Developing Tools to Support Data Literacy

Charissa Jefferson, California State University-Northridge

Diego Mendez-Carbajo, Illinois Wesleyan University

Katrina Stierholz, Federal Reserve Bank of St. Louis

Mary Suiter, Federal Reserve Bank of St. Louis

Agenda

- Introductions
- Data literacy—evidence for the need
- Librarians, ACRL Framework, and tools for teaching with data
- A brief lesson in lesson writing
- An activity with data
- Creating an activity
- Next steps (future workshops)

Unemployment Rate Activity

Unemployment

- Two categories
  - Not in the labor force
    - Under 16
    - 16 or older but NOT looking for work
  - In the labor force
    - Employed
    - 16 or older, not working, not in the military, not institutionalized, and looking for work
  - Unemployment rate is the percentage of the labor force who are unemployed

Classroom Unemployment Rate

The **labor force** is the number of people 16 years or older who are currently employed and those who are actively seeking employment (blue slips).

The unemployed are those who are actively looking but haven't found a job (# of blue slips who didn't find seats with candy)

Calculating the Unemployment Rate

$$\frac{\text{Number of unemployed}}{\text{Labor force}} \times 100 = \text{unemployment rate}$$

Calculating the Unemployment Rate

The country of Alpha has a population of 150,000 people. According to these latest data, there are 20,000 people under the age of 16, and 30,000 people who are over the age of 16, but not looking for work. Currently, there are 5,000 people who are 16 or older, not employed, and are actively looking for work. The president of Alpha has asked you to calculate the size of the labor force, the number of unemployed, and the unemployment rate. Please show your work.

Calculating the Unemployment Rate

	Not in labor force	In labor force
Number of people under 16		
Number of people not seeking work		
Number of unemployed people 16+ but actively looking for work		
Number of people 16+ who are employed	+	
Total labor force	=	

$$\frac{\text{Number of unemployed}}{\text{Labor force}} \quad X \quad 100 = \text{unemployment rate}$$

Calculating the Unemployment Rate

	Not in labor force	In labor force
Number of people under 16	20,000	
Number of people not seeking work	30,000	
Number of unemployed people 16+ but actively looking for work		5,000
Number of people 16+ who are employed	+	95,000
Total labor force	=	100,000

$$\frac{\text{Number of unemployed}}{\text{Labor force}} \times 100 = \text{unemployment rate}$$

$$\frac{5,000}{100,000} \times 100 = 5\%$$

Who is in the labor force?
(People 16 years or older who are currently employed or actively seeking employment)

Who is classified as not in the labor force?
(People under 16 years of age and people 16 years or older who are not actively seeking employment)

What is an example of someone who is not in the labor force?
(Children under age 16, teenagers and adults who are not looking for work and retired people.)

Unemployment: A condition where people at least 16 years old are without jobs and actively seeking work.

Releases > Employment Situation > Release Tables > Current Population Survey (Household Data) > Table A-15. Alternative measures of labor underutilization

Table A-15. Alternative measures of labor underutilization:
Monthly, Seasonally Adjusted

Add to Data List Add to Graph   Expand All Collapse All   📅 Jan 1948   Jun 2018   Jul 2018   Aug 2018   **Sep 2018**

	Name	Percent		
		Sep 2018	Aug 2018	Sep 2017
☐	U-1 Persons unemployed 15 weeks or longer, as a percent of the civilian labor force	1.4	1.4	1.7
☐	U-2 Job losers and persons who completed temporary jobs, as a percent of the civilian labor force	1.7	1.8	2.1
☐	U-3 Total unemployed, as a percent of the civilian labor force (official unemployment rate)	3.7	3.9	4.2
☐	U-4 Total unemployed plus discouraged workers, as a percent of the civilian labor force plus discouraged workers	3.9	4.1	4.4
☐	U-5 Total unemployed, plus discouraged workers, plus all other persons marginally attached to the labor force, as a percent of the civilian labor force plus all persons marginally attached to the labor force	4.6	4.7	5.1
☐	U-6 Total unemployed, plus all persons marginally attached to the labor force, plus total employed part time for economic reasons, as a percent of the civilian labor force plus all persons marginally attached to the labor force	7.5	7.4	8.3

Add to Data List Add to Graph   Expand All Collapse All

Data Literacy

- What is it?

