Communication Rumination: Engaging with Sci-comm & Edutainment

Larry Lesser

UTEP Distinguished Teaching Professor

The University of Texas at El Paso

in early March 2020…..

- Anticipating our son’s visit from college for spring break week

in early March 2020…..

- Anticipating our son’s visit from college for spring ~~break week~~

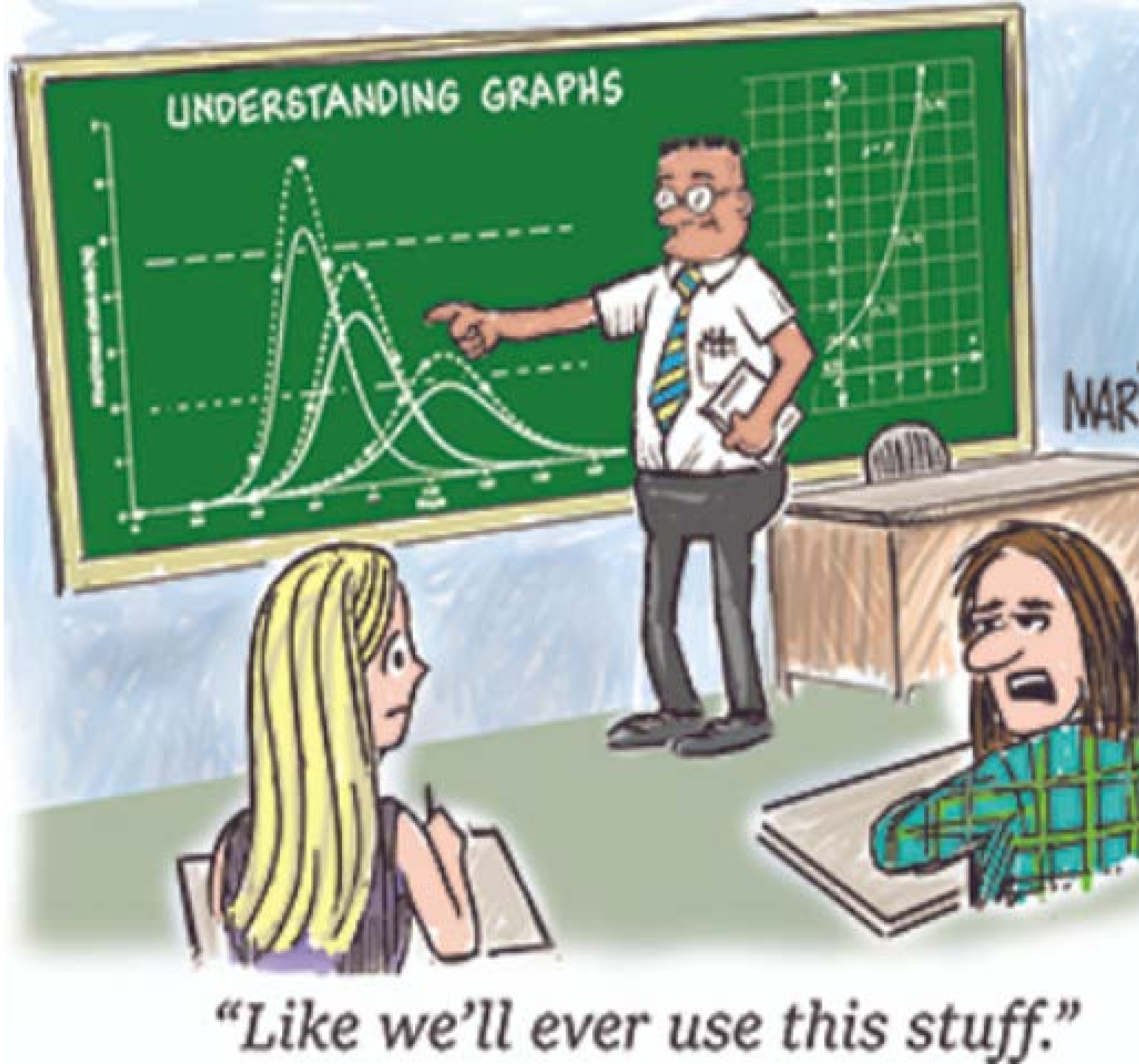
in early March 2020…..

