BALANCE & WELL-BEING
We find balance in our digital lives.

CYBERBULLYING, DIGITAL DRAMA & HATE SPEECH
We are kind & courageous.

PRIVACY & SECURITY
We care about everyone's privacy.

DIGITAL FOOTPRINT & IDENTITY
We define who we are.

What is digital competence?

- Digital literacy
- Problem solving
- Computational thinking
- Collaborative problem solving
- Digital citizenship

DIGCOMP 2.0

THE DIGITAL COMPETENCE FRAMEWORK FOR CITIZENS WHY - WHAT - FOR WHOM

Digital society needs digitally-competent citizens

Being digitally competent means using digital technologies in a confident and safe way for various purposes such as working, getting a job, learning, shopping online, obtaining health information, being included and participating in society, entertainment, etc.



DIGCOMP 2.0

THE DIGITAL COMPETENCE FRAMEWORK FOR CITIZENS THE COMPETENCES

Communication and collaboration

-  Interacting through digital technologies
-  Sharing through digital technologies
-  Engaging in citizenship through digital technologies
-  Collaborating through digital technologies
-  Netiquette
-  Managing digital identity




Digital content creation



Developing digital content 


Integrating and re-elaborating digital content 


Copyright and licenses 


Programming 

Information and data literacy




Browsing, searching and filtering data, information and digital content 

Evaluating data, information and digital content 


Managing data, information and digital content 

Problem solving



Solving technical problems 

Identifying needs and technological responses 


Creatively using digital technologies 


Identifying digital competence gaps 

Safety

Protecting devices 

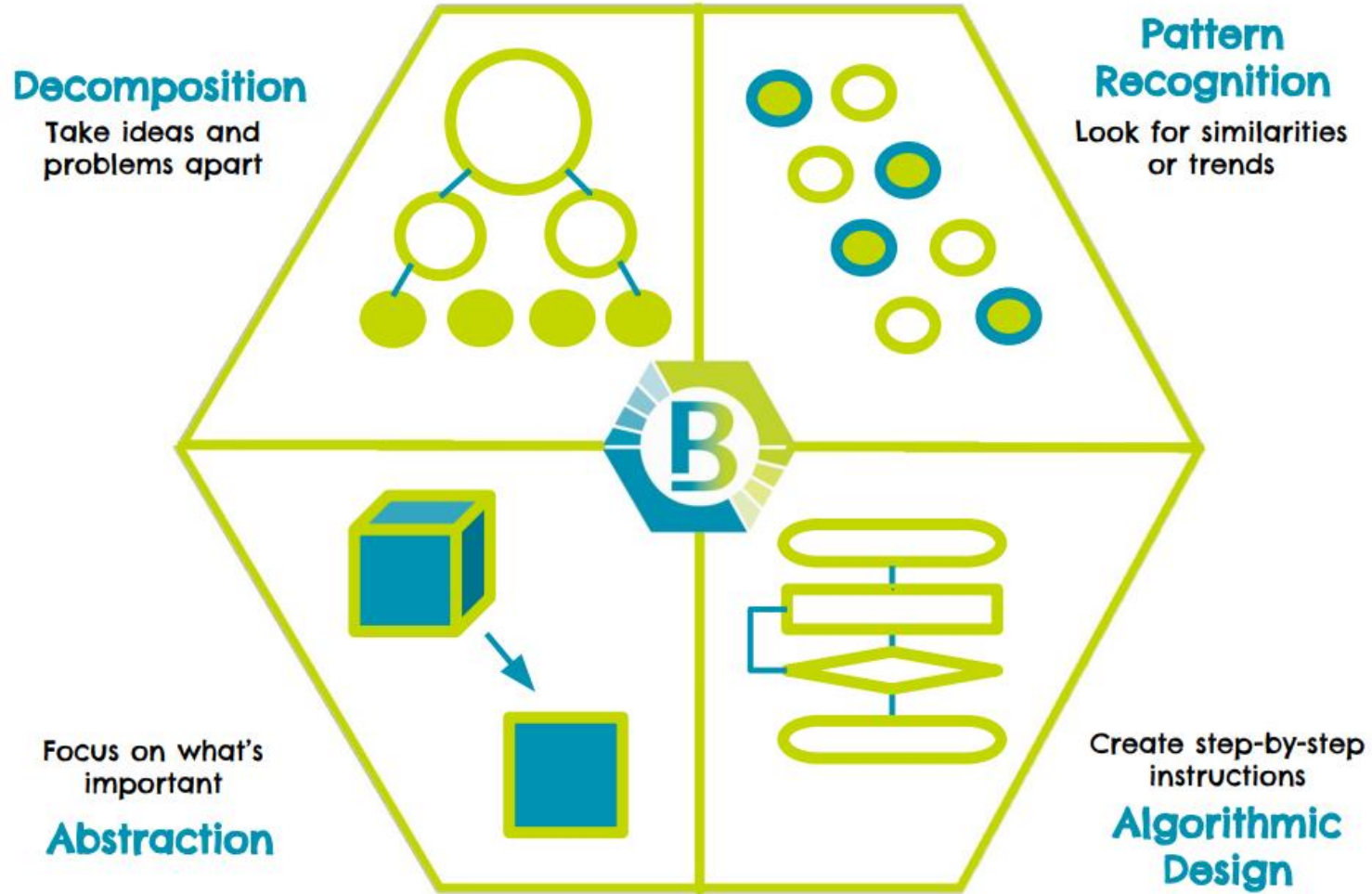
Protecting personal data and privacy 

Protecting health and well-being 

Protecting the environment 



Computational Thinking



Assessment frameworks for collaborative problem solving (CPS)

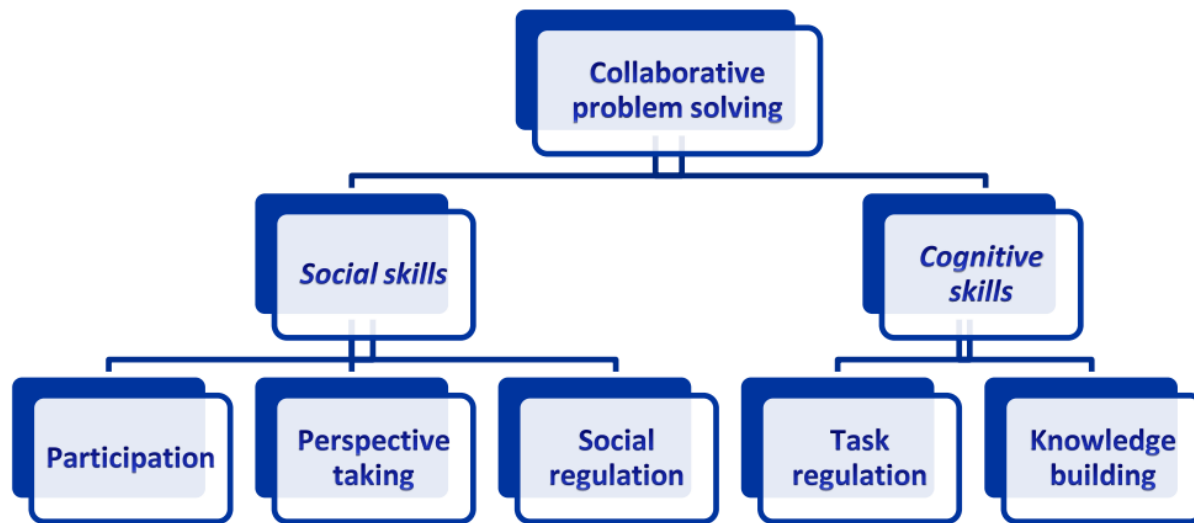
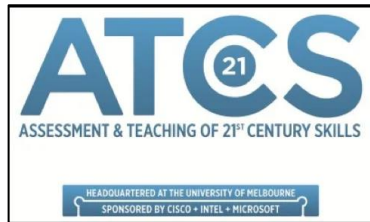


Figure 1. Collaborative problem solving construct (Griffin, Care, & McGav, 2012).

	(1) Establishing and maintaining shared understanding	(2) Taking appropriate action to solve the problem	(3) Establishing and maintaining team organisation
(A) Exploring and Understanding	(A1) Discovering perspectives and abilities of team members	(A2) Discovering the type of collaborative interaction to solve the problem, along with goals	(A3) Understanding roles to solve problem
(B) Representing and Formulating	(B1) Building a shared representation and negotiating the meaning of the problem (common ground)	(B2) Identifying and describing tasks to be completed	(B3) Describe roles and team organisation (communication protocol/rules of engagement)
(C) Planning and Executing	(C1) Communicating with team members about the actions to be/ being performed	(C2) Enacting plans	(C3) Following rules of engagement, (e.g., prompting other team members to perform their tasks.)
(D) Monitoring and Reflecting	(D1) Monitoring and repairing the shared understanding	(D2) Monitoring results of actions and evaluating success in solving the problem	(D3) Monitoring, providing feedback and adapting the team organisation and roles

Social dimension

Cognitive dimension

Digital Citizenship competence



Self-Image & Identity



Relationships & Communication



Digital Footprint & Reputation



Cyberbullying & Digital Drama



Information Literacy



Internet Safety



Privacy & Security



Creative Credit & Copyright

The New Digital Citizenship

Empower Proactive Digital Learners

Digital citizens are learners who use their technology-driven powers conscientiously – and with empathy – to help make the world a better place.

Every digital learner is also a:

- Digital Agent**
 - Leverages technology to solve social problems: 85% of millennials believe they can make their world a better place.
 - Actively influences societal norms: 60% of millennial leaders say social media plays a key role in bringing change.
 - Advocates for equal digital rights and access for all: 97% of teachers say their students don't have the digital tools they need.
- Digital Self**
 - Proactively manages their digital identity and property: 47% of teens say they do everything they can to protect their digital identity.
 - Respects the digital privacy and rights of others: 80% of students believe knowing about intellectual property is important for their future career.
 - Understands the permanence of the digital world: 85% of employers say positive online content influences hiring decisions.
- Digital Interactor**
 - Communicates with empathy via digital channels: 77% of teens say people are less authentic on social media.
 - Collaborates with others to accomplish goals: 90% of questions posed online are answered correctly by peers.
 - Applies critical thinking to all online sources: 80% of students mistake "sponsored content" ads for legit news.

