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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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

Info & Updates Digital Literacy Acquisition and Equity Research Hub dlaerhub.wordpress.com
Digital Problem Solving
<table>
<thead>
<tr>
<th>Literacy</th>
<th>Numeracy</th>
<th>PS-TRE</th>
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Operationalizing And Assessing Digital Problem Solving

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)

From Education and Skills Online Sample Items
Average scores on the PIAAC problem solving in technology-rich environments scale for adults age 16 to 65, by participating country and region

Scale score

<table>
<thead>
<tr>
<th>Country</th>
<th>Score</th>
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<td>Poland</td>
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<tr>
<td>United States</td>
<td>274</td>
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</tbody>
</table>

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

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

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
Place of Web by group**

- Round 1
  - Home: 306.25
  - Library: 264.67

- Round 2
  - Home: 268.24
  - Library: 260.00
Web at library use**
by group

- Less than once a week
- at least once a week

Round 1
- Less than once a week: 310.00
- at least once a week: 282.75

Round 2
- Less than once a week: 267.78
- at least once a week: 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
<table>
<thead>
<tr>
<th>Goal setting &amp; Progress monitoring</th>
<th>Planning/Self-Organizing</th>
<th>Acquiring &amp; Evaluating information</th>
<th>Making use of information</th>
<th>Pragmatic Knowledge</th>
</tr>
</thead>
</table>
Designing Digital Tasks Aligned to the PSTRE Framework

Planning

Pragmatic Knowledge

Goal Setting

Making Use of Information

Acquiring & Evaluating Information

MedlinePlus (Website)

Use this resource to find:
- Information about diseases and conditions, including clinical trials
- Information about alternative and conventional treatments
- Drug information
- Doctor and hospital directories
- Health organizations
- Links to the latest medical research
- News articles and general information on a variety of health and nutrition topics
- Anatomy and surgery videos (watch your upcoming surgery!)

Written for the layperson, MedlinePlus from the National Library of Medicine is one of the best places to start your search for medical information.
PIAAC’s PSTRE Framework Reflects Cognitive Dimensions

- Setting Goals and Monitoring Progress
- Planning, Self-organizing
- Acquiring and Evaluating Information
- Using 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.
**What do we know?**

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 need to 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

Opposing Tensions with Approaches to Digital Problem Solving

<table>
<thead>
<tr>
<th>Systematicity</th>
<th>Flexibility</th>
<th>Persistence</th>
<th>Good enough</th>
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</thead>
<tbody>
<tr>
<td>Works to understand task firsts</td>
<td>Switches strategies when what is being used doesn’t work</td>
<td>Does the same thing over and over, even when frustrated</td>
<td>Determines that an outcome of the problem solving process is sufficient</td>
</tr>
<tr>
<td>One step at a time</td>
<td>Thinks creatively; develops work-arounds</td>
<td>Comes up with alternative approaches to avoid frustration</td>
<td>Relates to an individual’s time to learn, motivation, affect, prior knowledge and the context of the task</td>
</tr>
<tr>
<td>Take the time to explore the interface and resources</td>
<td>Experiments, might shift back and forth between approaches</td>
<td>Not flustered by error messages or unexpected results</td>
<td></td>
</tr>
<tr>
<td>Checks progress against criteria</td>
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</table>

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

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