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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)

Info & Updates **Digital Literacy Acquisition and Equity Research Hub** dlaerhub.wordpress.com

Setting the Context:
Purpose, Need, and Collaboration

IMLS National Leadership Grant

- **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

PIAAC
Programme for the International Assessment of Adult Competencies

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

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Digital Problem Solving

OECD
BETTER POLICIES FOR BETTER LIVES

European Commission

PIAAC
Programme for the International Assessment of Adult Competencies

Literacy	Numeracy	PS-TRE
Japan	Japan	Japan
Finland	Finland	Finland
Netherlands	Flanders-Belgium	Australia
Australia	Netherlands	Sweden
Sweden	Sweden	Norway
Norway	Norway	Netherlands
Estonia	Denmark	Austria
Flanders-Belgium	Slovak Rep.	Denmark
Czech Rep.	Czech Rep.	Czech Rep.
Slovak Rep.	Austria	Korea, Rep. of
Canada	Estonia	Germany
Korea, Rep. of	Germany	Canada
U.K.	Australia	Slovak Rep.
Denmark	Canada	Flanders-Belgium
Germany	Cyprus	U.K.
United States	Korea, Rep. of	Estonia
Austria	U.K.	United States
Cyprus	Poland	Ireland
Poland	Ireland	Poland
Ireland	France	Italy
France	United States	Spain
Spain	Italy	Cyprus
Italy	Spain	France

This PowerPoint was developed by:

AIR
American Institutes for Research

Operationalizing And Assessing Digital Problem Solving

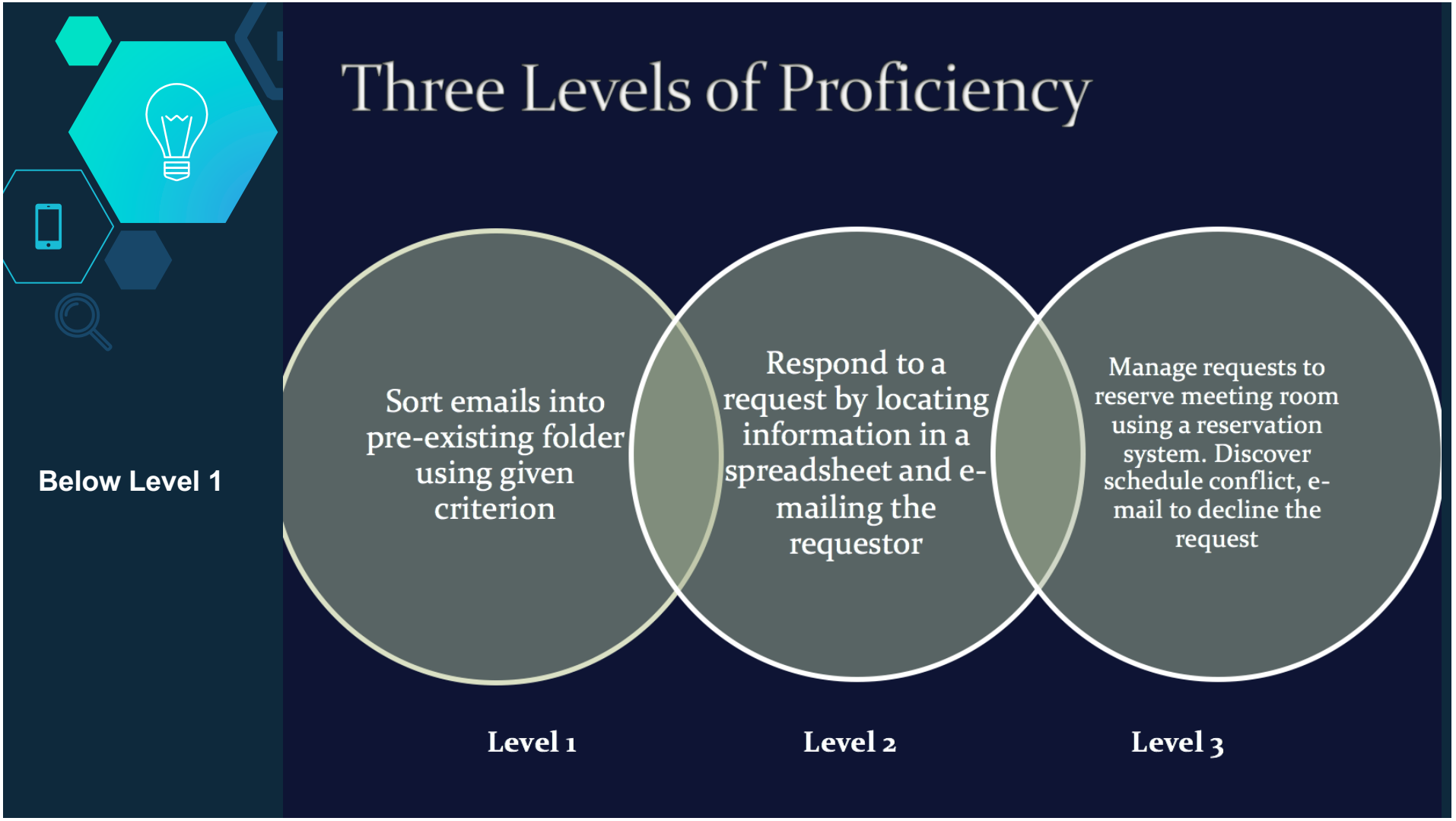
PIAAC's Purpose was to Assess Problem Solving in a Technology Rich Environment (PSTRE)