Find more digital citizenship resources on the ISTE Blog at iste.org/blog.

© 2017 International Society for Technology in Education

Sources: CNN2, CoSN, Ed Tech Review, Harvard Business Review, Intellectual Property Office, Microsoft Teen Online Survey, The Millennial Impact Report, Pew Research Center, Stanford University

Is assessing DC different? If so, in what ways?

- Cognitive maturity, development and experience: Do older students necessarily perform better? (e.g. DL)
- Technological advancement, tool familiarity and dependence: Can there be a “fair comparison” of performance ? (e.g. DL)
- Generic competence or technology dependent competence? (e.g. CT)
- Generic competence or context dependent competence? (e.g. problem solving)
- Individual competence or interdependent competence? (e.g. group dynamics & leadership in CPS)

Measuring digital competence

Issues

- **Validity**—measuring what we want to measure
- **Reliability**—stable across measurement contexts

Functions

- Measuring growth, development
- Comparing individuals' aptitude/achievement
- Measuring change over time (cohort)

Challenges (measurement of outcomes as relatively stable latent variables)

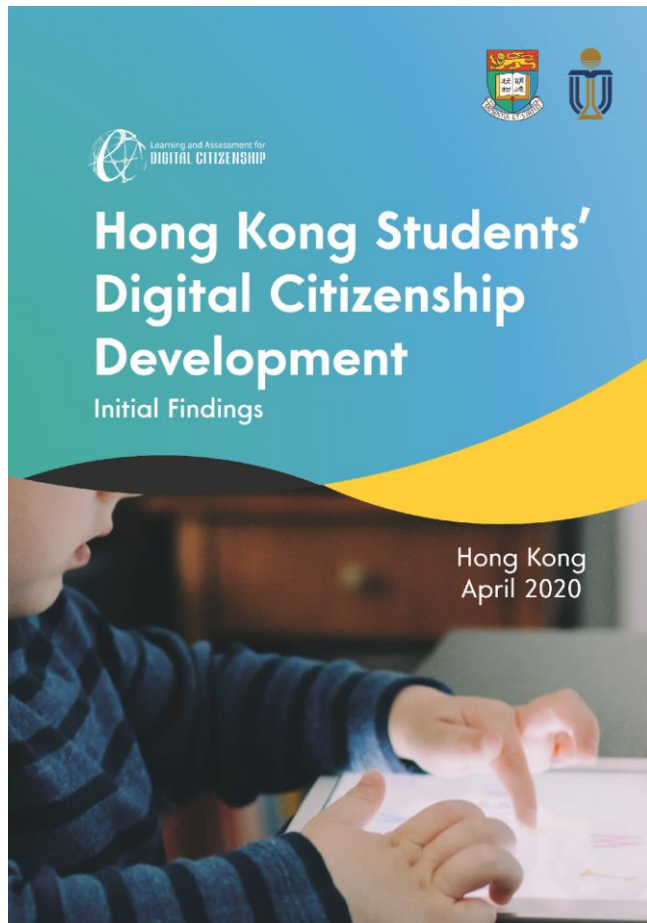
1. Need for technology mediation
 - Technology as non-neutral context affecting definition of assessment framework & indicators
 - Equity—learner experience and exposure to the technology impact on outcomes
2. Context dependence
 - Task and experience of learners
 - Social context—characteristics of others and the social setting
3. Rapid technological and social changes
 - Can population (cohort) achievement be compared/tracked?



Data collection period:
Dec 2018 - Apr 2019

Target students:

- * P3
- * S1
- * S3



What HK students can do

Information and
data literacy

* Simple search, evaluation & organization of information

Communication
and collaboration

* simple, routine communications & sharing digital information

Digital content
creation

* Can use common productivity tools to create, edit, change media

Digital Safety

* Can use simple ways to address risks, protect devices/privacy/ content

Problem solving
using ICT

* Can solve simple device/application problems, e.g. smartphone/bookmark

What HK students cannot do

Information and
data literacy

*Formulate complex search for highly relevant results, evaluate information

Communication
and collaboration

*Adapt communication strategy to context, protect digital identity

Digital content
creation

*Identify media uses that violate intellectual property rights

Digital Safety

* Sophisticated safety measures, e.g. identify safe ways to use USB drives

Problem solving
using ICT

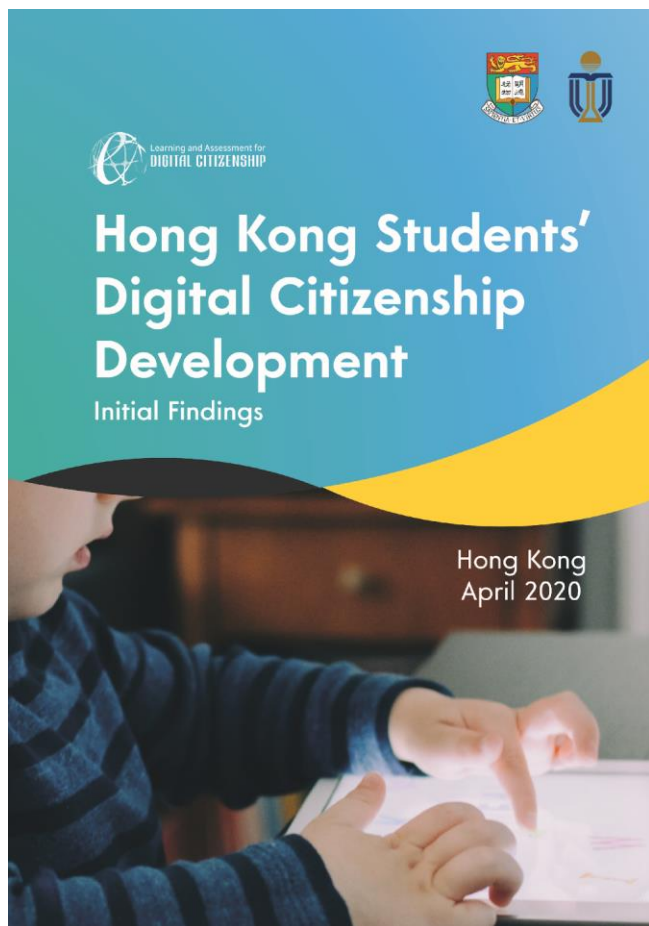
Solve complex device + application problems: e.g. no sound in video



Data collection period:
Dec 2018 - Apr 2019

Target students:

- * P3
- * S1
- * S3



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Computers & Education

journal homepage: <http://www.elsevier.com/locate/compedu>



Measuring digital literacy across three age cohorts: Exploring test dimensionality and performance differences

Kuan-Yu Jin^{a,b}, Frank Reichert^{a,*}, Louie P. Cagasan Jr.^{a,c}, Jimmy de la Torre^a, Nancy Law^a

^a Faculty of Education, The University of Hong Kong, Pok Fu Lam Road, Hong Kong SAR, China

^b Hong Kong Examinations and Assessment Authority, 24B Queen's Road East, Wan Chai, Hong Kong, Hong Kong SAR, China

^c Assessment, Curriculum & Technology Research Centre, UP-CIDS, Ang Bahay ng Alumni, Magsaysay Avenue, University of the Philippines, Diliman, Quezon City, 1104, The Philippines

ARTICLE INFO

Keywords:
Assessment
DigComp
Digital literacy
Gender differences
Item response theory

ABSTRACT

Digital literacy (DL) is an important capacity for students' learning in a rapidly changing world. However, tension exists between the theoretical conceptualizations of DL as a multidimensional construct and empirical studies reporting unidimensional DL scores. Also, little is known about how DL may vary among different age cohorts, and whether and at which age do performance gaps emerge with respect to gender. The focus of this research is to develop a test appropriate for measuring DL performance at different ages and a comprehensive DL assessment framework has been adopted for this purpose. Using data from three age cohorts of students (one from primary schools and two from secondary schools), the dimensionality of DL and performance differences are examined. Comparisons of unidimensional and multidimensional item response models suggest **the measured DL to be a unidimensional construct**. The results also show that secondary school students obtained higher levels of DL compared to primary school students. A gender gap in DL is found among secondary school students. There is also a need for further research to understand through longitudinal studies the emergence of the gender gap in DL performance.



