ALM / IASE Webinar - 14 March 2022

What every (numeracy) educator working with (young) adults should know about
Civic Statistics
and why

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אוניברסיטת חיפה
جامعة حيفا

Pro Civic Stat

Seminar Plan:

1. Introduction: Statistics education in different contexts

2. About Civic Statistics (and ProCivicStat)

3. Activity - in breakout rooms (get ready!)

4. More about Civic Statistics + examples

5. Where to find info & resources about Civic Statistics

6. Recommendations, Research implications

7. Open discussion

1. Introduction: 'statistics education/learning' in different learning contexts

Multiple communities of teaching/learning

- Adult numeracy education (ALM): In diverse settings

- Statistics education (IASE): College/University / K-12 school

- Mathematics/STEM education: K-12 schools

- (tertiary) Quantitative Reasoning/Literacy (QR/QL)
            / remedial math

- Other contexts: e.g., health education, financial education,
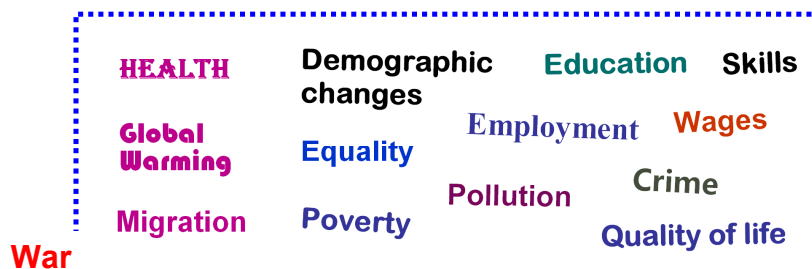   official statistics agencies…

Traditional content in Introductory Statistics:
in adult numeracy education? in school mathematics?

1 Why statistics	Uses of data, scientific method, …
2 Collect data	Plan collection of data, conduct simple surveys, use spreadsheets to organize data. Other methods.
3 Describe data	Design graphs & charts. Compute mean/median, spread (std.dev, range). Use to describe distributions
4 Probability	Describe chance of events by computing with rules of probability & simple simulations. Combinatorics.
5 Relationships prediction	Understand relationship of *two* variables - via visualizations, compute a correlation, regression
6 Inference	Compare differences between groups & distributions, by informal logic / simple formal inference.
7 Other?	e.g., report-writing, ...

Is this tradition aligned with actual statistical messages in the news?

2. About 'Civic Statistics' - 'hot' social & economic topics
(important to societies & people, involve social policy, monitoring, politics)

HEALTH   **Demographic changes**   Education   Skills

Global Warming   **Equality**   Employment   Wages

Migration   **Poverty**   Pollution   Crime   Quality of life

War

ProCivicStat (PCS): 2015-2018   (Funding: E.U. - ERASMUS+)

Pro Civic Stat

A partnership of teams from 6 universities in 5 countries:
Durham (UK), **Haifa** (Israel), **Ludwigsburg** (Germany), **Paderborn** (Germany), **Porto** (Portugal), **Szeged** (Hungary)

Resources & products: IASE-web.org/ISLP/pcs   **ProCivicStat Partners, 2018**
NEW Book: Ridgway, J. (Ed.). (forthcoming late 2022). *Statistics for empowerment & social engagement: teaching Civic Statistics to develop informed citizens.* Springer.

"Yediot Ahronot" (Israel) Russia war in Ukraine

Examples 1+2: Israeli media - March 2022 **Migration, Wages+Equality.**

הורדנו 30% משער "לאשה"!
מוזר, לא?

אבל מה שבאמת מוזר ומקומם זה שבשנת 2022 השכר הממוצע של נשים נמוך בכ-30% מזה של גברים!

בואו נדבר על כסף
פרויקט מיוחד ליום האישה

בקרוב תוכלי לדעת כמה הקולגה שלך מרוויחה

היית תוותרים לילדים על שטיפת כלים?

כך חילצתי את עצמי מבור כלכלי

יצחן שיק

We cut 30% of the front page of "La'isha" !

Strange, no?

But what is really strange and irritating is that in the year 2022, **the average pay for women is about 30% lower than that of men!**
_____
let's talk about money.
A special project for Women's day.