- Part of a broader effort
  - Numeracy
  - Quantitative literacy
  - Statistical literacy
 - Information literacy

- We are not alone!

Need to understand numbers

TABLE A-1 Key Abilities and Estimated Proportion of Adults at Each Level of Quantitative Literacy

Quantitative Literacy Level	% of Adults in Each Level (NAAL findings)	Estimated % (#) of Uninsured Adults in Each Level[*]	Estimated % (#) of Insured Adults in Each Level[*]	Key Abilities Associated with Level (NAAL)
Below Basic	22%	28.8% or 9,169,063	18.2% or 30,596,144	Locating numbers and using them to perform simple quantitative operations (primarily addition) when the mathematical information is very concrete and familiar
Basic	33%	33.4% or 10,656,748	31.9% or 53,702,419	Locating easily identifiable quantitative information and using it to solve simple, one-step problems when the arithmetic operation is specified or easily inferred
Intermediate	33%	29.3% or 9,339,640	35.3% or 59,508,631	Locating less familiar quantitative information and using it to solve problems when the arithmetic operation is not specified or easily inferred
Proficient	13%	8.6% or 2,749,954	14.6% or 24,505,031	Locating more abstract quantitative information and using it to solve multistep problems when the arithmetic operations are not easily inferred and the problems are more complex

Percentage of 16-19 year-olds with low literacy and numeracy (below level 2)

| low literacy | low numeracy |
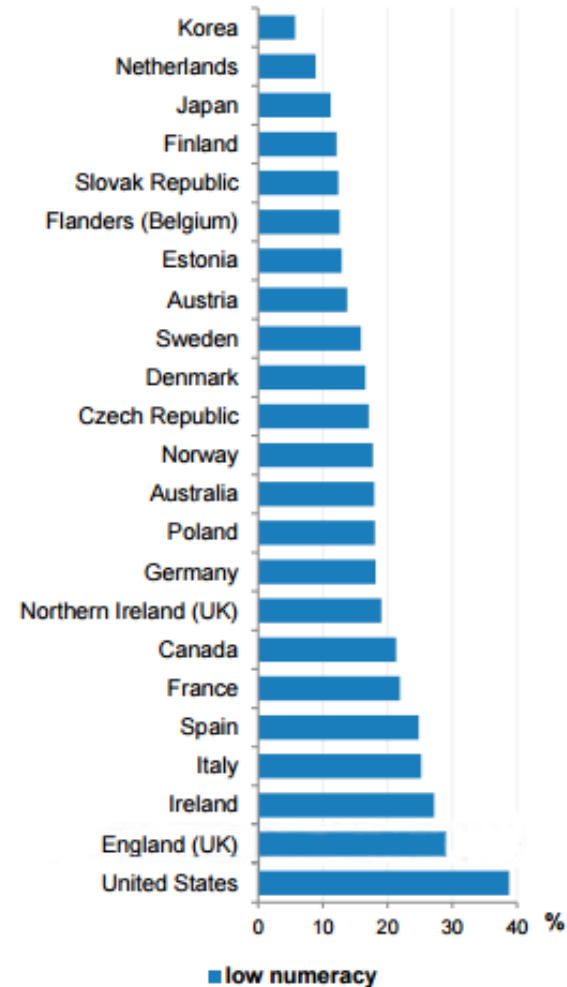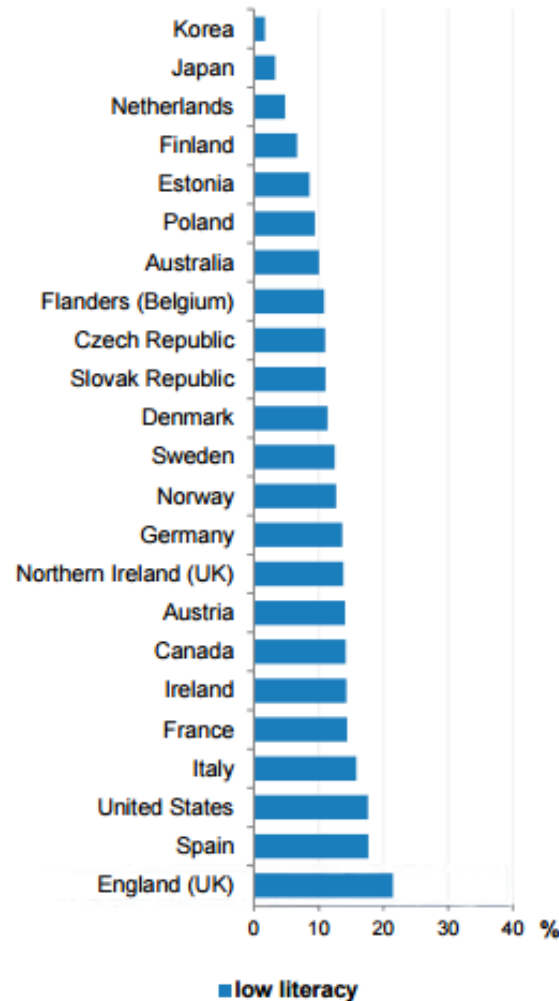
Note: Adults who obtained their highest qualification outside the host country: those with foreign qualifications and 1st generation migrants, who obtained their highest qualification prior to entering the host country, are excluded.