Exploring the structure of digital literacy competence assessed using authentic software applications

**Frank Reichert, Deju (James) Zhang,
Nancy W. Y. Law, Gary K. W. Wong &
Jimmy de la Torre**

**Educational Technology Research
and Development**
A bi-monthly publication of
the Association for Educational
Communications & Technology

ISSN 1042-1629


Education Tech Research Dev
DOI 10.1007/s11423-020-09825-x



RESEARCH ARTICLE



Exploring the structure of digital literacy competence assessed using authentic software applications

Frank Reichert¹  · Deju (James) Zhang² · Nancy W. Y. Law³ · Gary K. W. Wong⁴ · Jimmy de la Torre⁵

Accepted: 10 September 2020

© Association for Educational Communications and Technology 2020

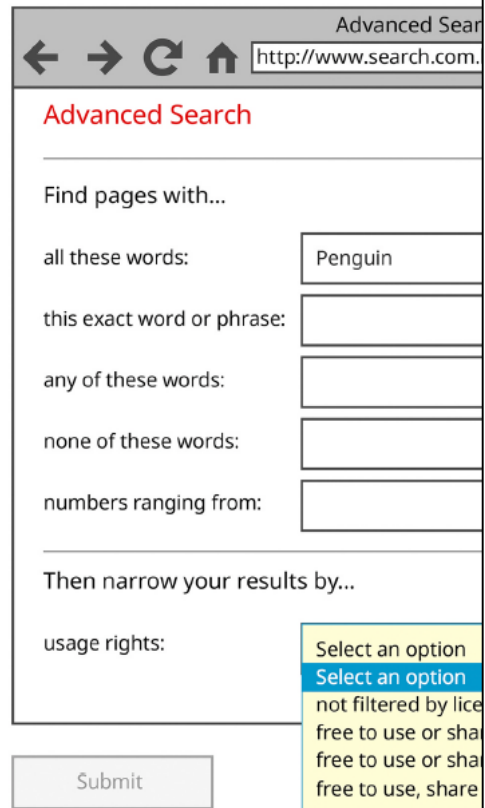
Abstract

Digital literacy competence (DL) is an important capacity for students' learning in a rapidly changing world. However, little is known about the empirical structure of DL. In this paper, we review major DL assessment frameworks and explore the dimensionality of DL from an empirical perspective using assessment data collected using authentic software applications, rather than simulated assessment environments. Secondary analysis on representative data collected from primary and secondary school students in Hong Kong using unidimensional and multidimensional item response theory reveals a general dimension of digital literacy performance and four specific, tool-dependent dimensions. These specific DL dimensions are defined by the software applications that students use and capture commonality among students' performance that is due to their familiarity with the assessment tools and contexts. The design of DL assessment is discussed in light of these findings, with particular emphasis on the influence of the nature of digital applications and environments used in assessment on the DL achievement scores measured.

Keywords Assessment · Authentic software applications · Digital literacy · Purpose-built software · Twenty-first century skills

Different approach to instrument design regarding technology

Joan is looking for pictures of penguins that she can use in her personal blog. She decides to search for copyright-free resources that allow her to edit images suitable for her blog post. Choose the right search option under the "usage rights" so that Joan can achieve what she wants to do.



Advanced Search
http://www.search.com.

Advanced Search

Find pages with...

all these words: Penguin

this exact word or phrase:

any of these words:

none of these words:

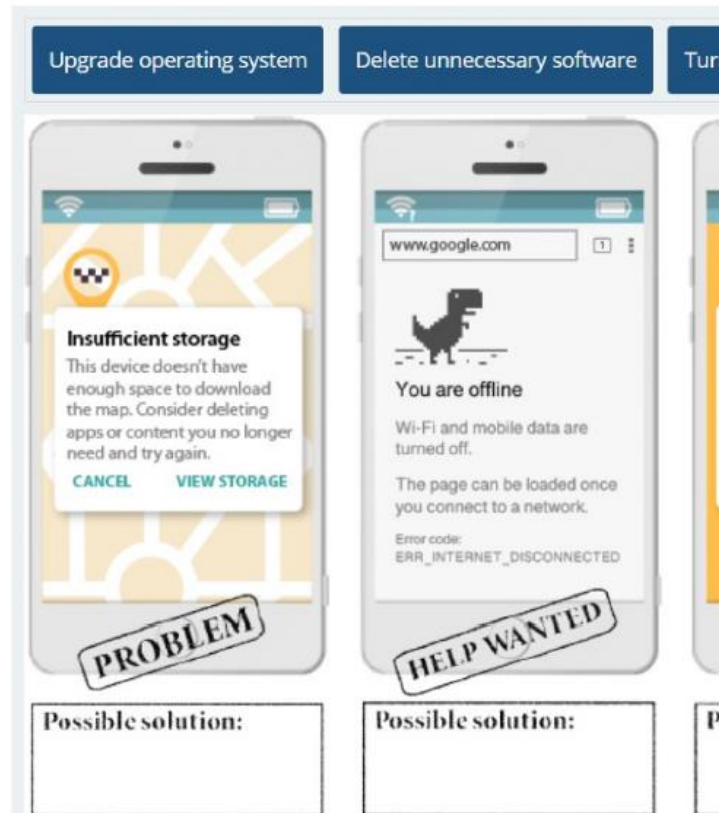
numbers ranging from:

Then narrow your results by...

usage rights: **Select an option**

Submit

Below are three technical problems that could occur when using a mobile phone. **DRAG and DROP** the solutions to the appropriate boxes.



Upgrade operating system Delete unnecessary software Turn

Insufficient storage
This device doesn't have enough space to download the map. Consider deleting apps or content you no longer need and try again.
CANCEL VIEW STORAGE

PROBLEM

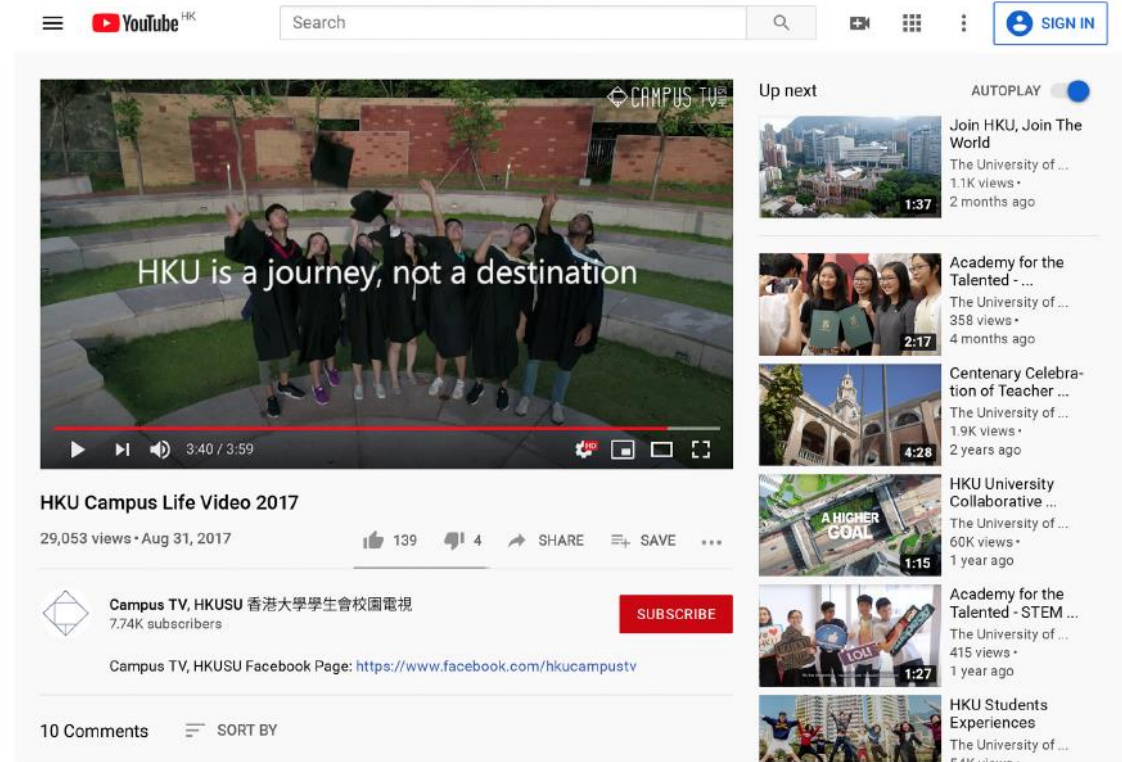
You are offline
Wi-Fi and mobile data are turned off.
The page can be loaded once you connect to a network.
Error code: ERR_INTERNET_DISCONNECTED

HELP WANTED

Possible solution:

Fig. 3. Example of a drag-and-drop item measuring "solving technical p

Jane likes a video about life at university on YouTube and wants to watch other videos from the same channel, Campus TV, HKUSU. Which function will help her to be updated with the latest videos on this channel? Click on the correct part of the screen.



