GENDER DIFFERENCES IN COMPUTER AND INFORMATION LITERACY AND THE USE OF ICT

A thematic report from the IEA International Computer and Information Literacy Study

Eveline Gebhardt, Julian Fraillon, John Ainley, Wolfram Schulz

IEA General Assembly Meeting 57
10–13 October 2016, Oslo, Norway

Report outline

1. Theoretical and Policy Background
2. Students
   - Differences between males and females in CIL performance
   - Differences between males and females in other ICT related variables
3. Teachers
   - Distributions of teacher's gender
   - Teacher's gender by background variables
   - Teacher ICT indices by teacher's gender
   - Integration of ICT by teacher's gender
4. Schools
   - Distributions of principal's gender
   - Principal's gender by school background variables
   - School ICT indices by principal's gender
   - Implementation index by principal's gender
5. Explanatory model by student gender

Research questions

1. To what extent is student gender related to:
   - Achievement in computer and information literacy (CIL)
   - ICT self-efficacy and attitudes to ICT use
   - Patterns of ICT use at home and school
2. To what extent do the relationships between the use of ICT and attitudes to ICT use differ for female and male students
3. To what extent is teacher gender related to:
   - Views of the value of ICT in education
   - ICT self-efficacy
   - Use of ICT in teaching
   - Emphasis on developing CIL
4. To what extent are there differences between male and female teachers in the relationships between:
   - ICT use,
   - emphasis on developing CIL,
   - ICT self-efficacy
   - views of ICT in education

Data

- 21* participating countries in 2013
- ~ 3300 schools
  - PPS sampling
  - One principal and one ICT Coordinator per school
- ~ 60, 000 students
  - Up to 20 students per school randomly sampled from the target grade
- ~ 35, 000 teachers
  - Up to 15 teachers per school randomly sampled all teachers who teach the target grade

ICILS instruments

- **Student test**
  - Four 30 minute modules (each student completes two)
- **Student questionnaire**
  - Background information, computer use in and out of school
- **Teacher questionnaire**
  - Background information, computer use in teaching and attitudes towards computer use in teaching
- **ICT-Coordinator questionnaire**
  - School resourcing for use of ICT in teaching
- **Principal questionnaire**
  - School characteristics and policies for use of ICT in teaching and learning

ICILS measures

- **Student test of computer and information literacy**
  - Standardised to international mean of 500 and international standard deviation of 100
- **Scale scores based on multiple items**
  - Standardised to international mean of 50 and international standard deviation of 10

Students

Student CIL

- Girls students outperform boys
  - Difference is statistically significant in 13 of 14 countries
  - Difference is > 0.1 s.d. in 12 of 14 countries

Student CIL by gender

Country	Males		Females		Difference (M-F)	
Australia	529	(0.9)	554	(0.3)	-24	(1.1)
Chile	474	(0.4)	499	(0.5)	-25	(0.4)
Czech Republic	548	(0.9)	559	(0.7)	-12	(1.1)
Germany	516	(1.0)	532	(0.9)	-16	(1.3)
Croatia	505	(1.7)	520	(0.7)	-15	(1.4)
Korea, Republic of	517	(1.5)	556	(0.3)	-38	(1.5)
Lithuania	486	(0.8)	503	(1.6)	-17	(2.2)
Norway	525	(1.5)	548	(1.0)	-23	(2.2)
Poland	531	(1.1)	544	(0.8)	-13	(1.6)
Russian Federation	510	(1.4)	523	(0.6)	-13	(1.3)
Slovakia	511	(0.6)	524	(1.3)	-13	(0.9)
Slovenia	497	(1.1)	526	(1.1)	-29	(2.1)
Thailand	369	(1.1)	378	(1.9)	-9	(2.5)
Turkey	360	(1.2)	362	(0.8)	-2	(1.6)
ICILS average	**491**	**(1.1)**	**509**	**(1.0)**	**-18**	**(1.6)**

Country in top 20 per cent

Country in bottom 20 per cent

Home access to ICT

- In 8 of 14 countries boys report having more (0.2 – 0.3) computers at home than girls report

Experience using computers

- Internationally and in 10 of 14 countries boys report longer experience (0.2 – 0.6 years) of using computers
- Experience using computers is positively associated with CIL for male (r =0.24) and female (r=0.26)
- The association of experience using computers varies across countries but is largely similar for males and females within countries