- 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

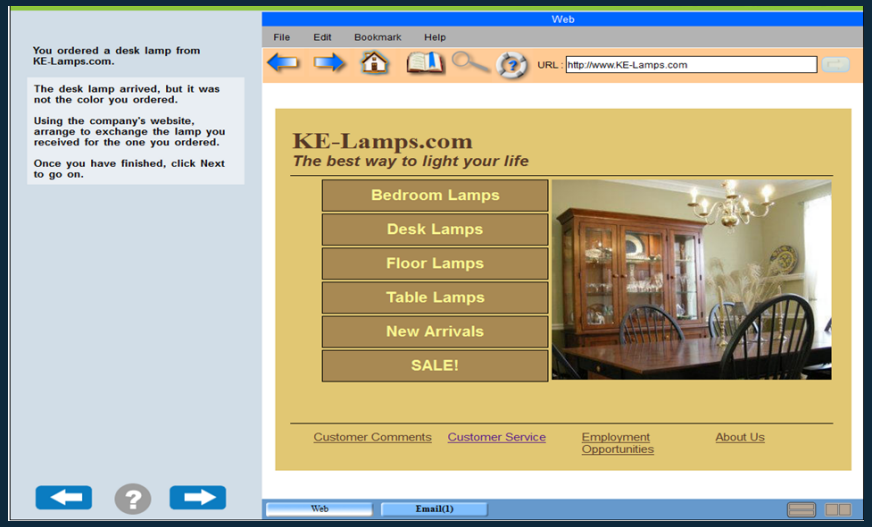
PIAAC's PSTRE framework definition

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



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.

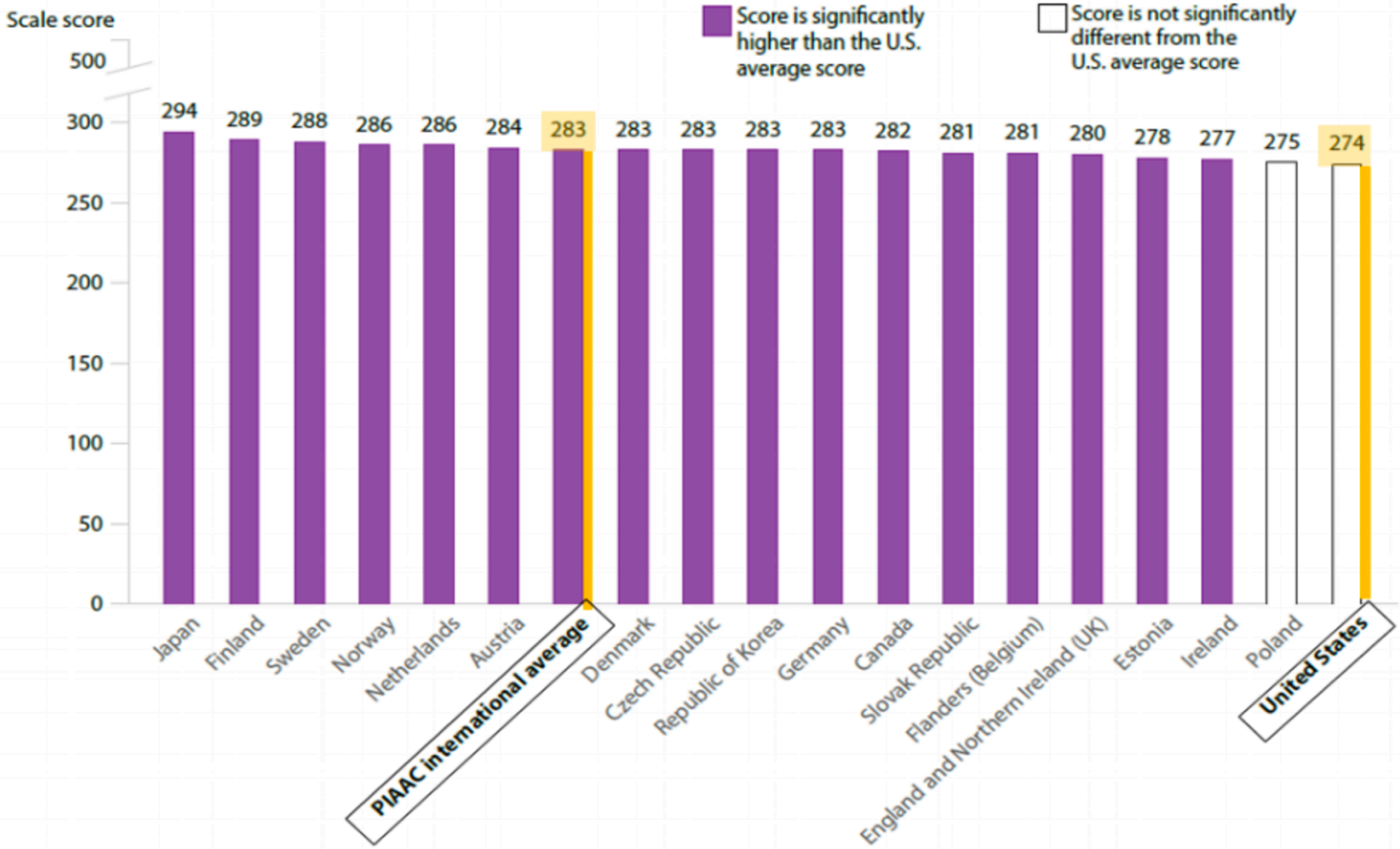
From Education and Skills Online Sample Items

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



SOURCE: U.S. Department of Education, National Center for Education Statistics, Program for the International Assessment of Adult Competencies (PIAAC), U.S. National Supplement, 2014; Organization for Economic Cooperation and Development, Program for the International Assessment of Adult Competencies (PIAAC), 2012.