YouTube HK Search SIGN IN

HKU Campus Life Video 2017
29,053 views · Aug 31, 2017

Campus TV, HKUSU 香港大學學生會校園電視
7.74K subscribers

SUBSCRIBE

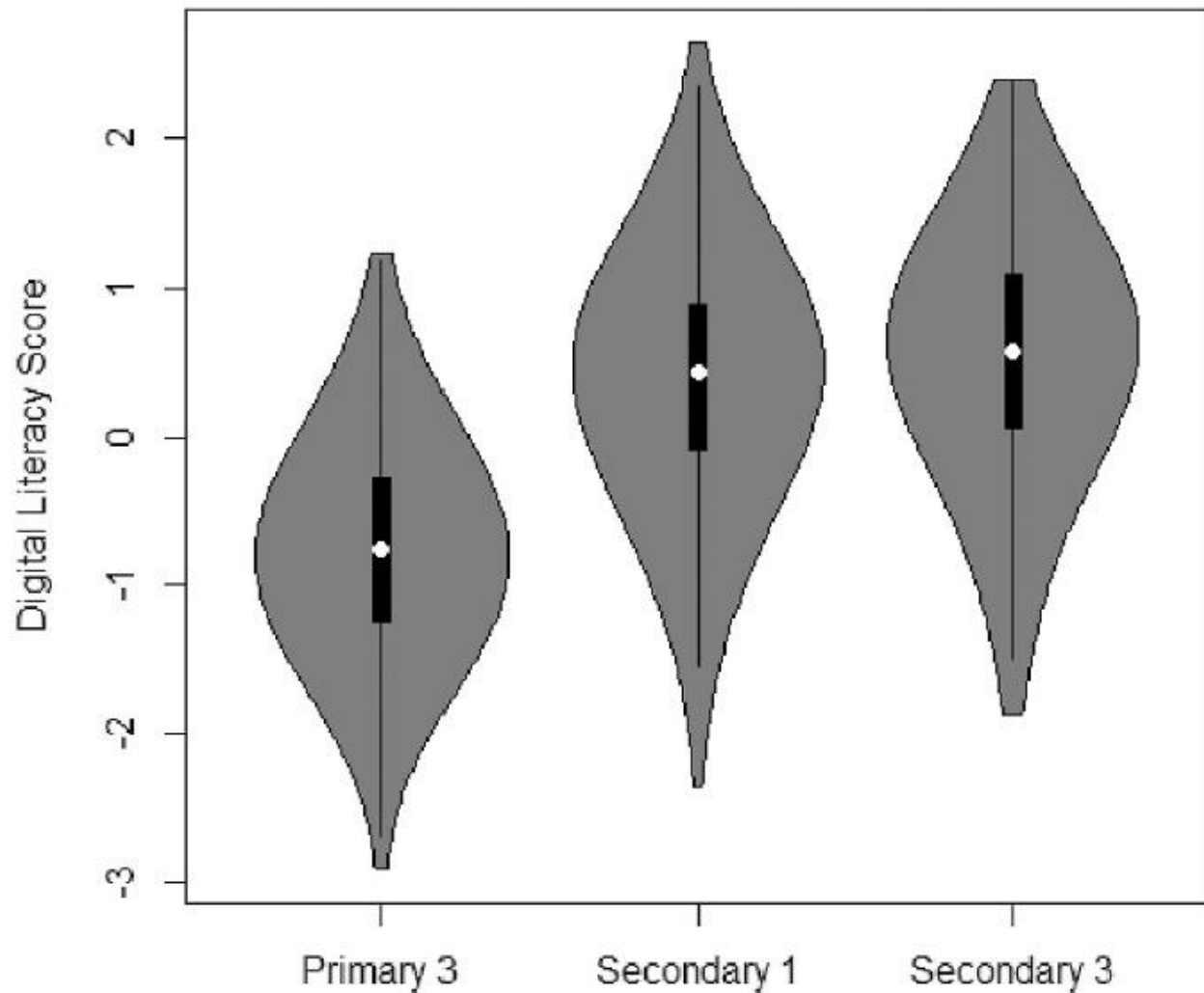
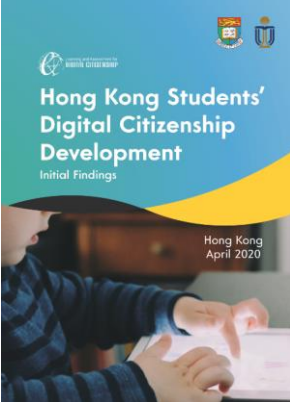
Campus TV, HKUSU Facebook Page: <https://www.facebook.com/hkucampstv>

10 Comments SORT BY

Fig. 5. Example of a click-image item measuring "engaging in citizenship through digital technologies" under digital communication competence. Note. Used with permission from Campus TV, Hong Kong University Students' Union (<https://www.youtube.com/watch?v=s8kMynR1rKg>), and The University of Hong Kong. ©2018 Google LLC, used with permission. All rights reserved. YouTube is a trademark of Google LLC.

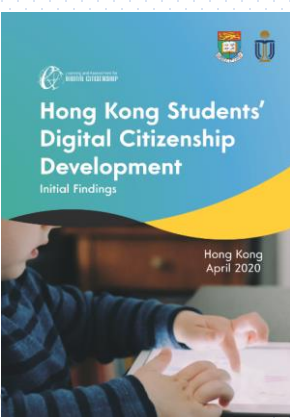
Fig. 2. Example of an item measuring "copyright and licenses" under

Comparing performance of the three age cohorts



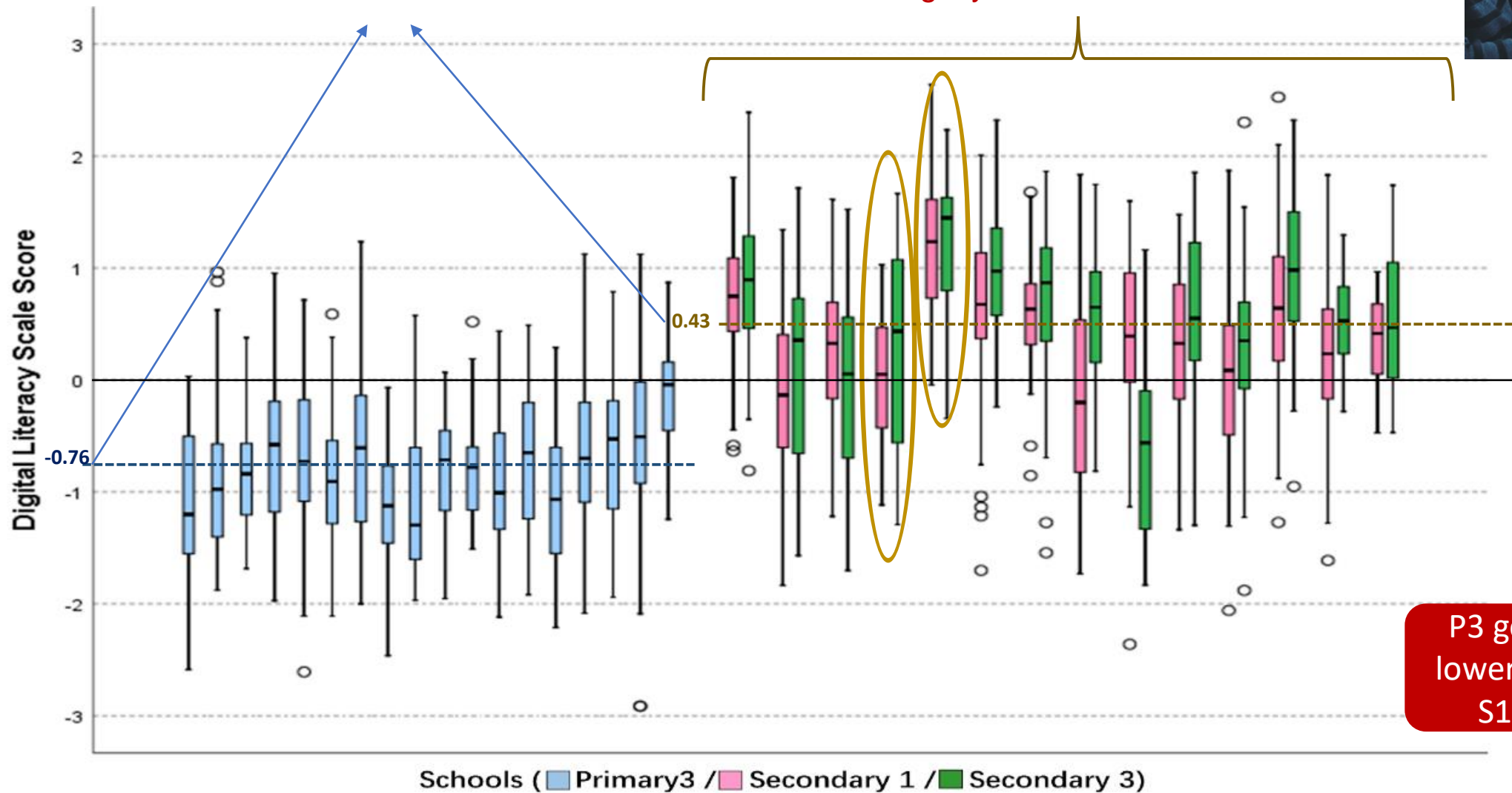
Violin plots showing the spread of students' DL performance across cohorts.

Digital literacy: our findings



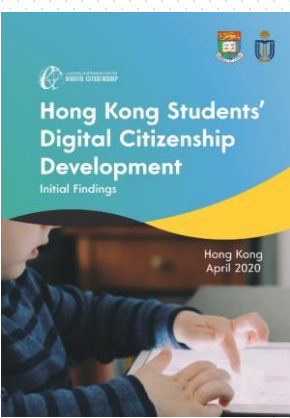
Secondary students perform significantly better than primary students