- Anticipating our son's visit from college for spring ~~break week~~

- My statistical literacy & social sciences precalculus students would soon have even more motivation to understand data and exponential growth

Frank Mariani 2020 cartoon

https://www.ams.org/education/teaching-resources



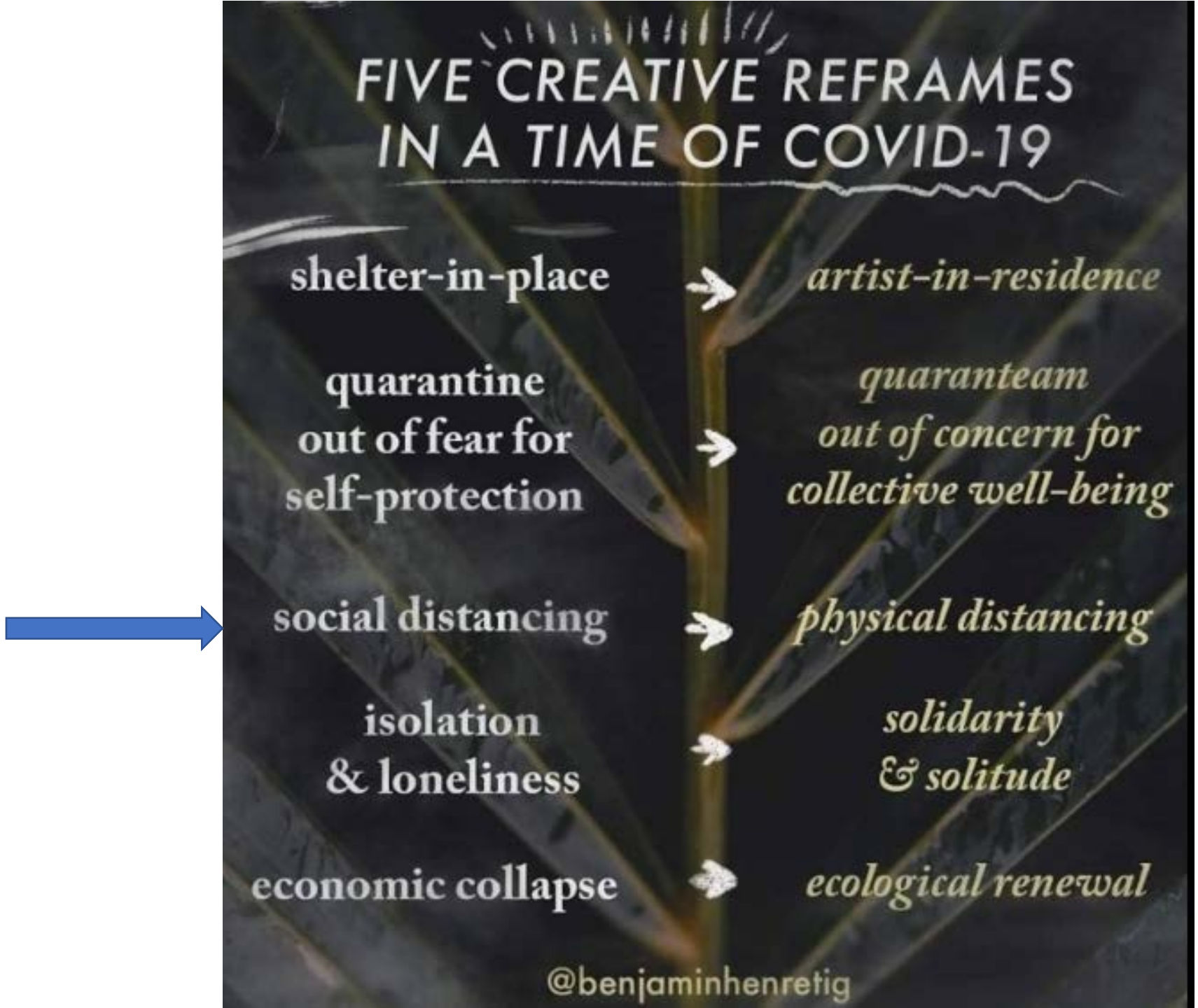
from article on doubling growth (Lesser, 2021)

"[Americans] might have heard on the news
that the number of cases roughly doubled every 3* days…
but didn't seem to realize that meant, for example,
that the number of cases was less than 1%
of what it would be in just 3 more weeks (since $2^7 > 100$)."