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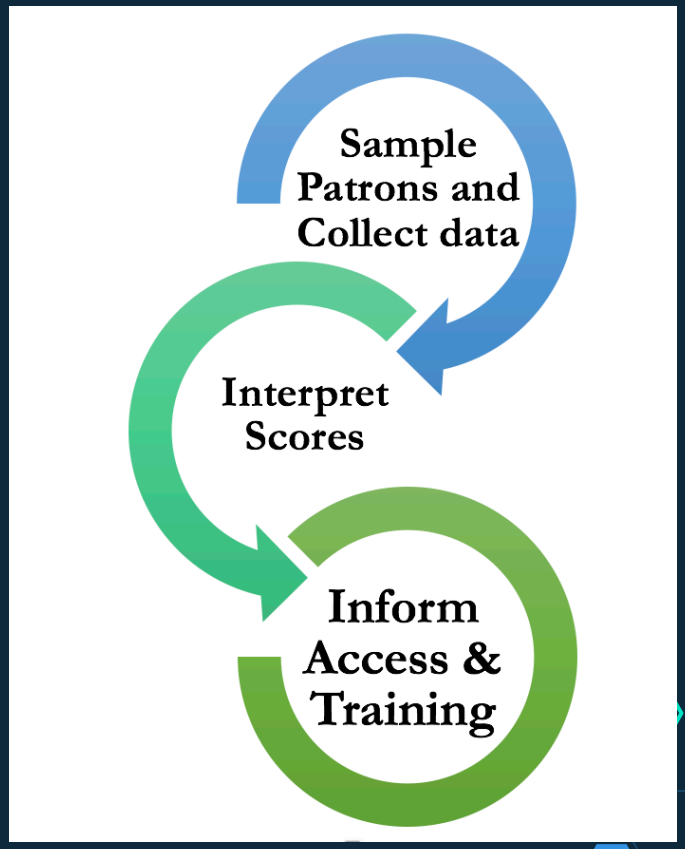