Overall, S3 students perform only slightly better than S1 students



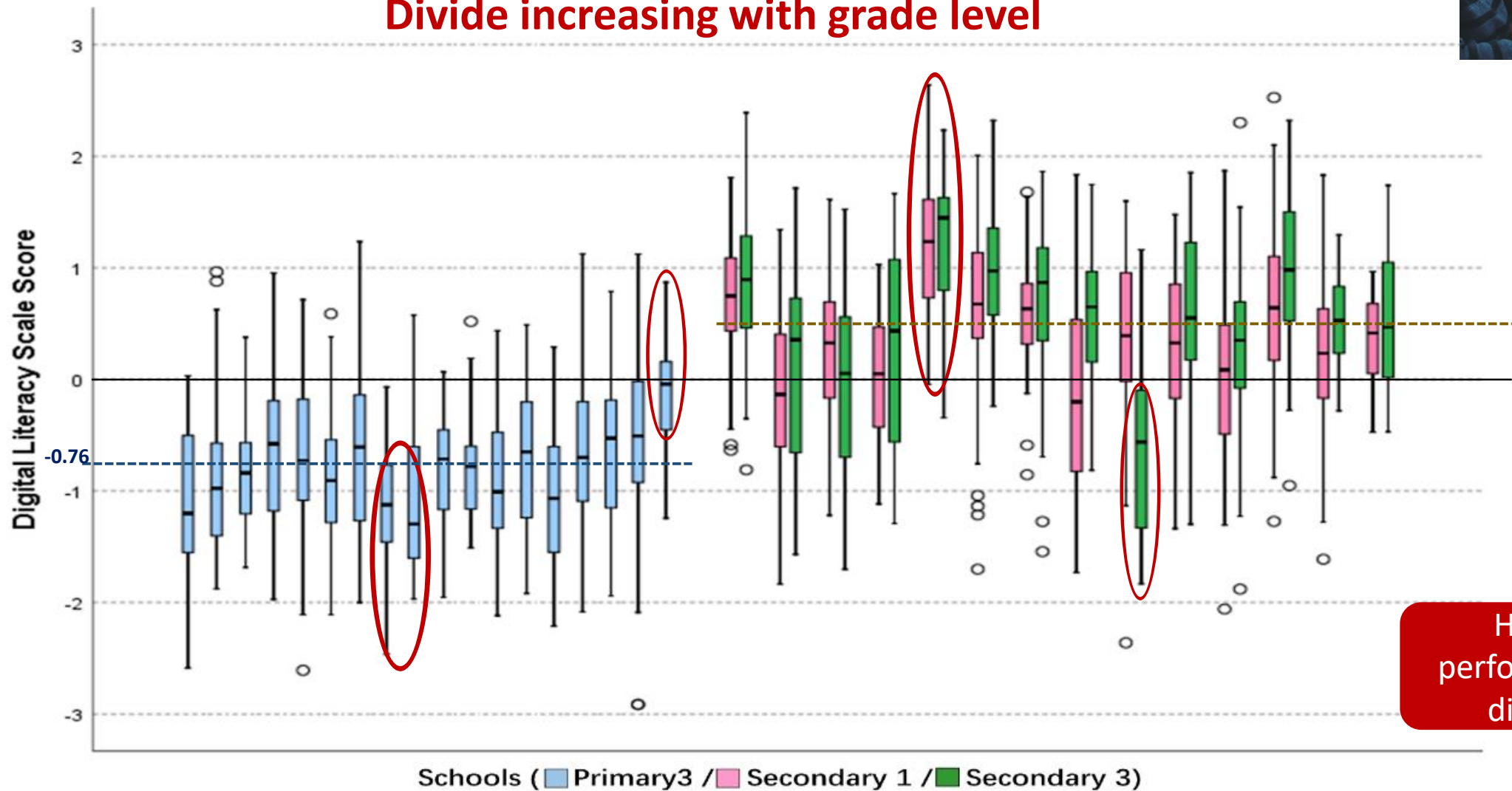
P3 generally lower DL than S1 or S3

Digital literacy: our findings



Digital Literacy performance divide—large *between-school* differences

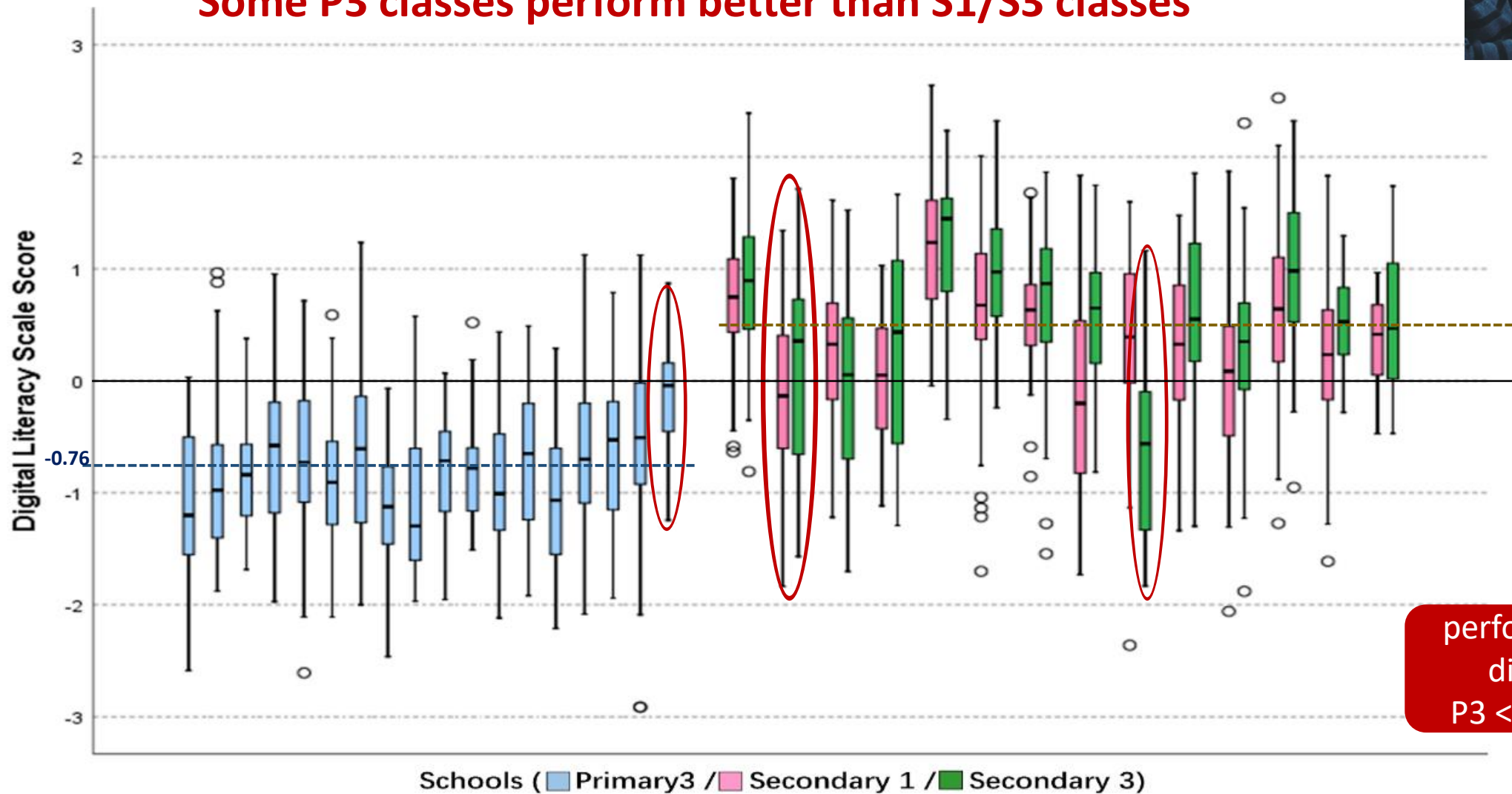
Divide increasing with grade level



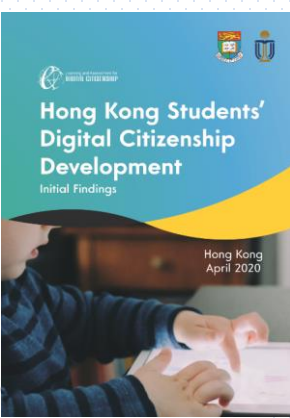
Digital literacy: our findings



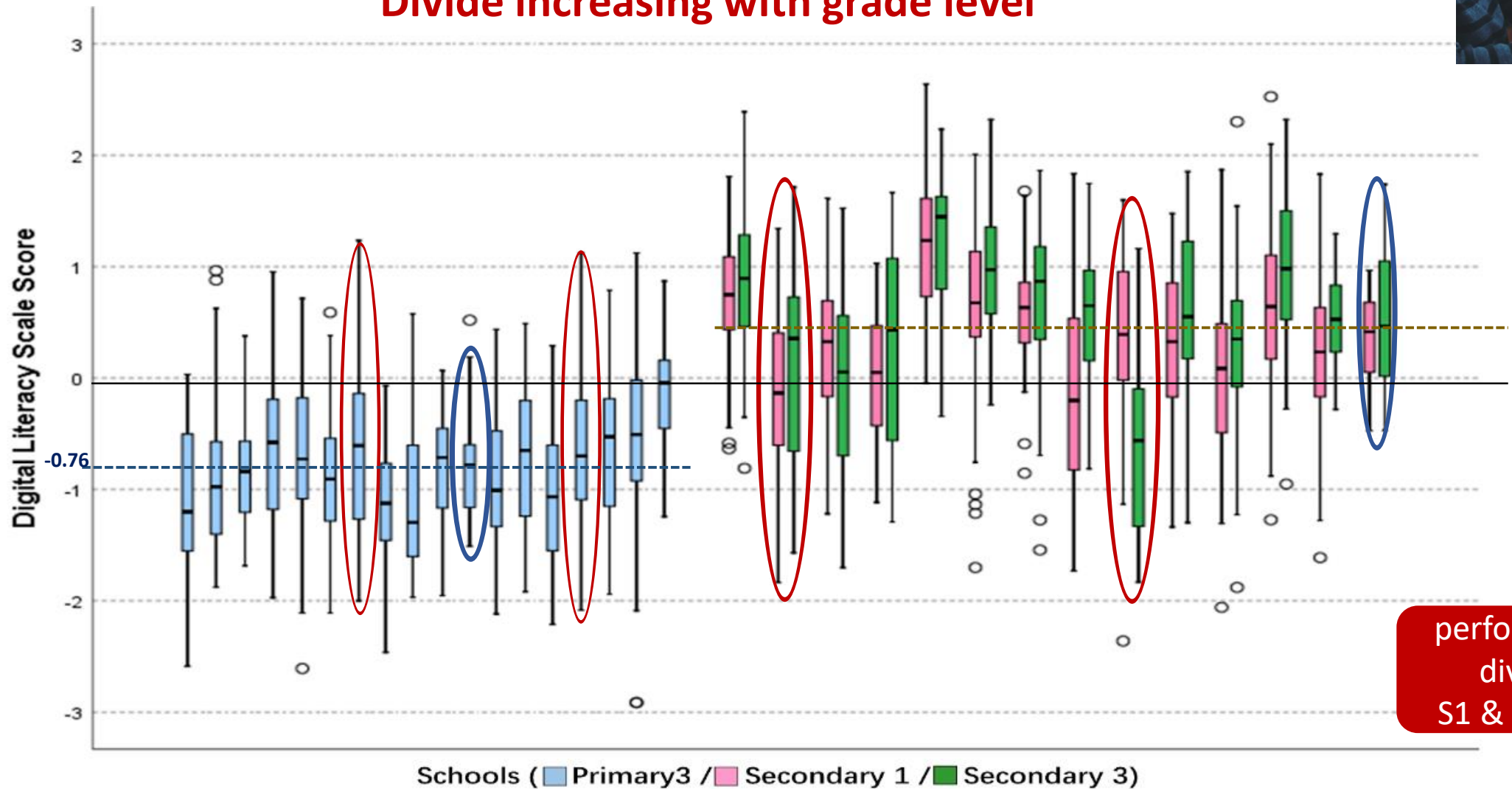
Digital Literacy performance divide—large *between-school* differences
Some P3 classes perform better than S1/S3 classes



