Thematic Workshop on Complex Problem Solving
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Complex Problem Solving

A valuable skill for human capital in the 21st century labor market?

Samuel Greiff, André Kretzschmar, & Jakob Mainert
1. The Skills
2. The Assessments
3. The Research Results
4. Your Complex Problem Solving Skills
Thematic Workshop on Complex Problem Solving

1960

2014

LLLight in Europe
How often do you encounter problems that require at least 30 minutes to be solved and for which there is no predetermined solution at your job?
Where is human capital heading in the 21st century?

Getting on the same page:

What is CPS?

Findings?

Relevance?
What is Complex Problem Solving

• A skill of *high market value* across different domains
• Essential for the *human capital* of the *reflective future citizen*
• Central for enabling lifelong learners to systematically *acquire* and *apply* knowledge in new problem situations
• The LLLight definition of complex problem solving
  “*nonroutine* analytical skill involving *domain-general* mental processes that are required across *diverse* problem situations”
Complex Problem Solving and Lifelong Learning

- basic ability to learn by *acquiring* and *applying* knowledge in its broadest sense
- facilitates desirable high-value job-specific skills
- Danner et al. (2012): Higher CPS-skills are predictive of better job performance

- CPS = „learning to learn“ skill
Thematic Workshop on Complex Problem Solving

**Agenda:**

1. The Skills
2. The Assessments
3. The Research Results
4. Your Complex Problem Solving Skills
CPS in PISA 2012

- Programme for International Student Assessment (PISA)
- 500,000 15-year old students worldwide
- representing 28 million students
- > 70 countries participating
- Most important educational large-scale assessment worldwide
Climate Control

You have no instructions for your new air conditioner. You need to work out how to use it. Find whether each control influences temperature and humidity by changing the sliders.
Draw lines in the diagram on the right to show what each control influences.
CLIMATE CONTROL

You have no instructions for your new air conditioner. You need to work out how to use it.

You can change the top, central and bottom controls on the left by using the sliders (−, −, ▲, +, ++). The initial setting for each control is indicated by ▲.

By clicking APPLY, you will see any changes in the temperature and humidity of the room in the temperature and humidity graphs. The box to the left of each graph shows the current level of temperature or humidity.

Question 1: CLIMATE CONTROL CP025Q01

Find whether each control influences temperature and humidity by changing the sliders. You can start again by clicking RESET.

Draw lines in the diagram on the right to show what each control influences.

To draw a line, click on a control and then click on either Temperature or Humidity. You can remove any line by clicking on it.
CLIMATE CONTROL

You have no instructions for your new air conditioner. You need to work out how to use it.

You can change the top, central and bottom controls on the left by using the sliders (→). The initial setting for each control is indicated by ▲.

By clicking APPLY, you will see any changes in the temperature and humidity of the room in the temperature and humidity graphs. The box to the left of each graph shows the current level of temperature or humidity.

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Task: Manage a wind mill park by maximising gains and minimizing losses!
Agenda:

1. The Skills
2. The Assessments
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4. Your Complex Problem Solving Skills
PISA 2012 Findings

Country differences?

Global relevance?
Developing problem-solving skills
CLIMATE CONTROL

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Light in Europe

Above Average Performers in Problem Solving

Strong performance in problem solving

Mean score
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
390

Korea
Singapore
Japan
Macao-China
Shanghai-China
Finland
Australia
Canada
England (U.K.)
France
Italy
Netherlands
Holland-Belgium

Germany
United States
Czech Republic
Austria

Norway
Denmark
Portugal
Russian Fed.

Poland
Slovenia

Israel
Hungary
Turkey

Chile
Brazil
Malaysia
U.A.E

Uruguay
Colombia

Low performance in problem solving

Average performance of 15-year-olds in problem solving

Fig V.2.
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<th>Level 6</th>
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Recent Results – PISA 2012

Mean $R^2$ of other domains: .77
Mean $R^2$ of Complex Problem Solving with other domains: .61
PIAAC 2\textsuperscript{nd} cycle
2021/22
What did we find out in the LLL Project?

Data Collection

Results
The LLLight’in’Europe assessment:

- Testing suite for 1129 adults (686 male) in 40 Orgs:
  - Several CPS assessments
  - Reasoning (Intelligence)
  - Background questionnaire
- Fully computer-based
- Efficient testing with tablets and mobile server
The Main Research Focus of LLLight’in’Europe

1. Complex Problems and Wages

2. Complex Problem Solving and Job Complexity

1. Complex Problem Solving and Career Success
1. Complex Problem Solving and What Employers Pay for It

→ To increase productivity, employers are eager to pay more
→ Higher CPS levels are associated with higher wages (not shown in graph)

Sample: 670 employees, trainees, and entrepreneurs, worldwide
2. How is CPS distributed among employees of different job complexities?

→ Complex working environment requires CPS skills on a daily basis.

→ High CPS-Performers seek for more complex jobs

→ Complex jobs offer more CPS learning opportunities

→ These processes might interact

But these are no causal effects!
3. Does CPS relate to occupational success?

→ the higher the job level, the higher the CPS average

→ CPS is substantially related to career-relevant criteria of job performance / supervisory ratings (e.g., Danner et al., 2012)
Conclusions

→ CPS as important transversal skill in international large-scale assessments

→ Adds new information on what high- and low-performers in CPS can and cannot do

→ more opportunities for CPS learning? Complex jobs hold many challenges and also offer opportunities to learn

→ CPS relates to career success and higher wages and is a precursor of lifelong learning
Now it is your turn: Solve a set of complex problems!
Thanks to:

• The EU
• The participating companies
• The researchers involved in the project

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