7 Mar 2022

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2. About 'Civic Statistics' - 'hot' social & economic topics
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Migration   Poverty   Pollution   Crime   Quality of life

Our goal: Improve citizens' engagement with evidence and decisions in our democratic societies.

The problem: Despite their importance, Civic Statistics topics are hardly addressed in a systematic way in statistics education, both at high-schools, university, or adult education.

(Why? So what? What can we do?)

3. Activity: Poverty   (breakout rooms, 8 min.)

Read this text about Poverty (Wikipedia, thanks!), Discuss questions below.

Poverty is the state of having few material possessions or little income.
Poverty can have diverse social, economic, and political causes, and consequences.

When evaluating poverty in statistics or economics, there are two main measures:
  Absolute poverty measures compare income against the amount needed to meet basic personal needs, such as food, clothing, and shelter.
  Relative poverty measures when a person cannot meet a minimum level of living standards, compared to others in the same time and place.
Thus, how *relative poverty* is defined varies from one country or society to another.

Statistically, as of 2019, most people on the planet live in poverty: (in Purchasing Power Parity dollars) 85% live on less than $30 per day, two-thirds live on less than $10 per day, and 10% live on less than $1.90 per day (extreme poverty).

Questions for group discussion (try at least the first two):

1. How is this **related to the traditional content** in introductory statistics?

2. Does this have **educational value** for (adult) numeracy / statistics / math education (i.e., can help what we expect of graduates!) - **Why, or why not?**

3. How can we use it when teaching statistics? Expected problems?

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4. More about 'Civic Statistics   (and ProCivicStat)
(important to societies & people, involve social policy, monitoring, politics)

Our goal: hope that our learners/graduates will **engage** with "civic statistics" (and with related numeracy tasks more broadly), and act as smart / active / critical consumers/users.

What is "engagement"? cognitions, dispositions, actions:

1. **care about** - be more sensitive, interested

2. **examine**   look for more information or data

3. **wonder / ask questions / doubt / reflect / critique** the given

4. **expand their understanding of what is involved & why.**
      (understand the network of correlates & consequences of a social problem)

5. **act / initiate / set goals / make decisions / evaluate actions**

'Civic Statistics: Key features

ProCivicStat (PCS) conducted literature reviews, analyzed media items, etc…

We argue that statistical news about key societal and economic topics have **12 broad features** that *differ* from typical "Introductory statistics" content.

Do we want 'engagement'? learners need to understand these features

Here are seven key features   (see Engel & Ridgway, 2022 (Ch.2))

1 **Societal context:**   meaning & consequences for society are the focus

2 **Multivariate:**   many variables, interactions, non-linear, …
3 **Aggregated:**   indicators, by sub-groups, by causal factors, …
4 **Dynamic:**   changes over time, geographical units
5 **Multi-source:**   multiple datasets / indicators for the same topic

6 **Diverse & rich texts:**   embedded in / communicated via
7 **Diverse & rich visualizations:**   embedded in / communicated via

More: Attributions of causality, Diverse measurements / collection methods, …

Example 2
Wages
Israeli media.

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Where are the civic statistics? inside the text…

– In the public sector, women in ages 45+ are over-represented (double their rate in the general workforce), but they earn **60% to 75% less than men** in the same age group.

> **This is a statistical claim - requires critical evaluation! Let's study this topic, via Wikipedia!**

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WIKIPEDIA
The Free Encyclopedia

Article   Talk

Gender pay gap

From Wikipedia, the free encyclopedia

Example 3: More Wages+Equality

The **gender pay (wage) gap** is the average difference between the remuneration for working men and women. Generally women are considered to be paid less than men.

There are two distinct numbers regarding pay gap: **non-*adjusted*** versus ***adjusted*** pay gap. The latter typically takes into account differences in hours worked, occupations chosen, education and job experience [1].

In the USA, for example, the **non-adjusted** average female's annual salary is 79% of the average male salary, compared to **95%** for the **adjusted** average salary [5][4] . The reasons (for the pay gap) link to legal, social and economic factors, and extend beyond "equal pay for equal work [6]"

The gender pay gap can be a problem from a public policy perspective because it reduces economic output, and women are more likely to be dependent upon welfare payments ,especially in old age [9][8][7].