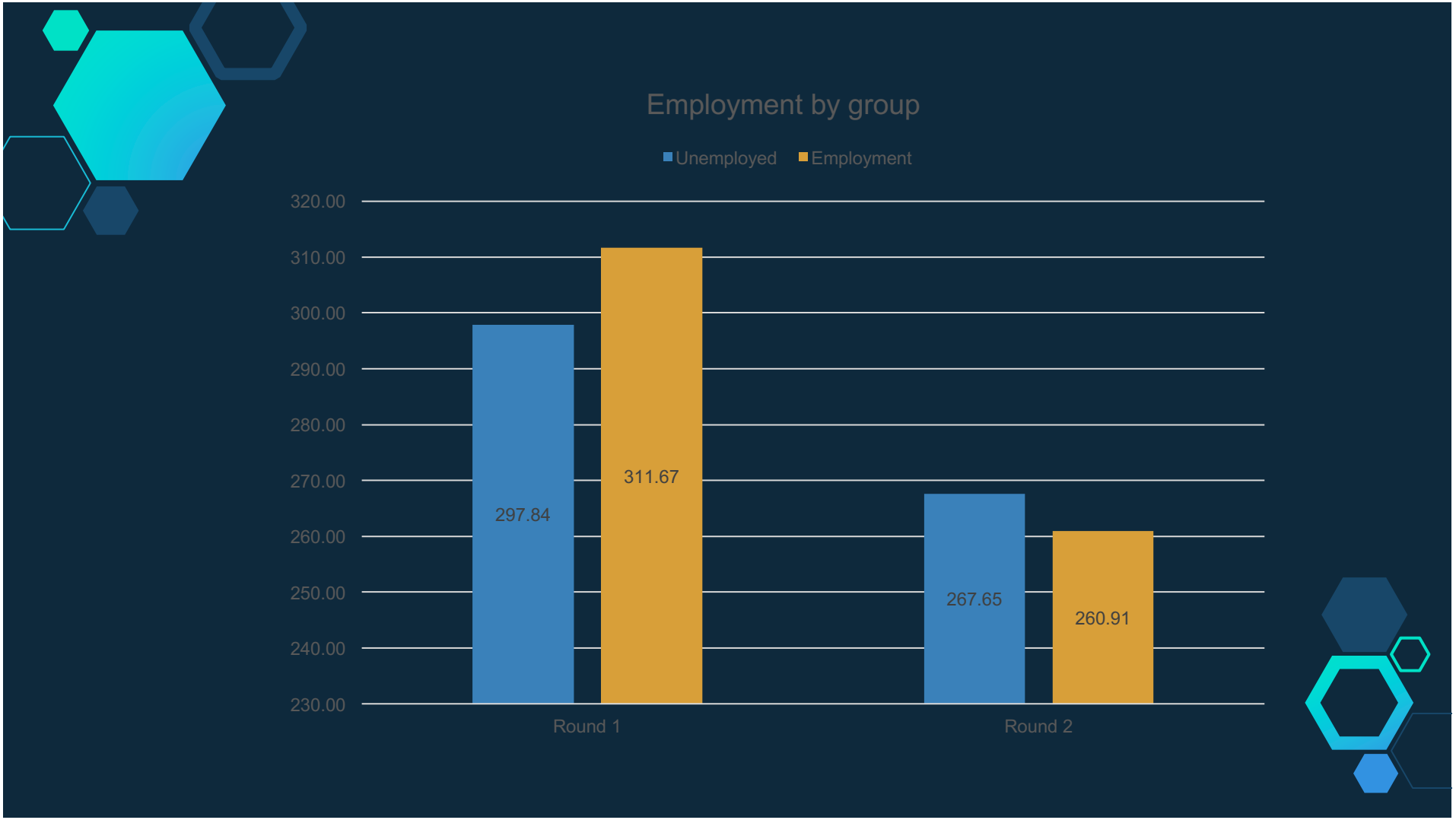
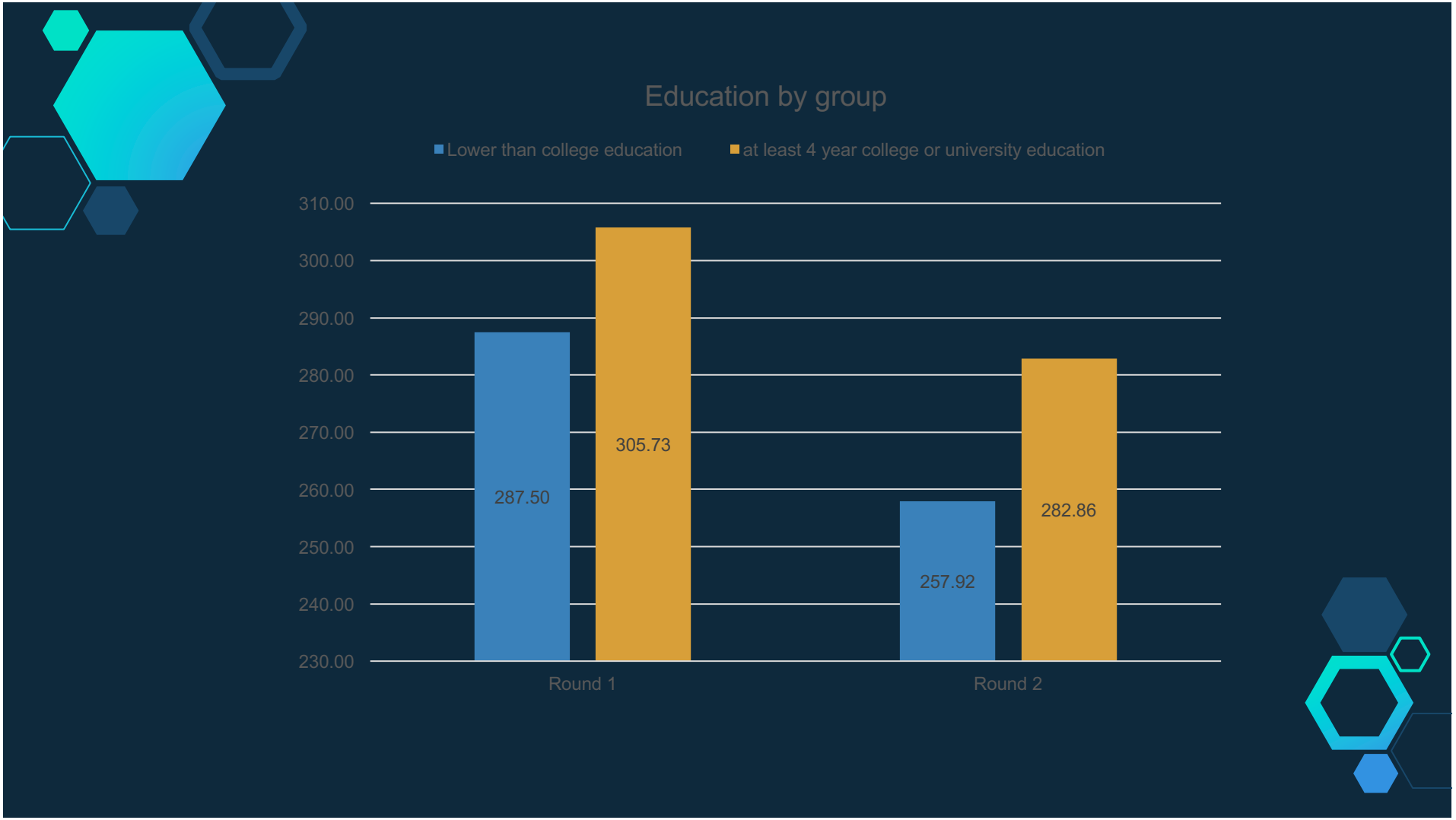
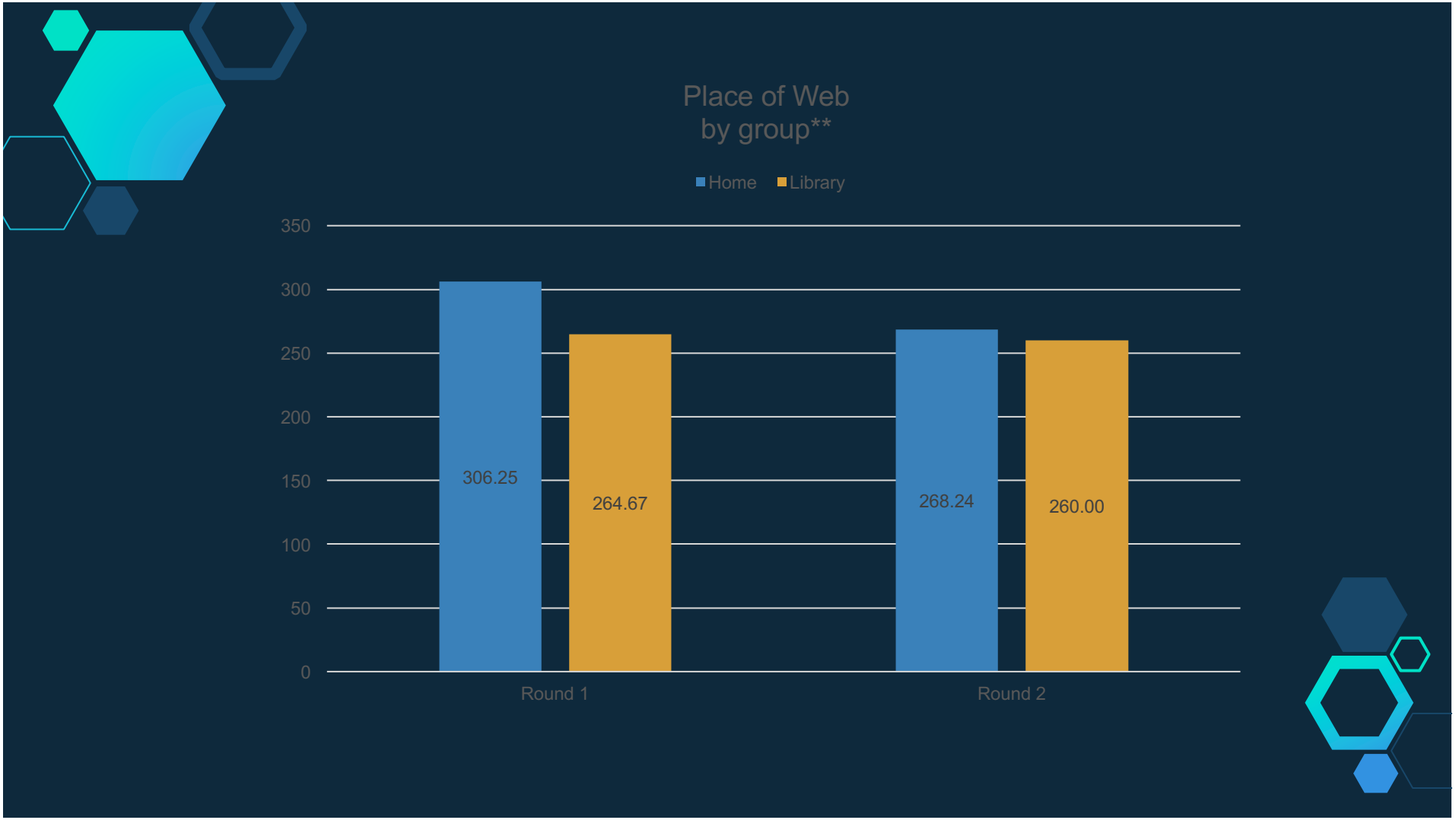