Source: OECD calculations based on the Survey of Adult Skills (PIAAC) (2012) (database).

If the chance of getting a disease is 10 percent, how many people out of 1,000 would be expected to get the disease?

80% got this question correct

If 5 people all have the winning number in the lottery and the prize is 2 million dollars, how much will each of them get?

Roughly half got this question correct

Let's say you have 200 dollars in a savings account. The account earns 10 percent interest per year. How much would you have in the account at the end of two years?

18% got this question correct

Effects of low numerical or data literacy

- Poor ability to understand risk

- Low financial literacy

- Unable to make informed judgements on issues that use data

- Low confidence with data also leads to data avoidance *("I skip the parts with numbers")*

A quick survey of the current state

- Charissa Jefferson (CSU-Northridge, co-author) surveyed librarians

- 2 questions:
  - Are you teaching with data?
  - Are you interested in learning about teaching with data

- Survey sent to Professional Listservs
  - Community College, university, instruction, data, and business librarians

- Received 142 responses

Teaching with Data

Do you teach with data?

Answered: 142   Skipped: 0
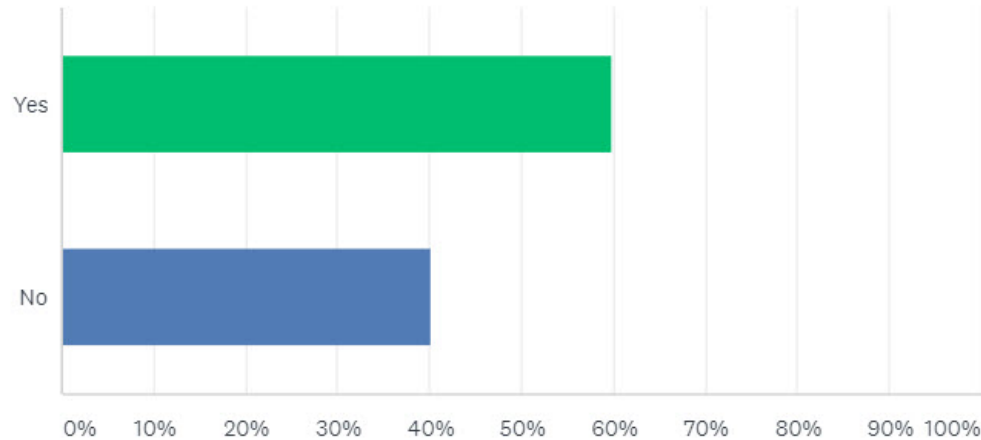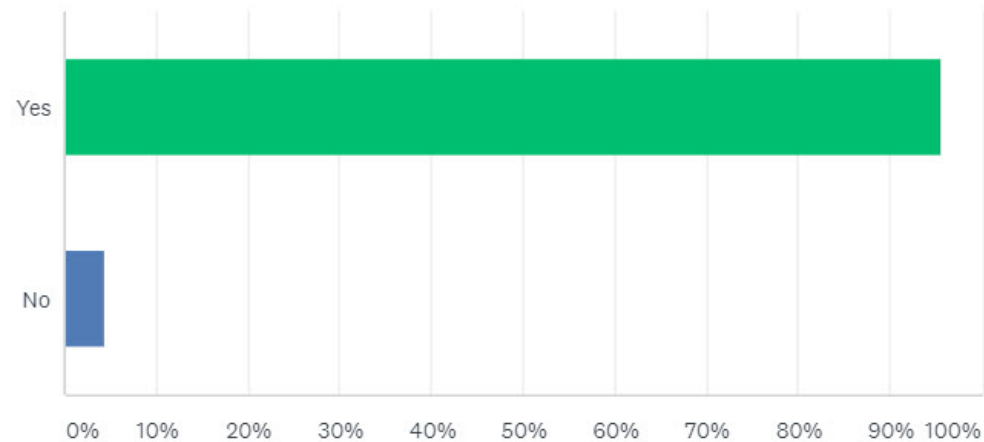
ANSWER CHOICES	RESPONSES	
Yes	59.86%	85
No	40.14%	57
Total Respondents: 142		