Correlations between CIL and ICT experience in years

Country	Males		Females	
Australia	**0.26**	(0.02)	**0.23**	(0.03)
Chile	**0.26**	(0.04)	**0.31**	(0.03)
Czech Republic	**0.14**	(0.03)	**0.15**	(0.02)
Germany	0.05	(0.04)	0.08	(0.05)
Croatia	**0.27**	(0.03)	**0.27**	(0.03)
Korea, Republic of	**0.30**	(0.02)	**0.24**	(0.03)
Lithuania	**0.26**	(0.03)	**0.34**	(0.03)
Norway	**0.15**	(0.03)	**0.17**	(0.04)
Poland	**0.25**	(0.03)	**0.31**	(0.03)
Russian Federation	**0.27**	(0.03)	**0.28**	(0.03)
Slovakia	**0.27**	(0.04)	**0.29**	(0.04)
Slovenia	**0.10**	(0.03)	**0.10**	(0.03)
Thailand	**0.34**	(0.03)	**0.36**	(0.04)
Turkey	**0.40**	(0.03)	**0.45**	(0.03)
ICILS average	**0.24**	**(0.0)**	**0.26**	**(0.0)**

Use of ICT for social communication

- In 9 of 14 countries (and overall) girls reported using ICT for social communication more often than boys
  - (boys in Turkey reported more frequent use)
- but…

Correlations between CIL and use of ICT for social communication

Country	Males		Females	
Australia	0.06	(0.03)	0.04	(0.03)
Chile	**0.20**	(0.03)	**0.13**	(0.04)
Czech Republic	-0.01	(0.04)	**-0.07**	(0.03)
Germany	0.06	(0.04)	-0.07	(0.05)
Croatia	**0.18**	(0.04)	**0.08**	(0.04)
Korea, Republic of	**0.14**	(0.03)	**0.16**	(0.03)
Lithuania	**0.14**	(0.04)	**0.13**	(0.03)
Norway	0.02	(0.03)	0.02	(0.04)
Poland	0.06	(0.03)	**0.08**	(0.03)
Russian Federation	**0.16**	(0.03)	**0.10**	(0.04)
Slovakia	**0.10**	(0.04)	**0.09**	(0.04)
Slovenia	0.04	(0.03)	0.04	(0.03)
Thailand	**0.25**	(0.03)	**0.31**	(0.04)
Turkey	**0.23**	(0.04)	**0.26**	(0.04)
ICILS average	**0.12**	(0.03)	**0.09**	(0.04)

Use of ICT for recreation and study

	Boys report more frequent use (countries)	Girls report more frequent use (countries)	No difference in use (countries)	International difference significant
Recreation	6	3	5	No
Study	0	8	6	Yes (Girls)

Use of ICT for recreation and study

	Boys		Girls	
	Significant correlation with CIL (countries)	Significant correlation with CIL internationally	Significant correlation with CIL (countries)	Significant correlation with CIL internationally
Recreation	12	Yes	11	Yes
Study	4	No	5	No

Student ICT self-efficacy

BASIC ICT SELF-EFFICACY

- Search for and find information you need on the Internet
- Search for and find a file on your computer
- Create or edit documents (for example assignments for school)
- Upload text, images or video to an online profile
- Edit digital photographs or other graphic images
- Create a multi-media presentation (with sound, pictures, or video)

ADVANCED ICT SELF-EFFICACY

- Use software to find and get rid of viruses
- Create a database
- Build or edit a webpage
- Change the settings on your computer to improve the way it operates or to fix problems
- Use a spreadsheet to do calculations, store data or plot a graph
- Create a computer program or macro
- Set up a computer network

Basic ICT self-efficacy

- Little difference in basic ICT efficacy between boys and girls
- Positive association with achievement among countries

Correlations between CIL and basic ICT self-efficacy

Country	Males		Females	
Australia	0.38	(0.03)	0.34	(0.03)
Chile	0.37	(0.03)	0.32	(0.03)
Czech Republic	0.24	(0.03)	0.21	(0.03)
Germany	0.23	(0.04)	0.19	(0.04)
Croatia	0.37	(0.03)	0.30	(0.04)
Korea, Republic of	0.42	(0.02)	0.40	(0.03)
Lithuania	0.35	(0.03)	0.41	(0.03)
Norway	0.22	(0.04)	0.27	(0.03)
Poland	0.33	(0.02)	0.34	(0.03)
Russian Federation	0.30	(0.02)	0.26	(0.03)
Slovakia	0.36	(0.03)	0.38	(0.03)
Slovenia	0.30	(0.03)	0.24	(0.03)
Thailand	0.27	(0.03)	0.32	(0.03)
Turkey	0.36	(0.04)	0.38	(0.03)
ICILS average	**0.32**	**(0.03)**	**0.31**	**(0.03)**

Country in top 20 per cent

Country in bottom 20 per cent

Advanced ICT self-efficacy

- Boys expressed higher advanced ICT self-efficacy in all 14 countries
- Association with CIL not as high as for basic ICT self-efficacy