Digital literacy: our findings



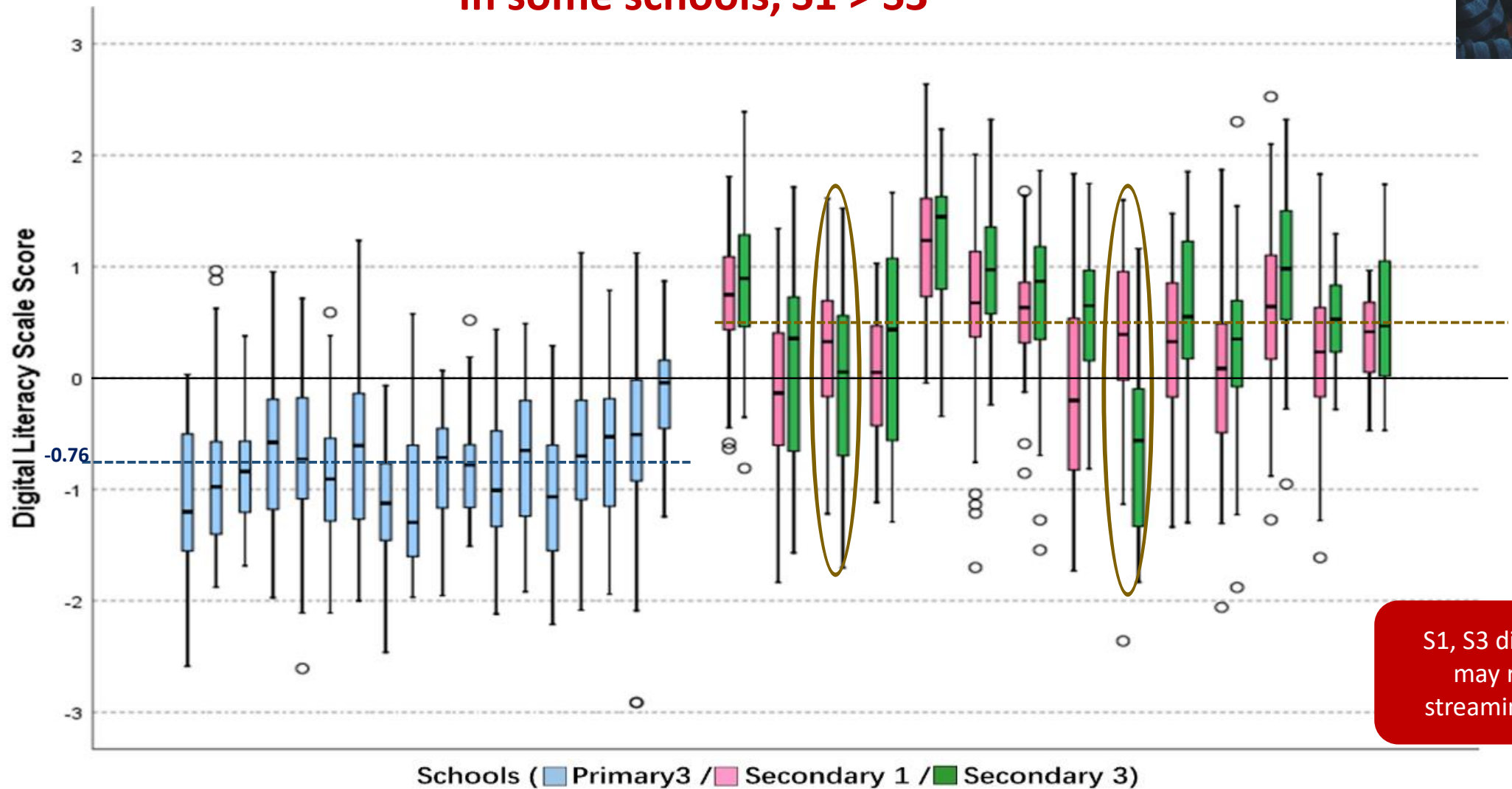
Digital Literacy performance divide—large *within-school* differences
Divide increasing with grade level



Digital literacy: our findings



Digital Literacy performance divide—large *within-school* differences
In some schools, S1 > S3



S1, S3 difference may reflect streaming effect

Global Alliance to Monitor Learning

Digital Literacy Global Framework (DLGF)



Example: Pathways mapping for agriculture (farmers)



Trading using mobile phone



Using smartphone to cut out middlemen



A data-driven irrigation system using Internet-of-things

Global Alliance to Monitor Learning

Digital Literacy Global Framework (DLGF)



Example: Pathways mapping for e-government

IFB Reference No.	Description	Closing date
POLICE/IFB/2018/88	Procurement of...	17/04/2018
POLICE/IFB/2018/91	Procurement of...	17/04/2018
POLICE/IFB/2018/93	Procurement of...	17/04/2018
POLICE/IFB/2018/90	Supply of Fr...	10/04/2018
POLICE/IFB/2018/92	Procurement of...	10/04/2018
POLICE/IFB/2018/89	Supply of W...	27/03/2018
HEALTH/IFB/2018/28	Procurement of...	26/03/2018
HEALTH/IFB/2018/29	Procurement of...	26/03/2018
POLICE/IFB/2018/84	Procurement of...	20/03/2018
POLICE/IFB/2018/87	Procurement of...	27/03/2018

Bidding for government procurement through e-government website

Smart Dubai Government MYID

600 Government Services

دبي الذكية dewa

RTA

MYID

0:28 / 1:41

Applying for single sign-on account to access a range of e-government online services

Global Alliance to Monitor Learning



- Introduction
- Online Consultation
- Competence Descriptors & Glossary
- Executive Summary
- Digital Literacy Use Examples
- Pathway Mapping Methodology
- FAQ
- Project Team
- Final Report



Information Paper No. 51
 June 2018
 UIS/2018/ICT/IP/51

A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2

United Nations Educational, Scientific and Cultural Organization

UNESCO

"Building peace in the minds of men and women"

- IN BRIEF
- WHAT WE DO
- WHERE WE WORK
- PARTNERS
- JOIN US
- RESOURCES

Home > Mobile Learning Week 2020 > Mobile Learning Week 2018

Skills for a connected world

26-30 March 2018
 UNESCO, Paris

Mobile Learning Week 2018

Global Alliance to Monitor Learning

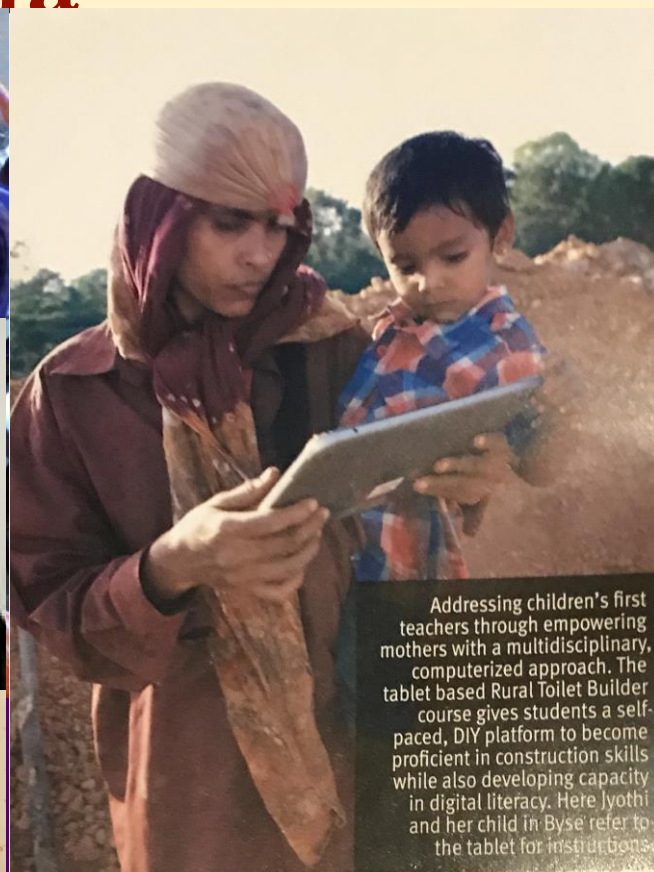
Digital Literacy Global Framework (DLGF)



Example from MLW 2018: Women empowerment in India



Srividya Sheshadri
Research Scholar
Center for Women's Empowerment & Gender Equality
*91 956 770 9598
srividya.sheshadri@ammachilabs.org



Addressing children's first teachers through empowering mothers with a multidisciplinary, computerized approach. The tablet based Rural Toilet Builder course gives students a self-paced, DIY platform to become proficient in construction skills while also developing capacity in digital literacy. Here Jyothi and her child in Byse refer to the tablet for instructions.



Model Based Toilet design, implemented in Byse Village, Karnataka.