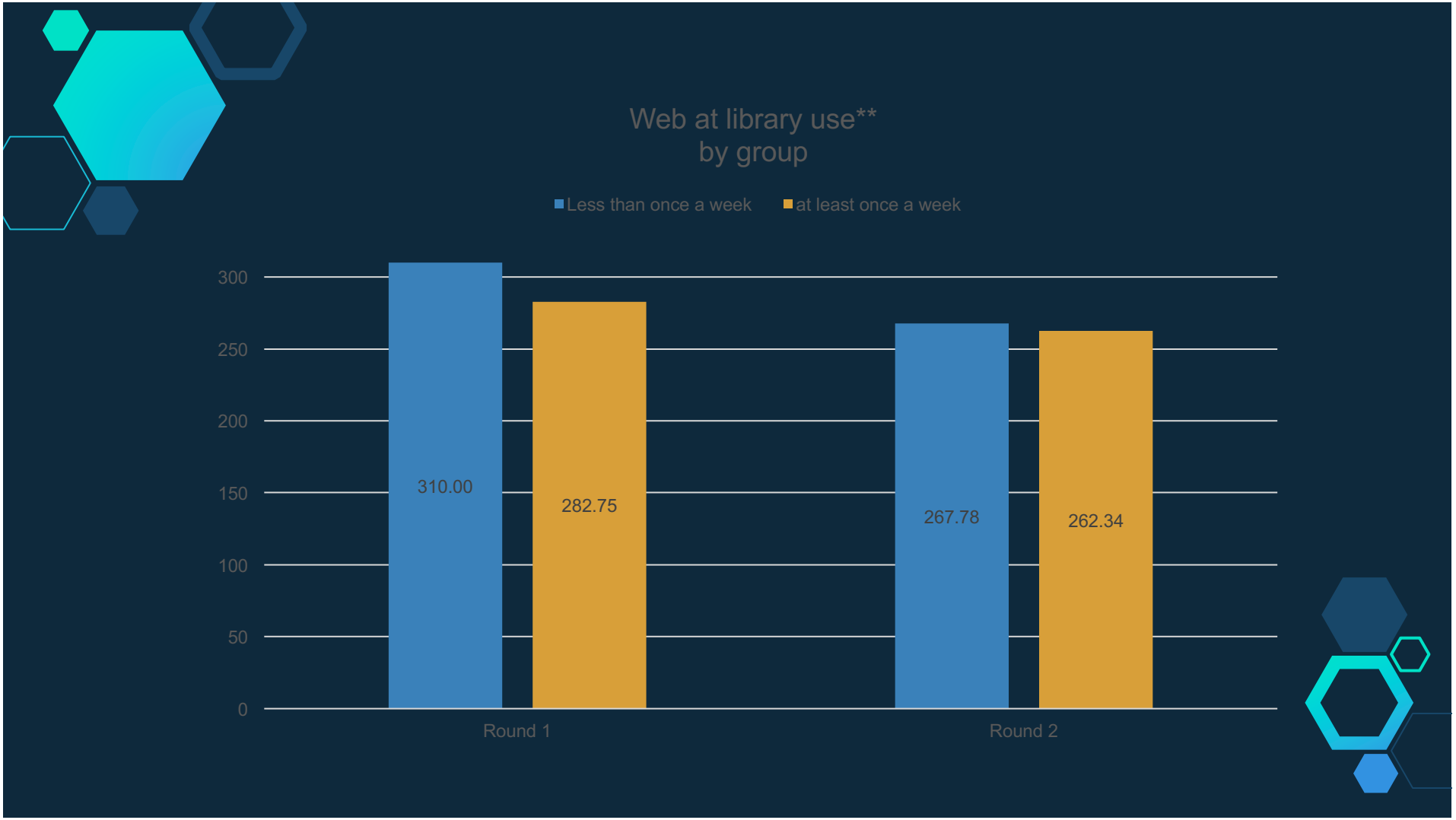
Education & Skills Online Assessment