Learning about Teaching with Data

Possible Conclusions

- Some librarians are teaching with data, but nearly all who responded were interested in learning about how to teach with data
  - Perhaps the tools and resources are needed such as
    - Readymade lesson plans
    - Toolkits with interactive content
    - Workshops for professional development on teaching with data

ACRL's Framework for Information Literacy in Higher Education

- Adopted in 2016; replaced a set of competencies adopted fifteen years prior

- Designed for academic librarians & used extensively

- High level concepts to develop information literacy skills

- Widespread interest and support for it—recent publication of a 6 volume set of lessons; each frame had a volume
  - But out of that, only one lesson using data

Information Literacy Framework, 2015

Data visualizations are tools for creating information

Assessing the credibility of data and its source

Data may be public domain or commercial; it informs policy

Data's unique properties inform search strategy (tags and categories)

Development of new data to answer new questions (new data are added as new issues arise)

The use and reuse of data to understand a research questions and related content

Authority is constructed and contextual

Information creation as a process

Searching as strategic exploration

Information has value

Scholarship is a conversation

Research as inquiry

A Data Literacy Activity

- Fractile vs. Interval

Equal vs. Fractile Examples

Equal Interval Example		Fractile Example	
Category/Interval	Number of Cards/Data Points	Category/Interval	Number of Cards/Data Point
15-19 years	16, 17, 19	15-20 years	16, 17, 19, 20
20-24 years	20, 21, 22, 22, 23	21-29 years	21, 22, 22, 23
25-29 years		30-39 years	30, 31, 34, 37
30-34 years	30, 31, 34	40-45 years	42, 43, 44, 45
35-39 years	37	46-50 years	46, 48, 49, 50
40-44 years	42, 43, 44	51-69 years	51, 52, 62, 67
45-49 years	45, 46, 48, 49		
50-54 years	50, 51, 52		
55-59 years			
60-64 years	62		
65-59 years	67		

Active Learning

- Active learning is a form of learning in which teaching strives to involve students in the learning process more directly than in other methods.

- Bonwell (1991) "states that in active learning, students participate in the process and students participate when they are doing something besides passively listening."

- National Survey of Student Engagement (NSSE) and the Australasian Survey of Student Engagement (AUSSE) define active learning as learning that involves "students' efforts to actively construct their knowledge."

The Benefits of Active Learning

- Promotes learning for all students
- Effective strategies for making classrooms more inclusive
- Provides a more level playing field for future discussion
- Provides a "hook" on which students can hang "new learning"

Prior knowledge is a prerequisite for making sense of new learning.

We interpret and remember events by building connections to what we already know.