Global Alliance to Monitor Learning

Digital Literacy Global Framework (DLGF)

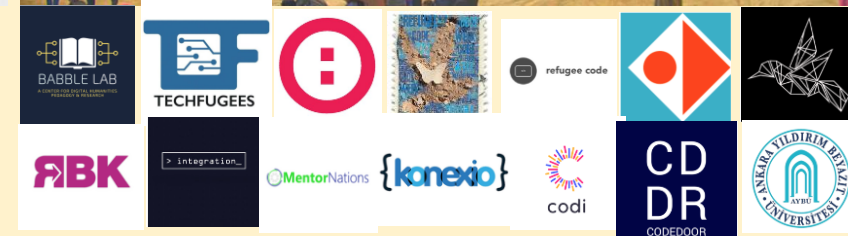


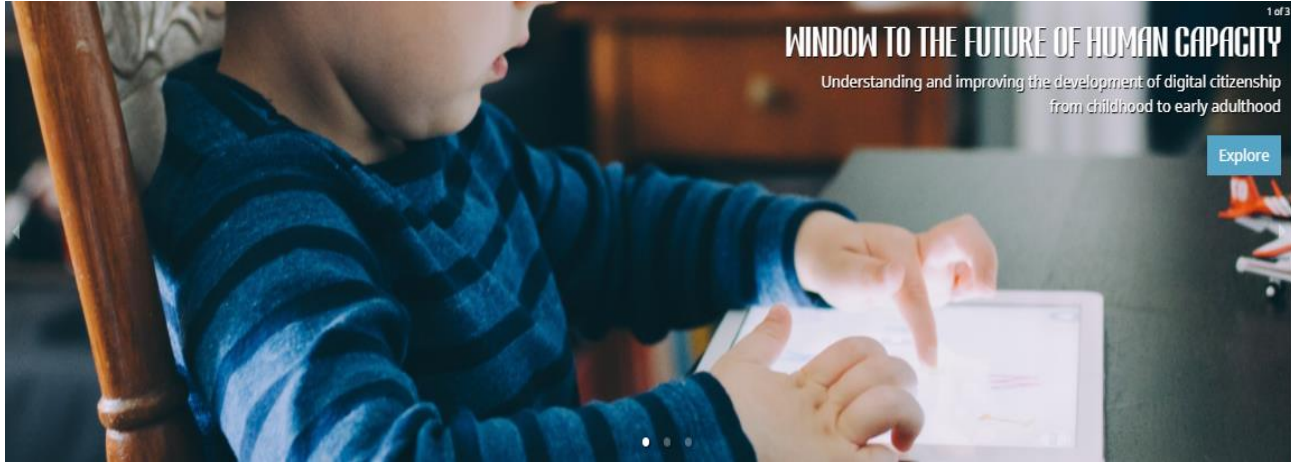
Example from MLW 2018: Supporting refugee learning

Consortium of coding schools

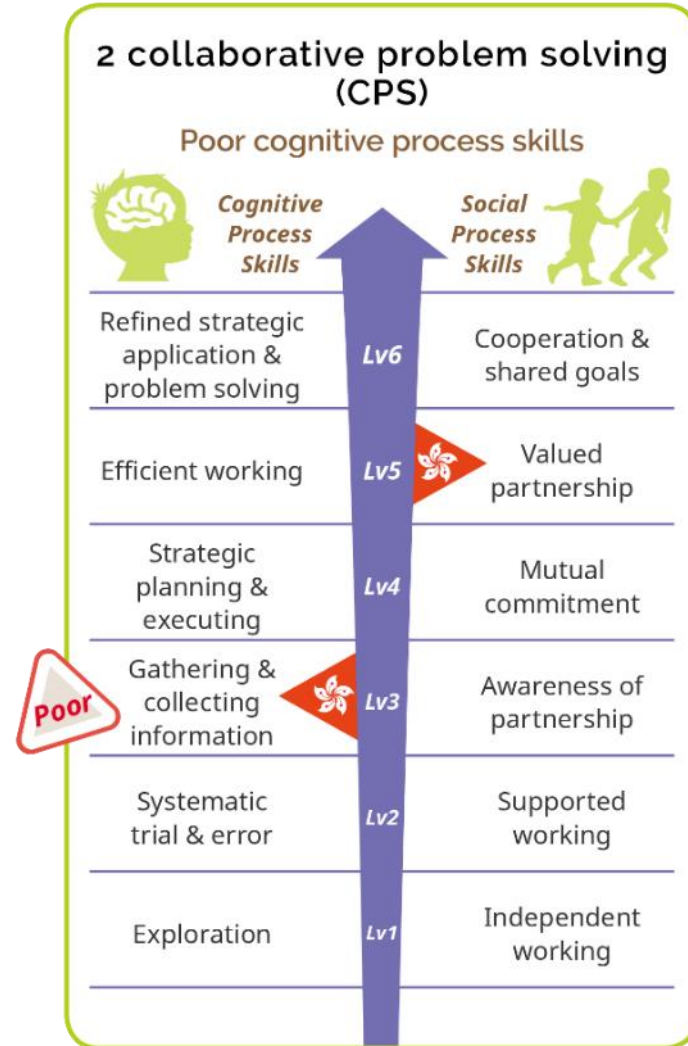


Digital storytelling

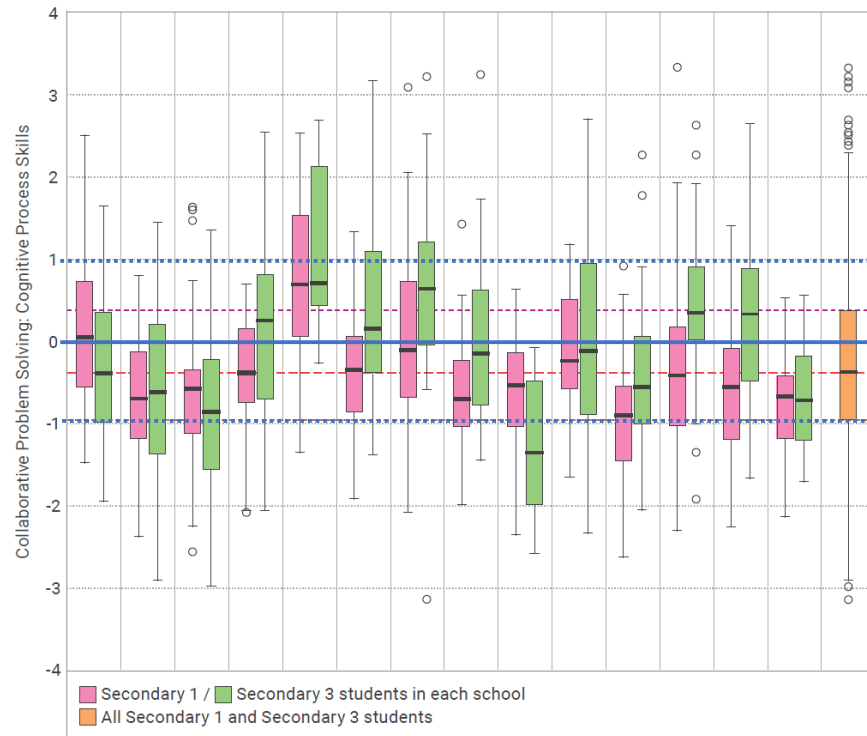
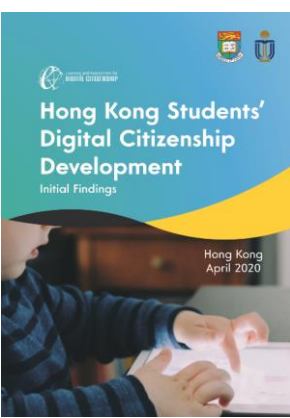




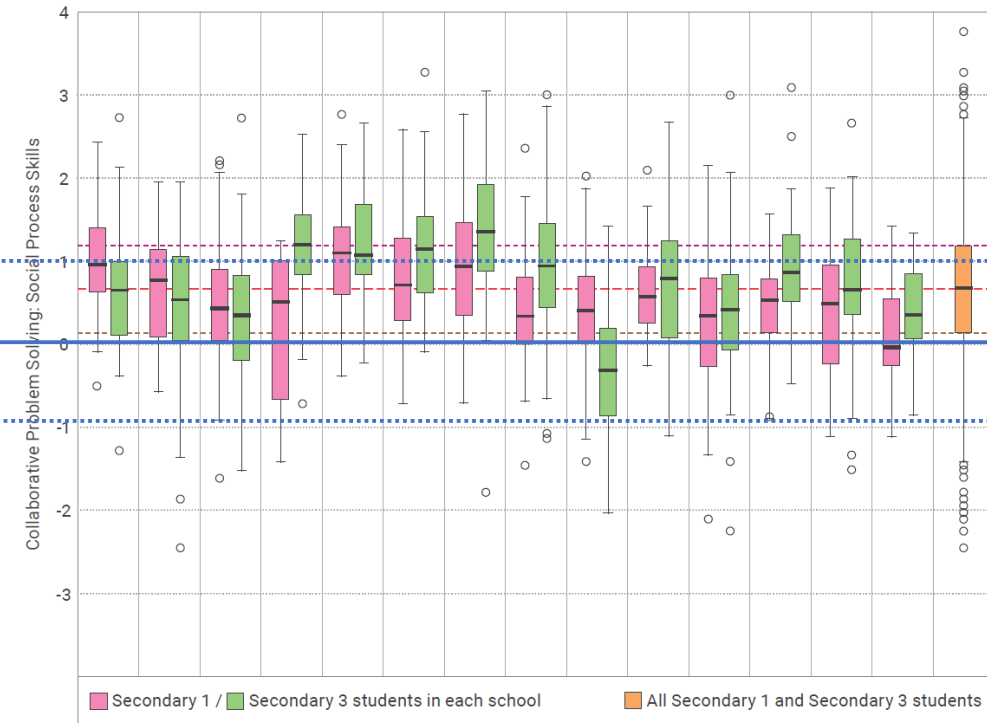
Measuring CPS skills performance of 13- & 15-year-olds in Hong Kong using ATC21S CPS system



CPS achievement measured using ATC21S



Cognitive process skills



Social process skills

Digital Literacy (DL) and ATC21S CPS score:

- DL with cognitive CPS:
r = .35 in S1
r = .40 in S3

- DL with social CPS:
r = .19 in S1
r = .29 in S3



The ATC21S CPS
assessment
framework
(Hesse et al.,
2015, p. 41-52)