Correlations between CIL and advanced ICT self-efficacy

Country	Males		Females	
Australia	**0.10**	(0.03)	0.05	(0.03)
Chile	**0.10**	(0.03)	**-0.06**	(0.03)
Czech Republic	0.04	(0.03)	0.04	(0.03)
Germany	0.05	(0.03)	-0.04	(0.04)
Croatia	**0.18**	(0.03)	**0.09**	(0.04)
Korea, Republic of	**0.20**	(0.03)	**0.16**	(0.03)
Lithuania	**0.12**	(0.03)	**0.09**	(0.03)
Norway	0.01	(0.04)	-0.05	(0.04)
Poland	**0.12**	(0.03)	0.04	(0.03)
Russian Federation	**0.08**	(0.02)	-0.02	(0.03)
Slovakia	**0.11**	(0.04)	**0.06**	(0.03)
Slovenia	0.03	(0.04)	0.02	(0.03)
Thailand	0.05	(0.04)	-0.04	(0.04)
Turkey	**0.24**	(0.05)	**0.17**	(0.04)
ICILS average	**0.10**	(0.03)	**0.04**	(0.03)

Country in top 20 per cent

Country in bottom 20 per cent

Teachers

Teacher gender and age

- 71% of all teachers were female
  - Max 84%
  - Min 54%
- Mean age male and female teachers 43 years
- Positive association (0.86) between percentage of female teachers and mean teacher age of female teachers across countries

Teachers' ICT self efficacy

- Measured using a set of items dealing with computer use (applications) and capacity to use ICT in teaching
- Currently working with a single factor, however, will also explore dimensions in ICT self efficacy
  - Basic operational skills
  - Advanced operational skills and collaboration
  - Using computers for instructional purposes

  (e.g. Scherer and Siddiq, 2015)

Teacher ICT self-efficacy

Country	Males		Females		Difference (M-F)	
Australia	55	(0.3)	54	(0.3)	1.5	(0.4)
Chile	53	(0.6)	51	(0.4)	1.5	(0.7)
Czech Republic	54	(0.5)	48	(0.3)	5.5	(0.6)
Croatia	50	(0.6)	47	(0.4)	3.0	(0.7)
Korea, Republic of	53	(0.6)	53	(0.2)	0.6	(0.5)
Lithuania	51	(0.8)	50	(0.3)	0.8	(0.9)
Poland	54	(0.6)	51	(0.3)	3.2	(0.6)
Russian Federation	46	(0.9)	50	(0.4)	-3.2	(0.9)
Slovakia	52	(0.6)	49	(0.2)	2.1	(0.7)
Slovenia	54	(0.6)	49	(0.3)	5.4	(0.6)
Thailand	44	(0.9)	45	(0.7)	-0.9	(1.1)
Turkey	49	(0.5)	48	(0.6)	1.5	(0.5)
ICILS average	**51.3**	**(0.6)**	**49.5**	**(0.4)**	**1.8**	**(0.7)**

Country in top 20 per cent

Country in bottom 20 per cent

Teachers' positive views of ICT in education

- Internationally there was no difference between positive views of female and male teachers in their positive views of ICT in education
  - In 7 countries male teachers expressed more positive views than female teachers
  - In no country did female teachers express more positive views than male teachers

Positive views on using ICT in teaching and learning

Country	Males		Females		Difference (M-F)	
Australia	48	(0.4)	48	(0.4)	-0.7	(0.6)
Chile	56	(0.6)	55	(0.6)	0.4	(0.8)
Czech Republic	48	(0.5)	47	(0.3)	1.0	(0.6)
Croatia	49	(0.4)	47	(0.3)	**1.9**	(0.6)
Korea, Republic of	50	(0.8)	47	(0.3)	**2.2**	(0.9)
Lithuania	50	(0.5)	49	(0.2)	**1.2**	(0.5)
Poland	51	(0.5)	49	(0.3)	**1.8**	(0.5)
Russian Federation	50	(0.9)	50	(0.3)	-0.1	(0.8)
Slovakia	48	(0.5)	47	(0.3)	**1.2**	(0.5)
Slovenia	48	(0.4)	47	(0.3)	**1.2**	(0.5)
Thailand	57	(0.8)	56	(0.9)	1.0	(0.9)
Turkey	55	(0.5)	54	(0.6)	**1.5**	(0.8)
ICILS average	**50.8**	(0.6)	**49.7**	(0.4)	**1.0**	(0.7)

Country in top 20 per cent

Country in bottom 20 per cent

Teachers' frequency of use of ICT in teaching

- Internationally no difference between female and male teachers in the frequency of use of ICT in teaching but
  - In 5 countries female teachers reported using ICT in teaching more frequently than did male teachers
  - In 3 countries male teachers reported using ICT in teaching more frequently than did female teachers