The Latest: Yellen says cheaper gas may yet accelerate US consumer spending

Stocks jumped after Federal Reserve Chair Janet Yellen announced America's central bank would not raise interest rates this month. The Fed instead revised down its rate hike expectations for the rest of the year.
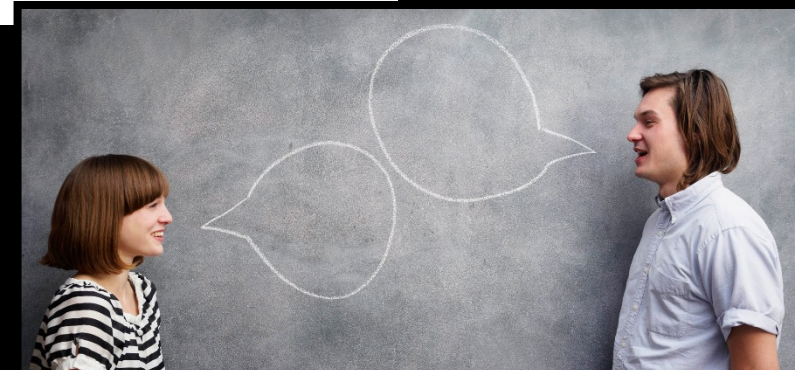
Are knowledge and higher order thinking skills substitutes?

"One cannot apply what one knows in a practical manner if one does not know anything to apply."