Example 4: Global Warming

MEIO AMBIENTE

MG com calor do Nordeste? Projeção indica efeitos do aquecimento global

Estimativas baseadas no pior cenário da ONU indicam que cidades mineiras podem enfrentar calor hoje registrado em algumas das capitais mais quentes do país

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Minas Gerais with heat from the Northeast? Projection indicates effects of global warming

Estimates based on the UN worst-case scenario indicate that cities in Minas Gerais could face the heat currently registered in some of the hottest capitals in the country

https://www.em.com.br/app/noticia/gerais/2021/08/22/interna_gerais,1298183/mg-com-calor-do-nordeste-projecao-indica-efeitos-do-aquecimento-global.shtml?utm

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https://www.em.com.br/app/noticia/gerais/2021/08/22/interna_gerais,1298183/mg-com-calor-do-nordeste-projecao-indica-efeitos-do-aquecimento-global.shtml?utm

= 1600 words !

Example 5: Health

395 Words

https://www.thesun.co.uk/health/17868431/global-death-toll-covid/

TRAGIC TOLL Global death toll from coronavirus hits six million, fresh data

1. THE tragic global death toll from Covid has hit six million, new figures have shown.

2. Today Johns Hopkins University recorded the grim tally has reached the landmark figure.

3. Death rates around the world are still highest among those who are unvaccinated.

4. But confirmed deaths aren't thought to represent the actual number, partly due to testing challenges globally and how the cause of death is attributed.

5. The United States has the biggest official death toll in the world, with the UK seeing 162,008 official Covid deaths since the pandemic began.

6. Vaccines are the best way to get through the Omicron wave, experts have repeatedly said - and slash the risk of serious illness or hospitalisation in yourself and others.

IASE
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14 March, 2022

The onus is now on the general public to live with Covid, but try not to spread the bug to the more vulnerable.

UK COVID-19 CASES AND DEATHS PER DAY

TOTAL CASES: 19,119,181   TOTAL DEATHS: 162,008

We pay for your stories!
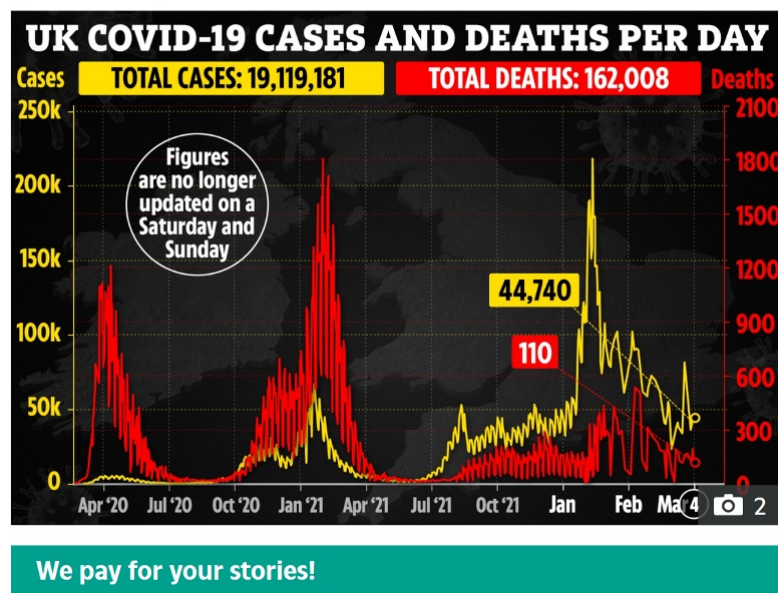
Based on the demands of tasks such as those shown earlier:
ProCivicStat developed a new conceptual framework:
11 Facets & Tools needed to understand 'Civic Statistics'
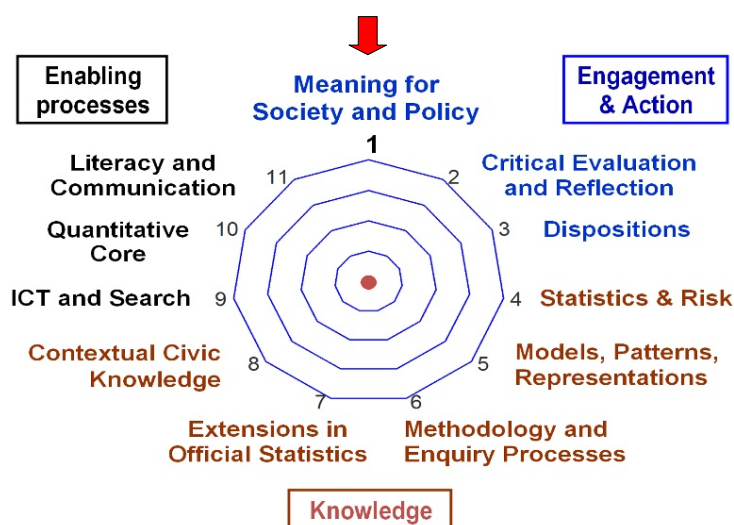
5. Where to find info & teaching resources about *Civic Statistics ?*