Teachers' emphasis on developing ICT skills in the reference class

- Internationally no difference between female and male teachers in the emphasis placed on developing ICT skills but
  - In 7 of 12 countries female teachers reported providing greater emphasis than male teachers
  - In no countries male teachers reported providing greater emphasis than female teachers

Principals and schools

Principals

- 45% of all principals were female
  - Max 76%
  - Min 8%
- In 6 of 14 countries fewer than 50% of principals were female

Principals and schools

- Principals and ICT-Coordinators were asked about school policies and resourcing relating to CIL education
- There were very few differences associated with the gender of the principal among countries and no significant differences at the international level
- Only positive views on the use of ICT to develop educational outcomes showed variation among countries

Principal's view on using ICT for educational outcomes by gender

Country	Males		Females		Difference (M-F)	
Australia	↑ 55.6	(0.7)	↑ 56.4	(0.8)	-0.8	(1.0)
Chile	↑ 54.5	(1.0)	55.5	(1.0)	-0.9	(1.4)
→ Czech Republic	45.2	(1.2)	48.4	(1.0)	-3.2	(1.5)
Germany	↓ 42.7	(1.2)	↓ 42.4	(3.0)	0.3	(3.2)
→ Croatia	↓ 43.7	(1.6)	49.0	(1.5)	-5.3	(1.9)
Korea, Republic of	53.9	(1.7)	53.0	(1.3)	0.9	(2.2)
Lithuania	49.7	(2.2)	49.4	(0.8)	0.3	(2.5)
Norway	49.0	(1.7)	48.5	(3.7)	0.5	(4.0)
→ Poland	46.9	(1.3)	53.5	(1.3)	-6.6	(1.8)
Russian Federation	↓ 41.6	(1.8)	↓ 42.6	(1.3)	-0.9	(2.2)
Slovakia	53.3	(1.2)	53.5	(0.8)	-0.2	(1.5)
Slovenia	44.3	(1.0)	↓ 45.0	(1.0)	-0.8	(1.5)
→ Thailand	53.4	(2.1)	↑ 59.4	(0.4)	-6.1	(2.2)
Turkey	↑ 54.4	(1.4)	↑ 56.5	(2.6)	-2.1	(2.9)
ICILS average	**49.2**	**(1.5)**	**50.9**	**(1.7)**	**-1.8**	**(2.0)**

↑ *Country in top 20 per cent*

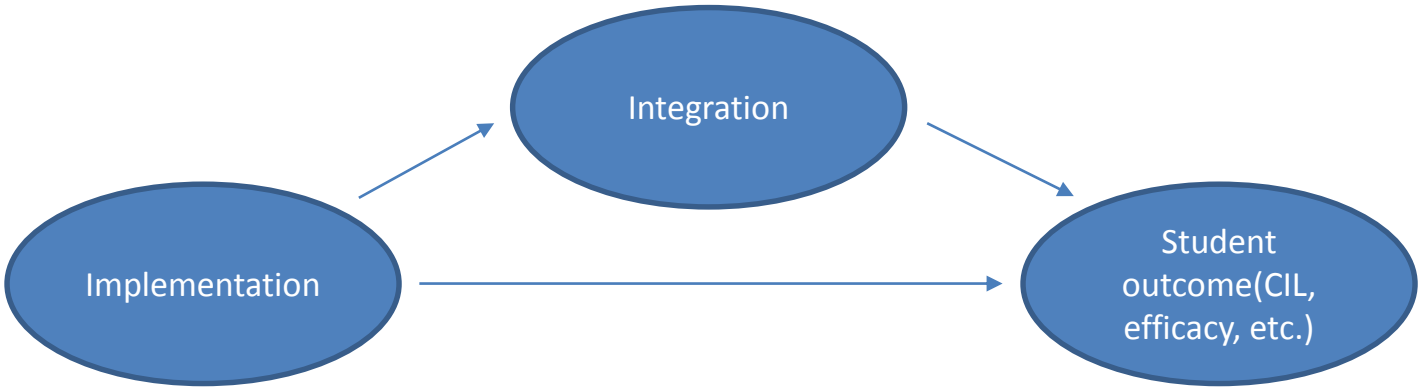
↓ *Country in bottom 20 per cent*

Next steps

- Development of a model to explain student CIL
  - Exploration of timing data and gender
  - Further exploration of differences across countries
  - Comparison of model by gender, for example

Model to explain student outcomes

- Create two composite indices
  - Level of ICT implementation in the school (IMPLEMENTATION)
  - Level of ICT integration into teaching (INTEGRATION)
- Analyse overall and separately for female and male students



Thank you

Questions