Employment by group
Unemployed
Employment
320.00
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
297.84
311.67
267.65
260.91
Round 1
Round 2

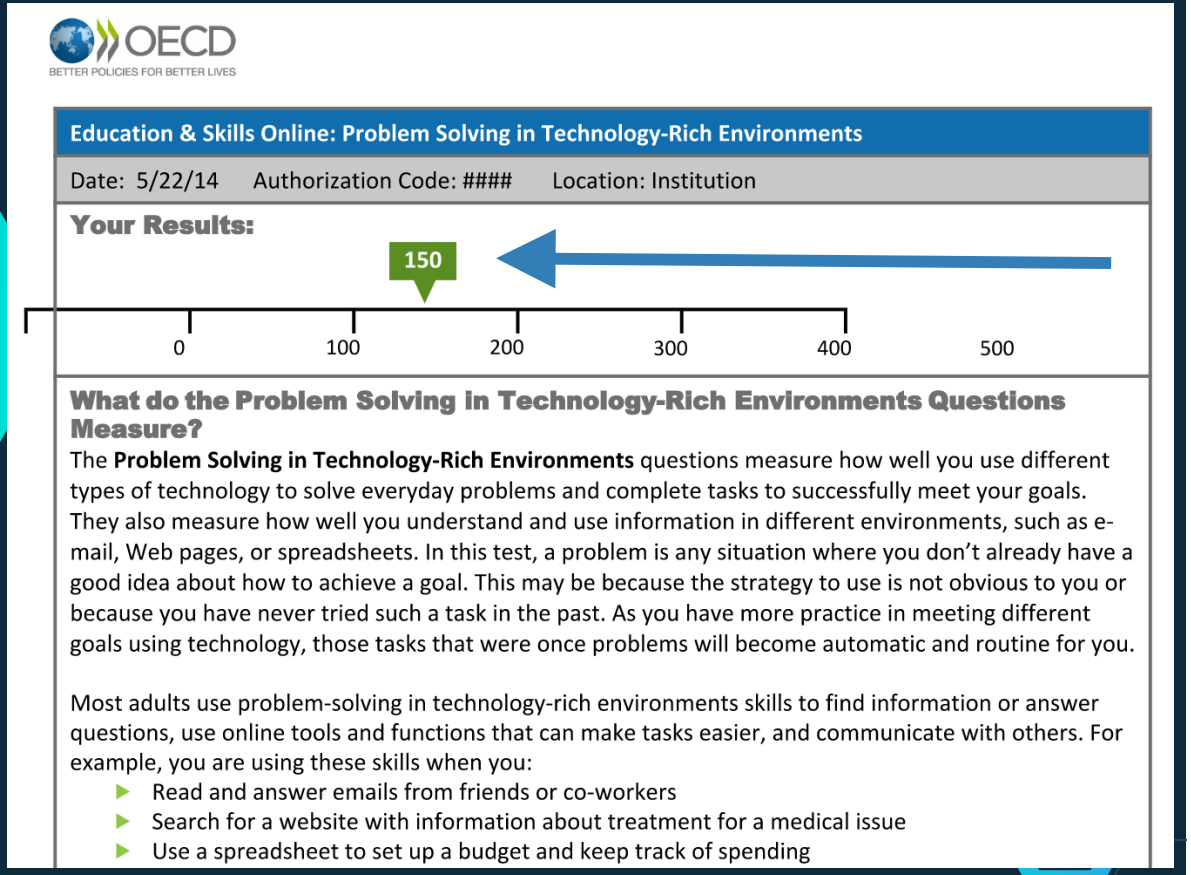

Education by group
Lower than college education
at least 4 year college or university education
310.00
300.00
290.00
280.00
270.00
260.00
250.00
240.00
230.00
287.50
305.73
257.92
282.86
Round 1
Round 2


Place of Web
by group**
Home
Library
350
300
250
200
150
100
50
0
306.25
264.67
268.24
260.00
Round 1
Round 2


Web at library use**
by group
Less than once a week
at least once a week
300
250
200
150
100
50
0
310.00
282.75
267.78
262.34
Round 1
Round 2

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



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Education & Skills Online: Problem Solving in Technology-Rich Environments

Date: 5/22/14 Authorization Code: #### Location: Institution

Your Results:

150

0 100 200 300 400 500

What do the Problem Solving in Technology-Rich Environments Questions Measure?

The **Problem Solving in Technology-Rich Environments** questions measure how well you use different types of technology to solve everyday problems and complete tasks to successfully meet your goals. They also measure how well you understand and use information in different environments, such as e-mail, Web pages, or spreadsheets. In this test, a problem is any situation where you don't already have a good idea about how to achieve a goal. This may be because the strategy to use is not obvious to you or because you have never tried such a task in the past. As you have more practice in meeting different goals using technology, those tasks that were once problems will become automatic and routine for you.