1. **PCS Website**: (under IASE)
   https://iase-web.org/islp/pcs

   or search: **procivicstat**

2. **PCS Book** (later 2022)

3. **IASE Proceedings**
   (conferences 2016-2021)

4. **Contact us!**

"ProCivicStat" website: (under IASE) https://iase-web.org/islp/pcs

ProCivicStat supports statistics teaching that enables students to engage with current social issues. We have created:

CivicStatMap — a database of teaching and learning materials, to support innovative teaching practices in high schools and universities
⇒ CivicStatMap ↗

Sample lesson plans: coming soon...

Sample datasets and activity guides: coming soon...

ProCivicStat Report: A Call for Action and Recommendations
⇒ ProCivicStat Report (pdf)

Conceptual framework mapping the skills and knowledge required for understanding civic statistics:
⇒ Conceptual Framework — short version (pdf)
⇒ Conceptual Framework — full version (pdf)
⇒ Conceptual Framework – Deutsche Kurzversion (pdf)

Review of dynamic visualisation tools, open access analysis tools, and relevant sources of data
⇒ Review of dynamic visualisation tools (pdf)

Datasets ⇒ Datasets (pdf)

Sample Syllabuses — two examples of how a syllabus can be constructed:
⇒ Syllabus for Civic Statistics (pdf)
⇒ Seminars to Support Statistical Literacy in Math Education (pdf)

Workshop Materials developing skills, and task analysis
⇒ Berlin Workshop Booklet (pdf)
⇒ Rabat Tasks Booklet (pdf)
⇒ Task Analysis Tool (xlsx)

Publications and academic papers
⇒ Publications and academic papers

Examples for resources for class tasks & thinking questions

(from "Berlin" booklet)

Pro Civic Stat

Erasmus+

Promoting Civic Engagement via Exploration of Evidence:
Challenges for Statistics Education

ProCivicStat © - Workshop at IASE Roundtable Berlin, July 19-22, 2016

Exploration of skills and knowledge needed for understanding statistics about society

By Iddo Gal (U. of Haifa), Jim Ridgway & James Nicholson (U. of Durham)

This Booklet was prepared as a product of ProCivicStat, a strategic partnership of the Universities of Durham, Haifa, Ludwigsburg, Paderborn, Porto and Szeged, funded by the ERASMUS+ program of the European Commission. The booklet contains a set of tasks using authentic texts and displays that involve statistics about society, sampled from diverse sources, e.g., publications of official statistics agencies, articles in TV, newspapers and web-based news channels, advocacy groups and NGOs, academia, etc. The tasks have been designed to provoke participants' reflections about the statistical knowledge and skills that [young] adults need for civic engagement, and about needed changes or new directions in statistics education.
For more information, visit the **ProCivicStat website: http://community.dur.ac.uk/procivic.stat**

List of tasks in this booklet

Task #	Civic area	Topic / details	Country	Source
Task 1	Well being	OECD Better Life Index	OECD	OECD
Task 2	Health, environment, population, education	Dynamic display: Pollution and weight	World	Gapminder Foundation
Task 3	Voting behavior	Dynamic display: Brexit	UK	House of Commons
Task 4	Health Risks	Dynamic display: Sexually Transmitted Diseases	UK	Health Protection Agency
Task 5	Environment	Dynamic GIF: Ice Volume	World	University USA
Task 6	Life expectancy	Dynamic display: Probability of age of death	USA	Social Security Administration
Task 7	Employment	Graph: women in economy	Norway	Eurostat
Task 8	Health	Mortality rates, probability	USA	Academic paper
Task 9	Poverty	Risk of poverty, income	Portugal	Statistics Portugal
Task 10	Migration	Migration trends	Europe	Eurostat
Task 11	Social diversity	Estimate of population size	USA	Newspaper
Task 12	Unemployment	Job statistics, data quality	Australia	ABS, ABC newspaper
Task 13	Economy, inequality	Country analysis	Israel	OECD
Task 14	Pollution	Health risks, policy impact	Germany	NGO, gov. report