The ATC21S CPS assessment framework			
Collaborative problem solving (CPS) skill	(1) Social process skills	(i) Participation skills	(a) Action
			(b) Interaction
			(c) Task completion/perseverance
		(ii) Perspective taking skills	(a) Adaptive responsiveness
			(b) Audience awareness (mutual modelling)
			(a) Negotiation
		(b) Self-evaluation (Metamemory)	
		(c) Transactive memory	
		(d) Responsibility initiative	
	(2) Cognitive process skills	(i) Task regulation skills	(a) Problem analysis
(b) Goal setting			
(c) Resource management			
		(d) Flexibility and ambiguity	
		(e) Information collection	
		(f) Systematicity	
(ii) Learning and knowledge building skills	(a) Relationships (Representations and formulations)		
	(b) Rules: "If...then"		
	(c) Hypothesis "what if..." (Reflection and monitoring)		



PISA 2015 CPS
Assessment
Framework
(OECD, 2017b,
p. 50)

PISA collaborative problem solving competencies				
		(1) Establishing and maintaining shared understanding	(2) Taking appropriate action to solve the problem	(3) Establishing and maintaining team organization
Problem solving process	(a) Exploring and understanding	(a1) Discovering perspectives and abilities of team members	(a2) Discovering the type of collaborative interaction to solve the problem, along with goals	(a3) Understanding roles to solve the problem
	(b) Representing and formulating	(b1) Building a shared representation and negotiating the meaning of the problem (common ground)	(b2) Identifying and describing tasks to be completed	(b3) Describing roles and team organization (communication protocol/rules of engagement)
	(c) Planning and executing	(c1) Communicating with team members about the actions to be/being performed	(c2) Enacting plans	(c3) Following rules of engagement, (e.g. prompting other team members to perform their tasks)
	(d) Monitoring and reflecting	(d1) Monitoring and repairing the shared understanding	(d2) Monitoring results of actions and evaluating success in solving the problem	(d3) Monitoring, providing feedback and adapting the team organization and roles

ATC21S
&
PISA CPS

Differences:

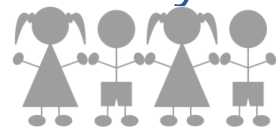
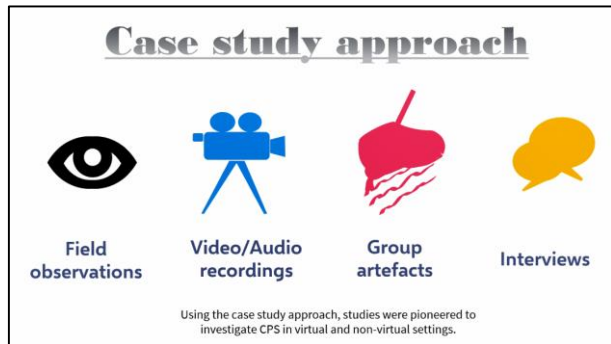
- Human-to-human v.s. human-to-agent
- Jigsaw model v.s. decision tree

Similarities:

- CPS is an individual attribute/capacity
- CPS as a relatively stable, context independent attribute (measurement ideal)–Context: task, social, technological

Exploring assessment of CPS

- Use ATC21S assessment framework
- Investigate CPS in virtual and non-virtual task setting
- Observe both individual and group performance
- Observe group dynamics during problem solving stages
- Study CPS skills of young children (~ 8 to 13 years)



Task context: anti-cyberbullying—recognizing and handling cyberbullying situations



Study 1 (fully open-ended tasks):

- * Open-ended design of learning game (on story board) over 3 Friday mornings
- * Groups of ~4 students, mixed age (8 to 13) & gender grouping , total 44 students
- * **Two groups with children 11 years and older (administered ATC21S CPS)**

Study 2 (compare fully open-ended with structured task):

- * Class of 34 grade 3 students (groups of 4 – 5)
- * Two half-hour tasks
 1. collaborate on an online anti-cyberbullying game
 2. collaborate on improving the game design (on storyboard)

Study 3 (compare effect of task sequencing):

- * 2 groups of grades 4 & 5 students
- * Test effect of prior knowledge:
 - group 1: game play before game design
 - group 2: game design before game play

Study 1 – Research questions

1. How do students' CPS behaviors change over time during a collaboration process?
2. How do group dynamics affect individual & group level performance?
3. How does the CPS scores of individuals assessed through game design task and ATC21S CPS system compare?

Study 1 – Findings

Group A – workshop 2

Skills	Student				Group Total
	GD28	GD29	GD30	GD31	
<i>Cognitive skill</i>	<u>38</u>	<u>28</u>	<u>15</u>	<u>23</u>	<u>104</u>
Learning and knowledge building	6	1	3	3	13
Task regulation	32	27	12	20	91
<i>Social skill</i>	<u>58</u>	<u>46</u>	<u>40</u>	<u>41</u>	<u>185</u>
Participation	60	46	42	41	189
Perspective taking	15	15	8	11	49
Social regulation	-17	-15	-10	-11	-53

Group A – workshop 3

Skills	Student				Group Total
	GD28	GD29	GD30	GD31	
<i>Cognitive skill</i>	<u>25</u>	<u>22</u>	<u>16</u>	<u>52</u>	<u>115</u>
Learning and knowledge building	2	2	1	1	6
Task regulation	23	20	15	51	109
<i>Social skill</i>	<u>68</u>	<u>47</u>	<u>62</u>	<u>82</u>	<u>259</u>
Participation	59	44	55	86	244
Perspective taking	20	19	12	10	61
Social regulation	-11	-16	-5	-14	-46

Group A – overall

Skills	Student				Group Total
	GD28	GD29	GD30	GD31	
<i>ATC21S Cognitive score</i>	<u>-0.46</u>	<u>-0.33</u>	<u>-0.45</u>	<u>-0.19</u>	<u>-1.42</u>
<i>Cognitive skill</i>	<u>63</u>	<u>50</u>	<u>31</u>	<u>75</u>	<u>219</u>
Learning and knowledge building	8	3	4	4	19
Task regulation	55	47	27	71	200
<i>ATC21S social score</i>	<u>0.85</u>	<u>0.94</u>	<u>0.89</u>	<u>1.84</u>	<u>4.52</u>
<i>Social skill</i>	<u>126</u>	<u>93</u>	<u>102</u>	<u>123</u>	<u>444</u>
Participation	119	90	97	127	433
Perspective taking	35	34	20	21	110
Social regulation	-28	-31	-15	-25	-99

Study 1 – Findings

Group B – workshop 2

Skills	Student				Group Total
	GD21	GD22	GD23	GD24	
<i>Cognitive skill</i>	<u>14</u>	<u>5</u>	<u>23</u>	<u>2</u>	<u>44</u>
Learning and knowledge building	0	0	0	0	0
Task regulation	14	5	23	2	44
<i>Social skill</i>	<u>173</u>	<u>128</u>	<u>143</u>	<u>50</u>	<u>494</u>
Participation	160	124	149	49	482
Perspective taking	9	14	3	4	30
Social regulation	4	-10	-9	-3	-18

Group B – workshop 3

Skills	Student				Group Total
	GD21	GD22	GD23	GD24	
<i>Cognitive skill</i>	<u>20</u>	<u>5</u>	<u>21</u>	<u>1</u>	<u>47</u>
Learning and knowledge building	0	0	0	0	0
Task regulation	20	5	21	1	47
<i>Social skill</i>	<u>165</u>	<u>84</u>	<u>102</u>	<u>56</u>	<u>407</u>
Participation	169	85	105	57	416
Perspective taking	1	7	3	0	11
Social regulation	-5	-8	-6	-1	-20

Group B – overall

Skills	Student				Group Total
	GD21	GD22	GD23	GD24	
<i>ATC21S Cognitive score</i>	<u>-1.97</u>	<u>-0.25</u>	<u>-1.31</u>	<u>-0.04</u>	<u>-3.57</u>
<i>Cognitive skill</i>	<u>34</u>	<u>10</u>	<u>44</u>	<u>3</u>	<u>91</u>
Learning and knowledge building	0	0	0	0	0
Task regulation	34	10	44	3	91
<i>ATC21S social score</i>	<u>0.83</u>	<u>0.96</u>	<u>-0.29</u>	<u>0.28</u>	<u>1.78</u>
<i>Social skill</i>	<u>338</u>	<u>212</u>	<u>245</u>	<u>106</u>	<u>901</u>
Participation	329	209	254	106	898
Perspective taking	10	21	6	4	41
Social regulation	-1	-18	-15	-4	-38

Study 1 – Findings

- The CPS behavior of individuals and groups changed over time.
- Group dynamics could affect group performance when students' behaviours and group work products are examined together.
- No correlation between assessment results between Study 1 score and the ATC21S score of individuals.
- Exhibited CPS behavior changes with:
 - The nature of the task
 - The stage of the problem-solving progress
 - The other members' behavioral changes in the group



Learning and Assessment for
DIGITAL CITIZENSHIP

Assessing digital competence:

What do we know about the challenges?

How should we tackle them?

Measuring digital competence

Issues

- **Reliability**—enforce **stability across measurement contexts**
- **Validity**—measuring what **we can measure**

- Does context dependence of performance mean that there is no latent ability underpinning Digital Competence?
- Would it be possible to explore latent ability and its context dependence?
- Is the context dependence of achievement measures a unique feature of digital competence/21st century skills?
- Digital competence can only be realistically reflected through interactions in dynamic situations—Can we use big data & machine learning to address these challenges?

Thank you!

Q&A

<https://ecitizen.hk/>



Learning and Assessment for
DIGITAL CITIZENSHIP



Learning and Assessment for
DIGITAL CITIZENSHIP

What is digital competence

- Digital literacy
- Problem solving
- Computational thinking
- Collaborative problem solving