Advancing Digital Skills for Problem Solving in Technology-Rich Environments

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Advancing digital skills for problem solving in technology-rich environments

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Info & Updates Digital Literacy Acquisition and Equity Research Hub  dlaerhub.wordpress.com
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Advancing Digital Equity in Public Libraries: Assessing Library Patrons’ Problem Solving in Technology Rich Environments (LG-06-14-0076)
Setting the Context: Purpose, Need, and Collaboration
Digital literacies are vitally important in today’s digital world.

The library is a community anchor and provides digital access and training.

Use data to examine digital problem solving and improve library practices, programs, and services for all adults.

Link libraries to PIAAC networks.
Purpose of the Project

- Extend national work on digital literacy acquisition to inform local efforts
- Bring libraries into the PIAAC conversation
- Maximize resources and meet community needs around lifelong learning and access

Education and Skills Online: Problem Solving in Technology-rich environments
Digital Problem Solving

OECD
Better Policies for Better Lives

PIAAC
Programme for the International Assessment of Adult Competencies
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PIAAC’s Purpose was to Assess Problem Solving in a Technology Rich Environment (PSTRE)

- 9 multi-stem constructed response items that evaluate digital communication, and the use of networks to acquire and evaluate information and perform practical tasks in personal, work-related, and community contexts
PIAAC’s PSTRE framework definition

Using digital technologies, communication tools, and networks to **acquire and evaluate information, communicate with others and perform practical tasks** in **Personal, Workplace, Civic situations**
Three Levels of Proficiency

Level 1: Sort emails into pre-existing folder using given criterion

Level 2: Respond to a request by locating information in a spreadsheet and e-mailing the requestor

Level 3: Manage requests to reserve meeting room using a reservation system. Discover schedule conflict, e-mail to decline the request
Problem Solving Sample Item: Level 2

- several steps and operators required to return a purchased item
- monitor progress towards a solution and handle unexpected outcomes or impasses.

From Education and Skills Online Sample Items
Problem Solving Sample Item: Level 3

- managing requests to reserve a meeting room on a particular date using a reservation system

- The task involves multiple applications, a large number of steps, a built-in impasse, and the discovery and use of ad hoc commands in a novel environment.

- The test-taker has to establish a plan and monitor its implementation in order to minimize the number of conflicts.

- In addition, the test-taker has to transfer information from one application (e-mail) to another (the room-reservation tool)
Average scores on the PIAAC problem solving in technology-rich environments scale for adults age 16 to 65, by participating country and region

- Japan: 294
- Finland: 289
- Sweden: 288
- Norway: 286
- Netherlands: 286
- Austria: 284
- Denmark: 283
- Czech Republic: 283
- Republic of Korea: 283
- Germany: 283
- Canada: 282
- Slovak Republic: 281
- Flanders (Belgium): 281
- England and Northern Ireland (UK): 280
- Estonia: 278
- Iceland: 277
- Poland: 275
- United States: 274

Score is significantly higher than the U.S. average score

Score is not significantly different from the U.S. average score

Employment by group

- **Round 1**
  - Unemployed: 297.84
  - Employment: 311.67

- **Round 2**
  - Unemployed: 267.65
  - Employment: 260.91
Education by group

- Lower than college education
- at least 4 year college or university education

Round 1:
- Lower than college education: 287.50
- at least 4 year college or university education: 305.73

Round 2:
- Lower than college education: 257.92
- at least 4 year college or university education: 282.86
Web at library use**
by group

Round 1
Round 2

Less than once a week
at least once a week

310.00
282.75

267.78
262.34
PSTRE Standard reporting yields a score that’s difficult to interpret.

Unpacking what it means to digitally problem solve is much more complex than a single score can offer.
Operationalizing Digital Problem Solving Depends on Who’s Defining it & for What Purpose

Examined and Observed Digital Problem Solving

Our interest builds from supporting library users who use the library’s digital resources, and online tools for personal, life-skills, education and enrichment purposes.
PSTRE Tool
- Relies on cognitive skills
- Uses an Assessment framework
- Outdated technologies that don’t operate like today’s tools
- Multi-step auto-scored items
- Score (0-400) and level (below 1-3)
- Individual Score Reports

Verbal Protocol
- More than cognitive skills
- Observation framework
- Web-based interfaces and digital tools in libraries
- Multi-step tasks
- Scaffolded support
- Use in real-life contexts
PIAAC’s PSTRE Framework Reflects Cognitive Dimensions

- Setting Goals and Monitoring Progress
- Planning, Self-organizing
- Acquiring and Evaluating Information
- Using Information

- Setting Goals and Monitoring Progress
- Using Information
- Planning, Self-organizing
- Acquiring and Evaluating Information
It’s not about "skilling up" individuals, it’s about expanding their repertoire of contexts for digital problem solving.
Adult Education and Lifelong Learning

Digital Problem Solving involves the **nimble use of skills, strategies, and mindsets** required to **navigate online in everyday context** and use novel resources, tools, and interfaces in efficient and **flexible ways** to accomplish personal and professional goals.
Digital Problem Solving strategies are different than basic digital literacies.

Digital Problem Solving strategies are context dependent.

Digital Problem Solving strategies need to be flexibly applied in an ever changing technological landscape.

What do we know?

What cognitive and other strategies are needed for digital problem solving?

How can Digital Problem Solving strategies be supported, learned, and practiced in libraries?

How can learning be designed to maximize the application of these Digital Problem Solving strategies in meaningful ways?
### Strategies have an architecture

**Systematicity**
- Works to understand task firsts
- One step at a time
- Take the time to explore the interface and resources
- Checks progress against criteria

**Flexibility**
- Switches strategies when what is being used doesn’t work
- Thinks creatively; develops work-arounds
- Experiments, might shift back and forth between approaches

**Persistence**
- Does the same thing over and over, even when frustrated
- Comes up with alternative approaches to avoid frustration
- Not flustered by error messages or unexpected results

**Good enough**
- Determines that an outcome of the problem solving process is sufficient
- Relates to an individual’s time to learn, motivation, affect, prior knowledge and the context of the task

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### Opposing Tensions with Approaches to Digital Problem Solving

- **Systematicity** vs. **Flexibility**
- **Flexibility** vs. **Persistence**
- **Persistence** vs. **Good enough**
- **Systematicity** vs. **Good enough**

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Developing the ability to **transfer learning** from one situation and context to another

- Knowing when to ask for help; listening; and making use of assistance provided
Affect

- the mindset to adapt to novel environments,
- being willing to ask for help to build reassurance, confidence, flexibility, persistence, systematicity
Prior knowledge

- Prior knowledge can be useful - if the problem solver is able to apply it flexibly to the new task at hand.

- Over-reliance on prior knowledge may hinder progress on the task if the problem solver is not able or willing to let go of a strategy or approach that is not working in the new situation.
Implications for Acquiring & Assessing Digital Problem Solving
Assessment approaches and tools need to be expanded

PSTRE offers a summary of results that indicate broad trends across a population.

Desire for a tool that helps determine how skilled an individual is with digital problem solving.

Observational tasks & scenarios used with an assessment checklist to help guide instructional supports and approaches that build on the architecture we identified.