University of Porto   Durham University   UNIVERSITÄT PADERBORN   University of Haifa   University of Szeged
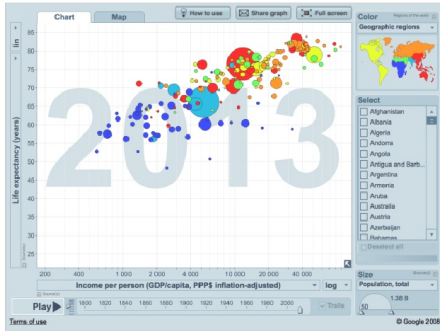

4

Task 2: Gapminder World

Background: Gapminder offers web-based interactive tools designed to develop public understanding of important facts about the state of the world.

Instructions:

1. Find Gapminder on the web: http://www.gapminder.org/world
   Start to explore it. Then continue with the Instructions below.

Stimulus: Visual

Instructions (cont.):

2. Analysis questions:

   Q1: What is the relationship between CO2 emissions and the body mass index for men in China, Germany and the USA?

   Q2: What can you conclude?

3. Fill in the Task Reflection form.
4. Discuss your thoughts with your group (if needed, add notes on Reflection form).

Questions for learners

11

Task 9: Poverty in Portugal

Background: This task illustrates a short press release from an official statistical agency: in this case, using texts from Statistics Portugal. *(Often, releases are longer, with tables & graphs).*

Source: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaques

Instructions:

1. Read the text under "Read this" below
2. Analysis questions:

   Q1: What can you conclude from the text about the chance of being poor in Portugal over 2014-2015 (i.e., the year discussed by the Press release)? Are things getting better or worse, regarding poverty in Portugal?

   Q2: What demographic characteristics do you think (from the press release) are the most important in relation to poverty in Portugal?.

3. Fill in the Task Reflection form.
4. Discuss your thoughts with your group (if needed, add notes on Reflection form).

Questions for learners

----- **Read this** ---

INSTITUTO NACIONAL DE ESTATÍSTICA
STATISTICS PORTUGAL

At risk of poverty rate, in 2014-15

1. The 2015 EU Statistics on Income and Living Conditions survey provisional data on previous year incomes indicates that 19.5% of people were at risk of poverty in 2014, keeping the value of the previous year. The risk of poverty for the elderly population has increased for the second consecutive year.

2. The presence of children in a household is associated to a higher risk of poverty, reaching 22.2% for households with dependent children vis-à-vis 16.7% for households without dependent children.

3. The at-risk-of-poverty rate for the unemployed population was 40.2% in 2014, a rise of 1.9 p.p. when compared to the previous year, and the proportion of people less than 60 years of age living in very low work intensity households increased 2.0 p.p. to a value of 12.2% in 2012.

4. More than 50% of the population that had completed secondary education was included in the two highest income classes. In contrast, almost half of the population that at most had completed primary education, and more than 60 % of the unemployed, lived in 2014 with an equivalent income of less than about 610 euro per month.

5. There was also a *reduction* in the asymmetry of the income distribution in 2014, with a Gini Coefficient of 34.0 % (half p.p. less than the previous year) and a ratio S80/S20 of 6.0 (6.2 in 2013).

Stimulus:

Text (authentic/shortened)

PCS Book **Pre-prints? Look on ResearchGate or Contact 1st author**

Ridgway, R. (Ed.)(2022). Statistics for empowerment and social engagement: teaching Civic Statistics to develop informed citizens. Springer.