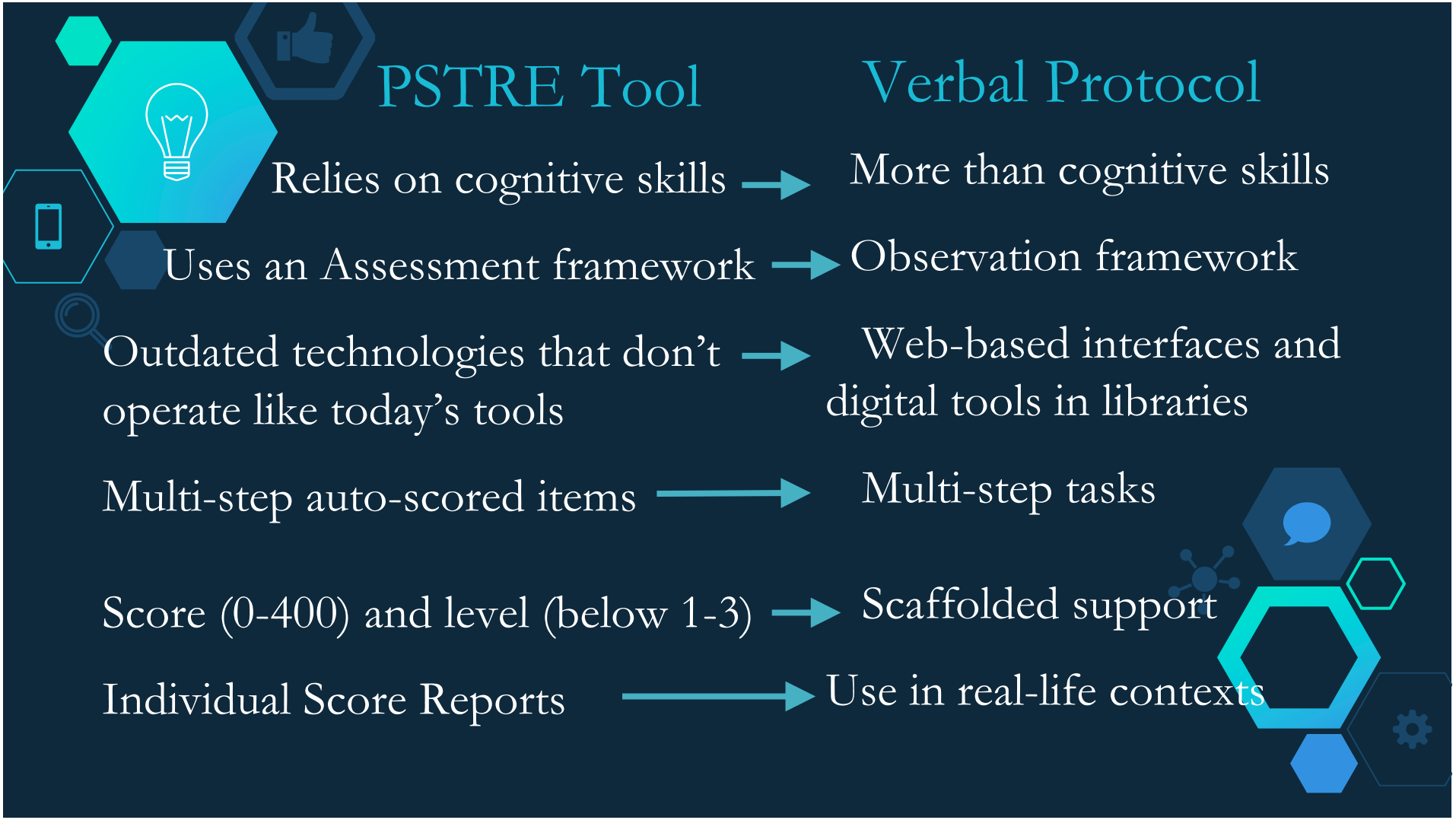
Most adults use problem-solving in technology-rich environments skills to find information or answer questions, use online tools and functions that can make tasks easier, and communicate with others. For example, you are using these skills when you:

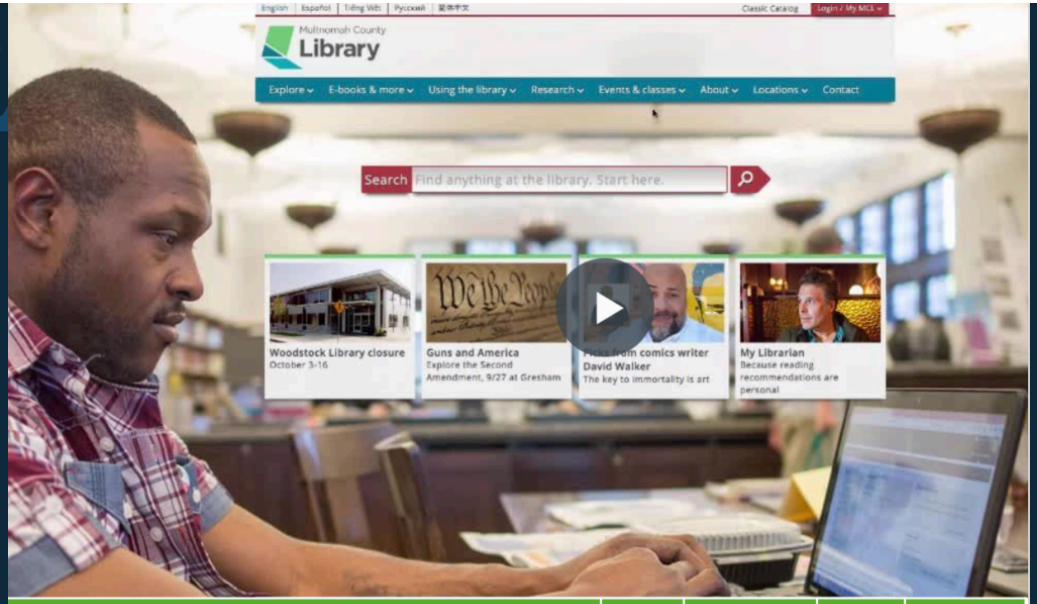
- Read and answer emails from friends or co-workers
- Search for a website with information about treatment for a medical issue
- Use a spreadsheet to set up a budget and keep track of spending

Operationalizing Digital Problem Solving Depends on Who's Defining it & for What Purpose

- **<u>Examined</u> and <u>Observed</u>** Digital Problem Solving

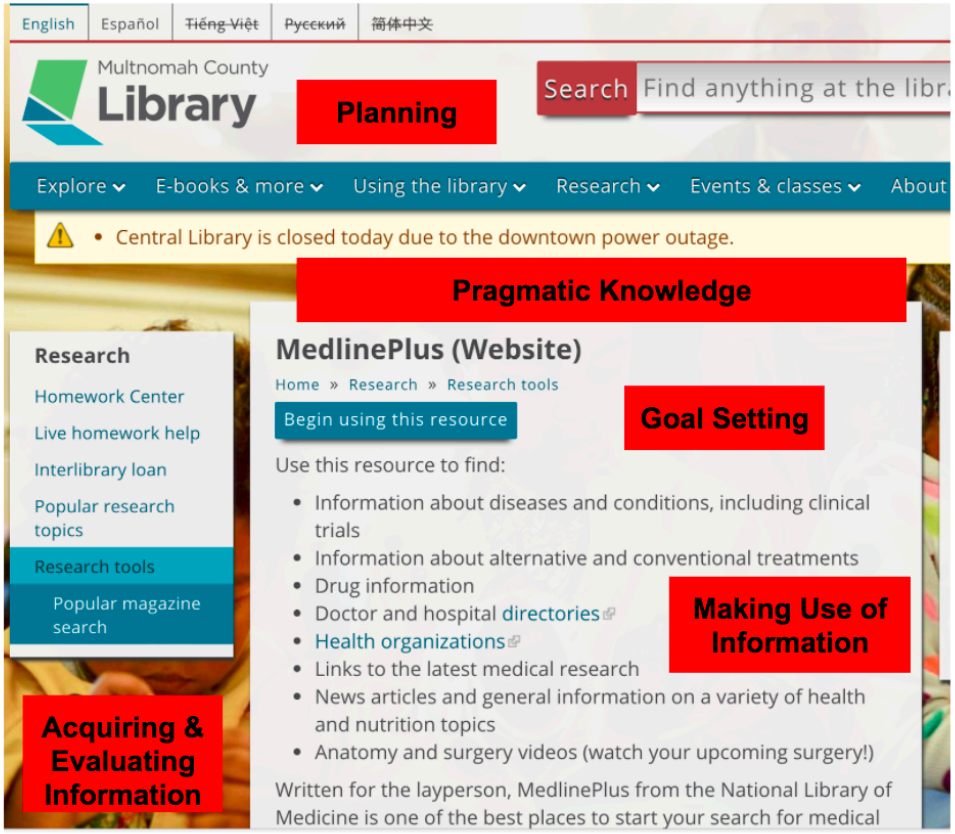
- Our interest builds from supporting library users who use the library's digital resources, and online tools for personal, life-skills, education and enrichment purposes.