- Robert Stenberg, Psychologist
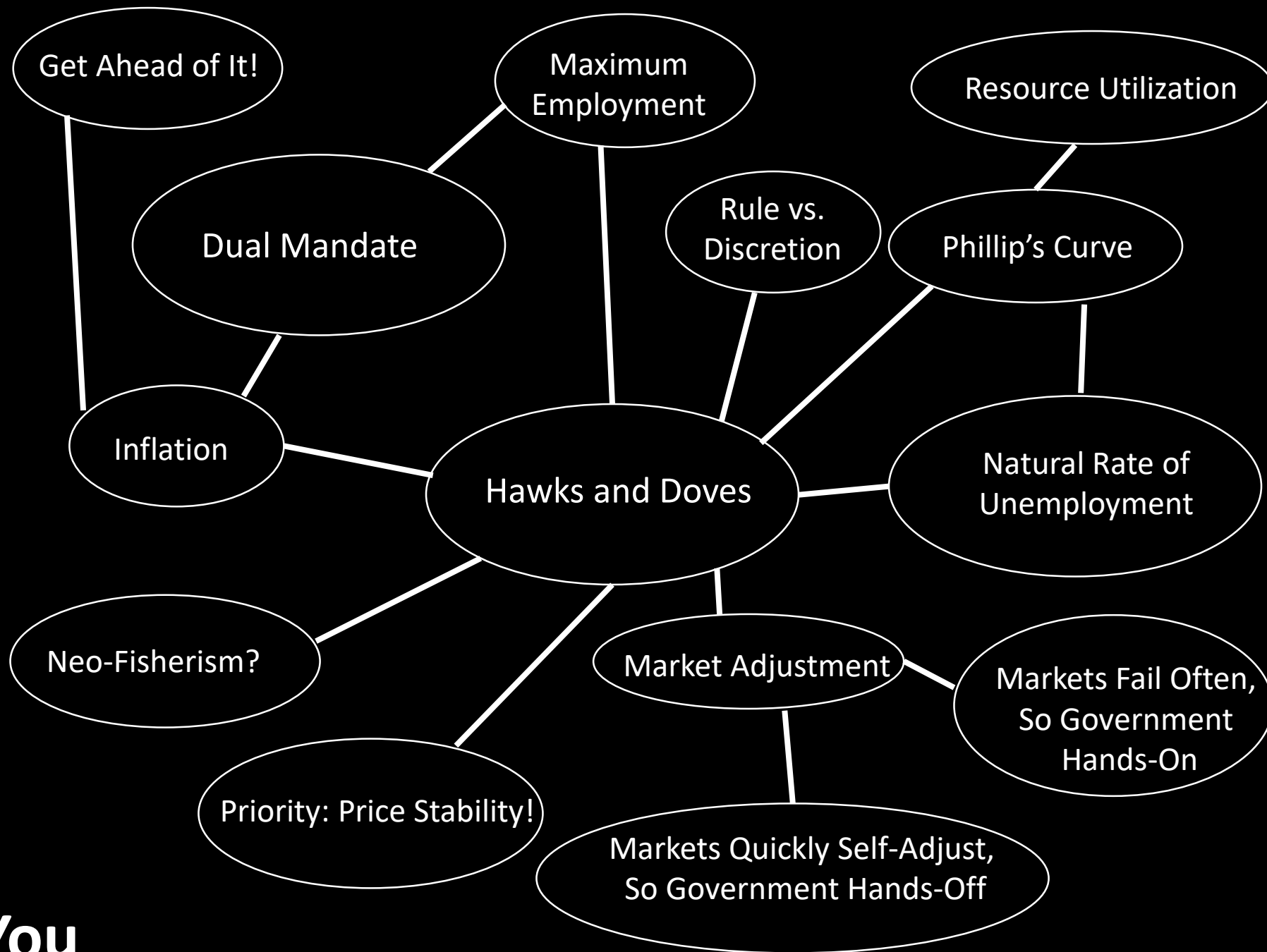
Hawks and Doves
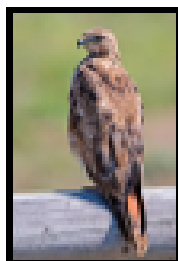
Your Students?
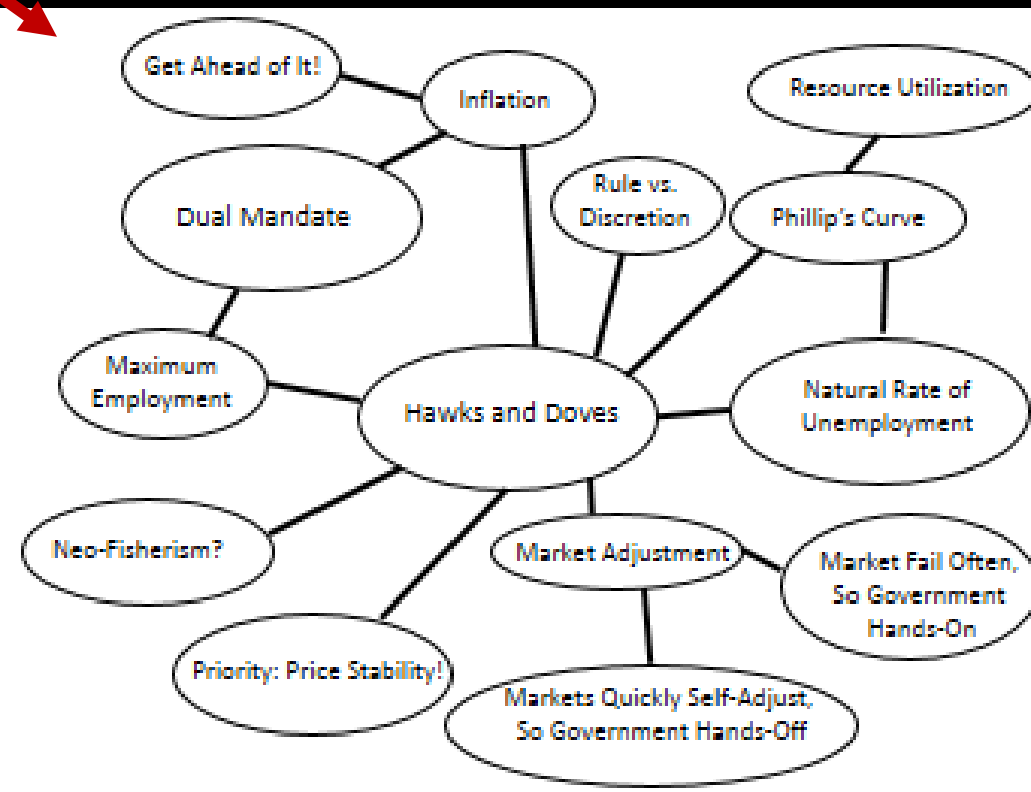
What is Backward Design?