Chp.	Title	Authors (with corresponding 1st author email)
Foreword	Democracy needs statistical literacy	Gerd Gigerenzer
Ch 1	Why engage with Civic Statistics?	Jim Ridgway (jim.ridgway@durham.ac.uk)
Part I: Redesigning Statistics Education		
Ch 2	Back to the future – rethinking the purpose and nature of statistics education	Joachim Engel (engel@ph-ludwigsburg.de), Jim Ridgway
Ch 3	A conceptual framework for Civic Statistics and its educational applications	Iddo Gal (iddo@research.haifa.ac.il), James Nicholson, Jim Ridgway
Ch 4	Implementing Civic Statistics – An agenda for action	Iddo Gal (iddo@research.haifa.ac.il), Jim Ridgway, James Nicholson, Joachim Engel
Part II: Tools, Data Sets, Lessons, and Lesson Preparation		
Ch 5	Interactive data visualizations for teaching civic statistics	Jim Ridgway (jim.ridgway@durham.ac.uk), Pedro Campos, James Nicholson, Sónia Teixeira
Ch 6	Data sets: examples and access for Civic Statistics	Sónia Teixeira (sonia.c.teixeira@inesctec.pt), Pedro Campos, Anna Trostianitser
Ch 7	Lesson plan approaches: Tasks that motivate students to think	Anna Trostianitser (anna.trostianitser@gmail.com), Sónia Teixeira, Pedro Campos
Ch 8	Seeing dynamic data visualizations in action: *Gapminder* tools	Peter Kovacs (kovacs.peter@eco.u-szeged.hu), Klara Kazar, Eva Kuruczleki
Ch 9	Data visualization packages for non-inferential Civic Statistics in high school classrooms	Daniel Frischemeier (dafr@math.uni-paderborn.de), Susanne Podworny, Rolf Biehler
Ch 10	Civic Statistics and *iNZight*: Illustrations of design principles for educational software	Chris Wild (c.wild@auckland.ac.nz), Jim Ridgway
Ch 11	Exploring Climate Change Data with *R*	Nuno Guimarães (nuno.r.guimaraes@inesctec.pt), Kimmo Vehkalahti, Pedro Campos, Joachim Engel
Ch 12	Covid-19 shows why we need Civic Statistics: illustrations and class activities	Jim Ridgway (jim.ridgway@durham.ac.uk), Rosie Ridgway

PCS Book - Table of Contents (cont.):
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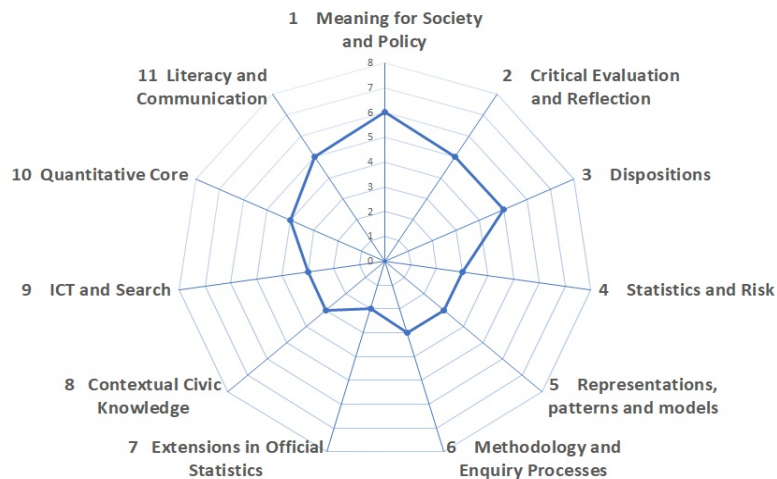|		
Part III: Implementing Civic Statistics		
Ch 13	Critical understanding of Civic Statistics: Engaging important contexts, texts, and opinion questions	Iddo Gal (iddo@research.haifa.ac.il)
Ch 14	Implementing Civic Statistics in business education: Technology in small and large classrooms	Peter Kovacs (kovacs.peter@eco.u-szeged.hu), Klara Kazar, Eva Kuruczleki
Ch 15	Civic Statistics for prospective teachers: developing content and pedagogical content knowledge through project work	Susanne Podworny (podworny@math.upb.de), Daniel Frischemeier, Rolf Biehler
Ch 16	Civic Statistics for prospective teachers: developing critical questioning of data-based statements in the media	Achim Schiller, Joachim Engel (engel@ph-ludwigsburg.de)
Ch 17	Civic Statistics at School: Reasoning with real data in the classroom	Christoph Wassner (wassner@martin-behaim-gymnasium.de), Andreas Proemmel
Ch 18	Preparing for a data-rich world: Civic Statistics across the curriculum	James Nicholson (j.r.nicholson@durham.ac.uk), Joachim Engel, Josephine Louie
Ch 19	Dynamic, interactive trees and icon arrays for visualizing risks in Civic Statistics	Laura Martignon (martignon@ph-ludwigsburg.de), Daniel Frischemeier, Michelle McDowell, Christoph Till
Part IV: The Futures of Civic Statistics		
Ch 20	Reflections on Civic Statistics — A triangulation of citizen, state and statistics: past, present and future	Karen François (karen.francois@vub.be), Carlos Monteiro
Ch 21	Connecting data science, data movements, & project-based learning social impact	Leid Zejnilovic (leid.zejnilovic@novasbe.pt), Pedro Campos
Ch 22	Data science, statistics, and Civic Statistics: Education for a fast changing world	Jim Ridgway (jim.ridgway@durham.ac.uk), Pedro Campos, Rolf Biehler
Ch 23	Civic Statistics in context: mapping the global evidence ecosystem	Jim Ridgway (jim.ridgway@durham.ac.uk), Rosie Ridgway