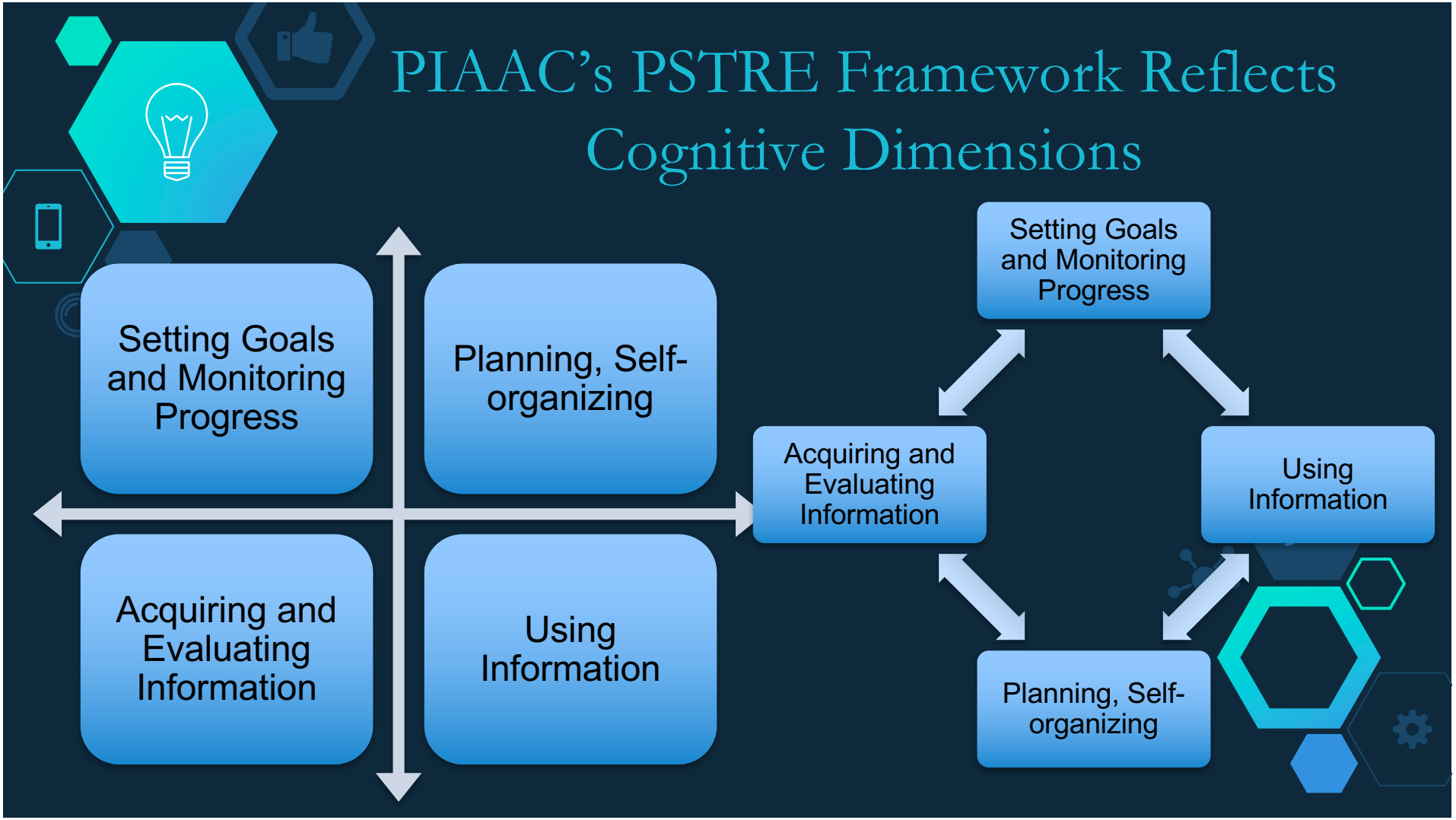

PSTRE Tool
Verbal Protocol
Relies on cognitive skills
More than cognitive skills
Uses an Assessment framework
Observation framework
Outdated technologies that don't operate like today's tools
Web-based interfaces and digital tools in libraries
Multi-step auto-scored items
Multi-step tasks
Score (0-400) and level (below 1-3)
Scaffolded support
Individual Score Reports
Use in real-life contexts



Goal setting & Progress monitoring	→
Planning/Self-Organizing	→
Acquiring & Evaluating information	→
Making use of information	→
Pragmatic Knowledge	→

Designing Digital Tasks Aligned to the PSTRE Framework




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
Acquiring and Evaluating Information
Using Information
Planning, Self-organizing

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

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

Opposing Tensions with Approaches to Digital Problem Solving

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

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