*actually, 2.68 before widespread mitigation efforts

3/23/20 email to a TX colleague's campus

"There are over 200 counties [of 254] in Texas
that have no cases of COVID-19....
Every community and University is different
and the state is supporting local decision making...."


FIVE CREATIVE REFRAMES
IN A TIME OF COVID-19
shelter-in-place
artist-in-residence
quarantine
out of fear for
self-protection
quaranteam
out of concern for
collective well-being
social distancing
physical distancing
isolation
& loneliness
solidarity
& solitude
economic collapse
ecological renewal
@benjaminhenretig

FRAMING
MATTERS

Schonger & Sele (2020) study in *PLOS ONE*

- online survey March 25-26, 2020
- explored whether the way exponential spread is communicated affects how much people underestimate benefits of mitigation
- *n* = 459 Swiss college students in non-STEM majors,

  each randomly assigned to 1 of 4 frames

	Mitigation given as reduction in daily growth rate	Mitigation given as increase in days for # of cases to double

	Mitigation given as reduction in daily growth rate	Mitigation given as increase in days for # of cases to double
Estimate # of cases avoided in 30 days		
Estimate time gained until 1 M cases reached		

POLL: which frame best avoids underestimating benefits of mitigation?

	Mitigation given as reduction in daily growth rate	**Mitigation given as increase in days for # of cases to double**
Estimate # of cases avoided in 30 days	A	B
Estimate time gained until 1 M cases reached	C	D

“The frame that combines doubling times [instead of growth rates] with the logarithmic perspective fully eliminates mitigation bias…” (Schonger & Sele, 2020)

	Mitigation given as reduction in daily growth rate	**Mitigation given as increase in days for # of cases to double**
Estimate # of cases avoided in 30 days (exponential perspective)	Worst frame A	B
Estimate time gained until 1M cases reached (logarithmic perspective)	C	**Best frame** **D**

FRAMING
MATTERS

Insight from van der Bles et al. (2019) framework

Graphical/numerical summaries chosen

may influence whether uncertainty communication

is received as a marker of transparency/honesty

or is politicized to “undermine the perceived competence of the communicator”

speaking of doubling growth:

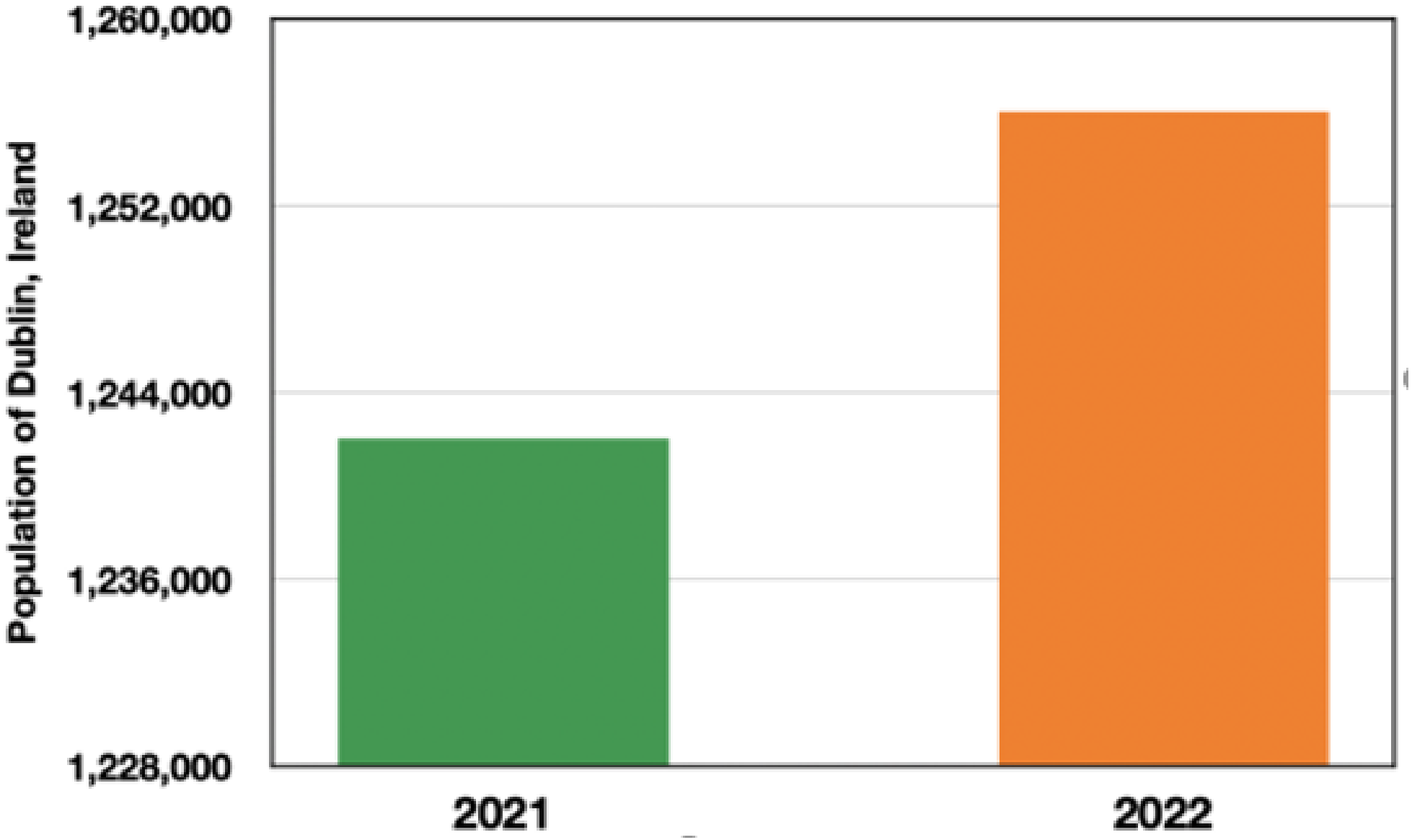
my newest contribution to CAUSEweb.org/fun