6. Implications, Recommendations, Research

1. Civic statistics deal with meaningful ('hot') social issues, and have consequences for society. CS have unique **features** (multivariate, dynamic, aggregated, rich texts & visualizations, etc).

2. We want/expect learners to **engage** Civic Statistics outside the classroom, to **improve citizens' engagement with evidence.** This requires the activation of **11 Tools & facets (in integration)** - including interest and motivation to apply them.

3. Media sources contain many important statistical ideas (about Civic Statistics), that are not included in traditional statistics instruction.

4. **Hence - need to rethink the sequencing of statistical topics, and design of activities & tasks (next slide)**:

   A. Tasks and materials should relate to "Important and meaningful" ("hot") social & economic contexts, discuss *consequences for society*, show why the topics (and the statistics about them) matter.

   B. Go beyond just traditional procedural tasks, or usage of 'real data'!
   Use *relevant data,* AND *findings,* AND *diverse texts* that are:
   Authentic, have stakeholders, "Need to know" , Critical questions

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The 'dilemma space' for Civic Statistics task design

Type 1	**Type 2**	**Type 3**	**Type 4**
Traditional statistics topics	analysis of 'real data' via standard methods	analysis of authentic data & tables & findings, embedded in policy questions	Critical analysis of texts (media articles analytic reports), Discuss Consequences for society

'Radar Plot' tool for rating tasks: 11 Facets & Tools
(for details, see ProCivicStat Book, Ridgway 2022, Chapters 3+4)

The radar plot shows 11 facets arranged around a circle with a scale from 0 to 8:

1 Meaning for Society and Policy
2 Critical Evaluation and Reflection
3 Dispositions
4 Statistics and Risk
5 Representations, patterns and models
6 Methodology and Enquiry Processes
7 Extensions in Official Statistics
8 Contextual Civic Knowledge
9 ICT and Search
10 Quantitative Core
11 Literacy and Communication

Key questions - and related research needs
(for adult numeracy educators / statistics educators)

Q1. Practices: What do we know about *actual practices* of our graduates outside the classroom, in their real life? when, and in what ways they engage with Civic Statistics or act in a 'statistically literate' way (or not!)
"Practices" are important in adult numeracy research, but neglected in stat education.

Q2. Curricular fit: Where (stage? year?) does Civic Statistics fit into:
- the standard statistics curriculum? (e.g., Intro Stat course)
- adult numeracy program/year?
- school math curriculum? (e.g., what year? how much?)

Q3. Adoption (and barriers to adoption): **'Civic statistics' is an 'innovation'** for many educators - so can create extra pressures, and some (many?) may not adopt it.
    Research topics, e.g.,: Motives, barriers, rejection reasons, track "Success stories" from which to learn how to improve adoption.

Thank you!   Gracias!   Obrigado! תודה

**Questions?   Comments?   Better ideas?
Good examples? Let me know!**

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Personal Webpage: https://hw.haifa.ac.il/en/people/human/igal

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