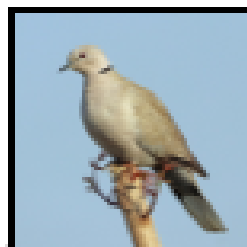- Backward Design refers to designing educational curriculum by setting goals before choosing activities or content to teach. Backward design begins with goals, then assessments and finally lesson plans.

- A metaphor used by proponents of backward design is a roadmap: with backward design, one chooses the destination first and then follows the map to get there.

What isn't backward design?

- Non-backward Design
  - Begin with the means—textbook, favorite lessons, tried and true activities
  - Assess what has been taught

Backward Design

- Backward Design
  - Begin with the end or desired results—standard/benchmark
  - Identify evidence necessary to determine that results have been achieved—summative assessment
  - Determine knowledge, skills and then teaching needed to equip students to achieve desired results.

Backward Design

- Ralph Tyler described the logic of backward design in 1949:

    "Education objectives become the criteria by which materials are selected, content is outlined, instructional procedures are developed and tests and examinations are prepared . . . The purpose of a statement of objectives is to indicate the kinds of changes in the student to be brought about so that instructional activities can be planned and developed in a way likely to attain these objectives."

Backward Design

Identify Desired Results Benchmarks of the Standards

Design Transfer for Evidence or Desired Results

Design Instruction that is Aligned to Desired Results and Transfer Task
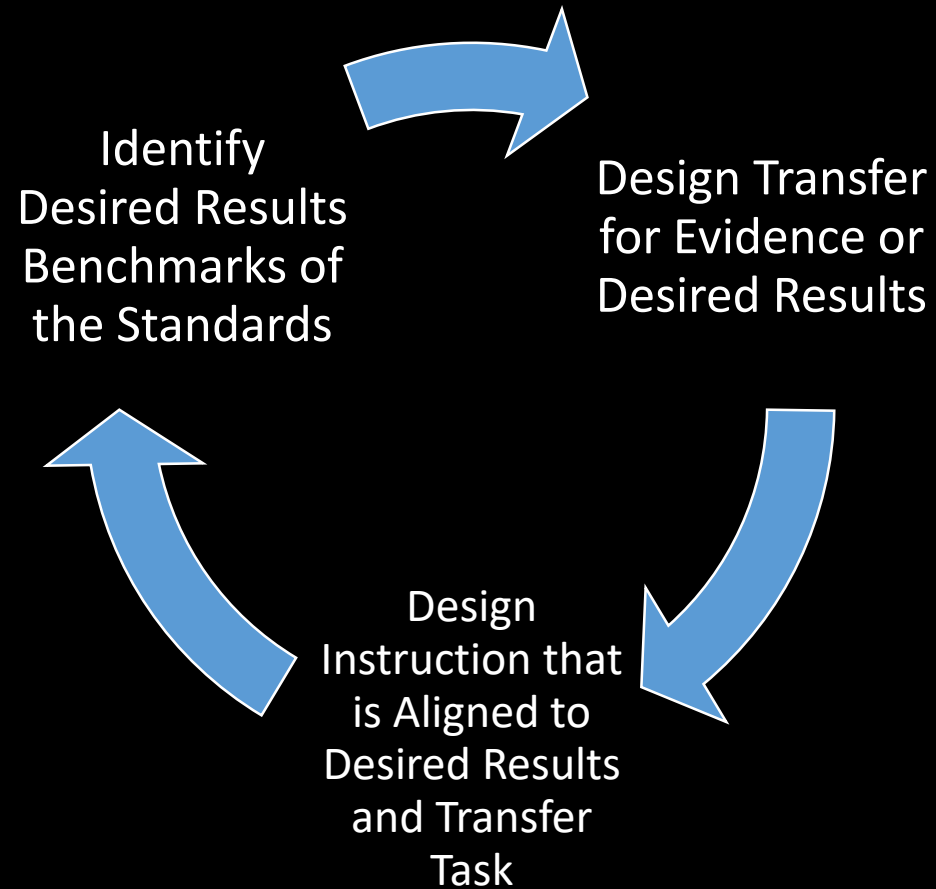
Essential Questions

Unit Essential Question

- A question that lies at the heart of a subject or a curriculum and that promotes inquiry and uncoverage of a subject. Can be overarching or unit specific and usually doesn't have a single answer. (Wiggins & McTigue)

Lesson Essential Question*

- A lesson can also have an essential question. This question reflects what you want students to know and be able to do by the end of the lesson. (Max Thompson)

Essential Questions

What are essential questions?