takes real data and a bad graph

and asks students….

Is Dublin Doublin' ?

CAUSEweb.org/fun



KCOS-TV, *Blast Beyond*
Seas. 2 Ep. 6; 1/30/12

Can outreach comm. inform “regular teaching”?

Lesser (2021)

Can outreach comm. inform “regular teaching”?

Lesser (2021)

- sharpen focus on **main point**
- **make interactive** (e.g., build in questions, demos/props),
- have lesson ‘plan’ that can **adjust** to unexpected questions,
- have compelling opening **‘hook’ to generate engagement**

ideas for opening HOOK

JSE papers on "Setting the Tone"/"Counterintuitive Examples",
"Striking Demonstrations"

also, ideas adapted from Barkley (2019):

- Quote from someone famous
- Tell a story
- Show a statistic
- Contrarian statement
- Pose intriguing what-if question
- Quick class poll

3 decades ago
(my 1st sci-comm experience)

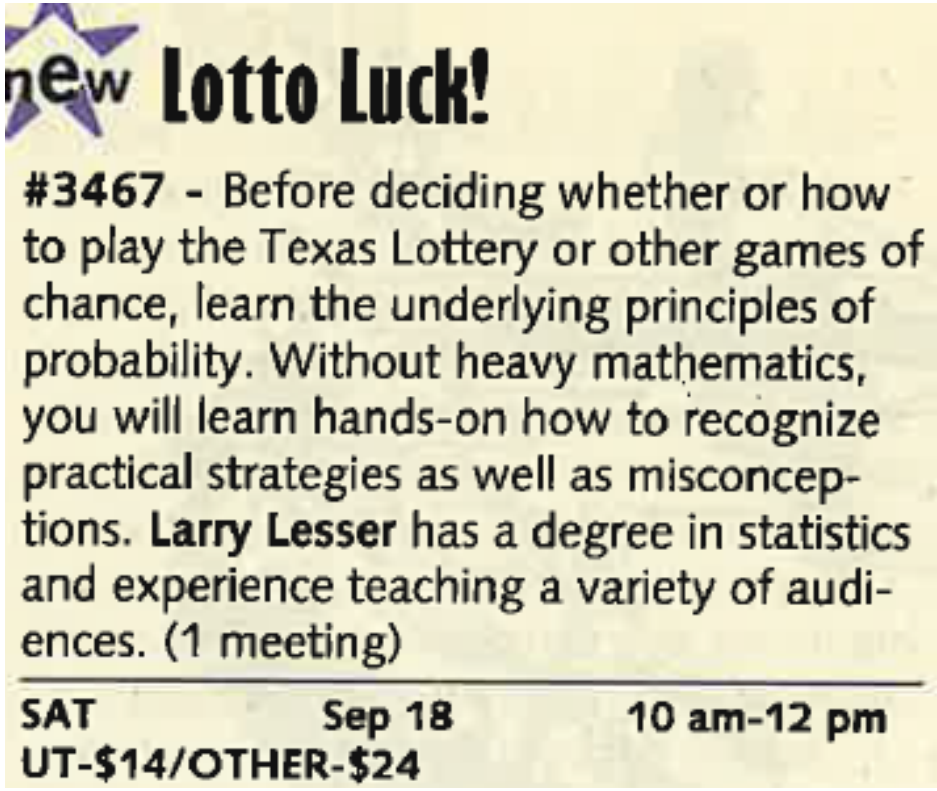
- not much literature or degree programs