- Essential questions are concepts and skills in the form of questions.
- Essential questions organize and set the focus of the lesson.
- Essential questions are tools to help teachers gather evidence of learning.
- One essential question per lesson.
- Essential questions should be posed at beginning of lesson and answered by students at the end of the lesson.

Essential Questions

What's the essential question?

Lesson objectives

- Define budget, income, expenses, variable expenses, periodic expenses, and fixed expenses;

- Give examples of effective and ineffective budgeting behavior;

- Give examples of variable, fixed, and periodic expenses; and

- Explain why some emergency savings is important when implementing good budgeting.

Essential Questions

What's the essential question?

Lesson objectives

- Use population pyramids to describe the demographic structure of a population;

- Make predication based on analysis of specific age groups and describe the implications of these predictions;

- Explain the relationship between productivity and gross domestic product (GDP) per capita;

- Explain the relationship between a well-education and healthy population and a country's standard of living;

- Define labor productivity, standard of living, and human capital.

Essential Questions

What is the essential question?

Lesson objectives:

- Define innovation,
- Define patents as protection of intellectual property,
- Explain how patents promote entrepreneurship,
- Interpret a map of patents assignments by county, and
- Explain the relationship between education, research institutions, and the frequency of patents and innovation.

Essential Questions

What is the essential question?

Lesson objectives:

- Red census tables and graphs to obtain information and draw conclusions,

- Define costs and benefits,

- Identify the costs and benefits that influence people's decisions to migrate, and

- Define push and pull factors for migration and identify examples.

Essential Questions Development

- Develop an essential question for the standard/benchmark you selected for your lesson.

Essential Question Critique

- Gallery Walk

BREAK

An activity from Keeping it Real: Plotting Nominal and Real Wages Across Individuals States

- Each Table will receive Handout 1: Option A
- Go through the steps and fill out the information

Deeper Dive into Prices

- Big Mac Index https://www.economist.com/content/big-mac-index

From Wikipedia:

Critics of the presidency of Cristina Fernández de Kirchner in Argentina and many economists believe that the government has for years falsified consumer price data to understate the country's true inflation rate.[17] *The Economist* stated in January 2011 that Big Mac index "does support claims that Argentina's government is cooking the books. The gap between its average annual rate of burger inflation (19%) and its official rate (10%) is far bigger than in any other country."[16] That year the press began reporting on unusual behavior by the more than 200 Argentinean McDonald's restaurants. They no longer prominently advertised Big Macs for sale and the sandwich, both individually and as part of value meals, was being sold for an unusually low price compared to other items. Guillermo Moreno, Secretary of Commerce in the Kirchner government, reportedly forced McDonald's to sell the Big Mac at an artificially low price to manipulate the country's performance on the Big Mac index.[18][17] In June 2012, the price of the Big Mac value meal suddenly rose by 26%, closer to that of other meals, after *The Economist*, *The New York Times*, and other media reported on the unusual pricing. A Buenos Aires newspaper stated "Moreno loses the battle".[18]

Your turn: Developing an activity

- Outline an opening activity based on your essential question
  - engage the student and set up the lesson

Helpful Tools

- Fun FRED data, Page One Economics, FRED blog
- Standards/Benchmarks
  - National Standards for Financial Literacy
  - National Content Standards in Economics
  - Data section of the National Council of Teachers of Mathematics
  - ACRL Framework for Information Literacy
- Active learning handout
- Newspapers & magazines

Gallery Walk

What's next?

- Develop a Community of Practice for Data Literacy
  - Google group to share information
  - Super-short monthly newsletter with highlights

- Recruit others!
  - Share the newsletter and information about the workshop

- Start now by adding active learning to your lessons

- Attend a 3 day lesson writing workshop in late 2019 or 2020