- I was a grad student in TX,

which had just launched its state lottery

I created & taught

adult ed for UT-Austin Informal Classes



new **Lotto Luck!**

#3467 - Before deciding whether or how to play the Texas Lottery or other games of chance, learn the underlying principles of probability. Without heavy mathematics, you will learn hands-on how to recognize practical strategies as well as misconceptions. **Larry Lesser** has a degree in statistics and experience teaching a variety of audiences. (1 meeting)

SAT Sep 18 10 am-12 pm
UT-$14/OTHER-$24

INREACH

- Compute probabilities using combinatorics or distributions

(e.g., exactly 1 person wins jackpot)

- Explore data on ticket sales, jackpots, ball numbers, etc.
- Expected value (formal)

OUTREACH

- Visualize probability that ***you*** win
- Explore "strategies" such as tracking
- Expected value (informal)

a ‘lotto’ media experience for a grad student!

- Periodicals: *Austin American-Statesman* (37 column inches) & other city papers, *Real Simple*, *BottomLine Retirement*, *USA Today,* Associated Press, *etc.*
- Radio: Atlanta, Austin, Denver, El Paso, Houston, San Antonio
- TV: CNN and various local stations

Saturday, August 28, 1993 Austin American-Statesman B3

Professor seeks to even odds of lottery

■ Class aims to unravel the numerical mysteries of the state's game of chance

By David Elliot
American-Statesman Capitol Staff

Staff photo by Lynne Dobson

Larry Lesser, a St. Edward's University professor, hopes to demystify the numbers surrounding the Texas Lottery in a class he will be teaching.

this crash course in media relations taught me:

Start with main point; have analogies (Lesser, 2016) and ‘sound bites’

Reframe questions when necessary

Ask to accuracy check the write-up (usually won’t happen)

“Every great news story has 6 qualities: timeliness, proximity, prominence, novelty, human interest and conflict” (Deschamp, 2006)

Know (and don’t judge) your audience

Utts (2015)

TABLE 16.1 Kahneman's Fourfold Pattern with Real Life Situations: Preferences in Italics

	Gain	Lose
Certainty Effect: Increase probability from 95% to 100%	95% chance to gain $10,000 *100% chance to gain $9,000*	*95% chance to lose $10,000* 100% chance to lose $9,000
Explains why people	Accept settlement in court case even with high chance to win	Reject settlement in court case even with high chance to lose
Possibility Effect: Increase probability from 0 to 1/1000	*1/1000 chance to gain $10,000* 100% chance to gain $11	1/1000 chance to lose $10,000 *100% chance to lose $11*
Explains why people	Buy lottery tickets	Buy insurance and warranties

visualizing (1 in 26 M) Lotto Texas jackpot chance

- 1 sheet of typing paper from 1.6-mile stack
- 1 inch on road from El Paso to Phoenix
- 1 person from 500 full Sun Bowl stadiums
- 1 minute in a half-century
- 1 pixel from 13 high-definition TVs [*student-contributed!*]

- 1 win (on average) if you buy 100 tickets/week for 5,000 years

When jackpots get big, some questions I get:

- (How to grasp) jackpot chances?
- Are there strategies to increase chances?
- Do YOU ever play (or win)?
- Is Quick Pick better than self-picks?
- Chance adjacent numbers [etc.] are drawn?
- How rare is a jackpot this big?

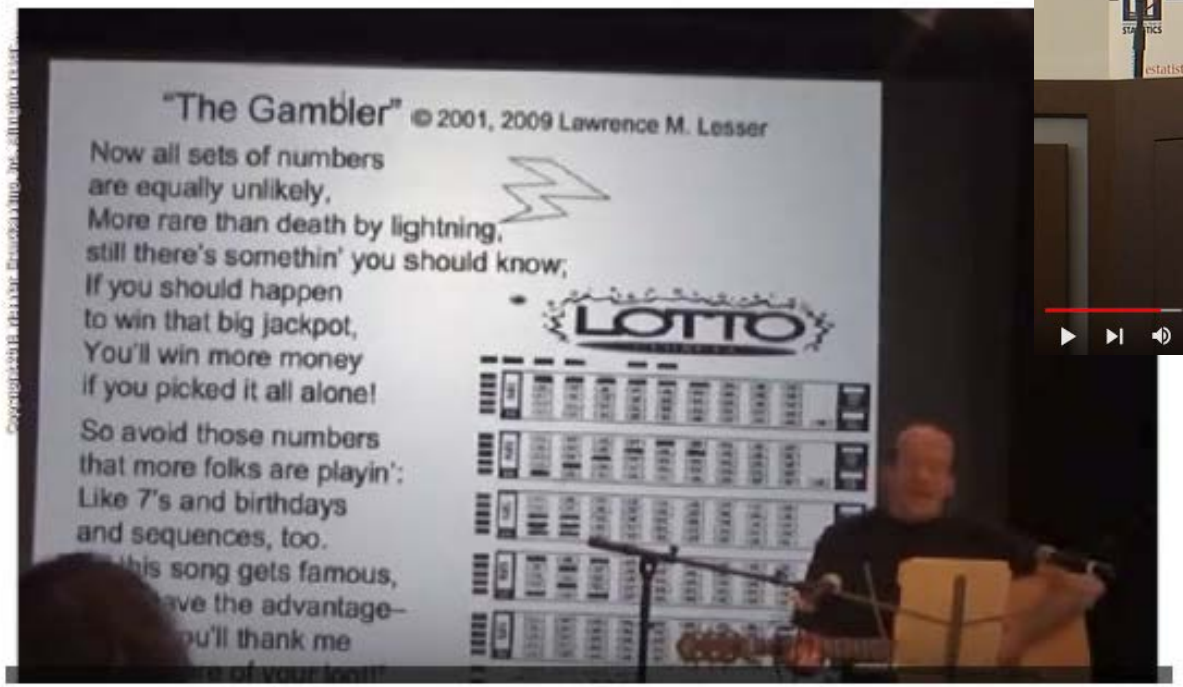
“LOTTERY STRATEGY”

my limerick in June 2021 *Amstat News*

The lottery numbers you choose
Won’t change your chance to lose.
But if all 6 match,
You’ll get way more cash
If you picked what’s picked by few!

UTEP Math professor creates song about lottery strategies, myths

By: Kayla Melson
Posted: Jan 06, 2018 11:03 AM MST
Updated: Jan 06, 2018 11:03 AM MST



EL PASO, Texas (KTSM) - If you're planning to purchase a Powerball ticket for Saturday night's drawing, you may want to listen to a special song first.

Larry Lesser, a UTEP math professor, wrote "The Gambler" to address strategies and myths for playing the lottery.

"**THE GAMBLER**" to tune of Kenny Rogers' hit

song/video in CAUSEweb.org/fun

"THE GAMBLER" (Teaching the Lottery-Playing Public about Statistics)

Professor Lesser
78 subscribers
Analytics
Edit video
13

2,796 views Jun 28, 2011
Dr. Larry Lesser's statistics education outreach about the lottery

NSF has helped turn science into songs!

recent examples:

- **NIMBioS BioSongs Project** (Louis Gross) turned biology research into songs via songwriter-in-residence program
- **CAUSEweb.org/smiles/** (Pearl/Lesser/Weber) 6 writers wrote interactive statistics songs (spinoff **CAUSEweb.org/voices** works across STEM)

Communicate like a songwriter for big new views?

Songwriters and educators must:

- grab attention with memorable “hook”/story
- plan trajectory (e.g., start gently)
- think when to “set up” material vs.
  dive in and debrief later
- think when/how to incorporate humor
- use concrete specifics and simple words

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simple ain’t always simple….

- Everyday words (e.g., “spread”) may reinforce misconceptions (Kaplan et al. 2012: use “variability” instead)
- Phrases with simple words like “in the long run” can be idiomatic (Lesser et al. 2016: use “in the long term” instead)
- Assignments like “Explain Concept X as if talking to your grandma” communicate things you don’t intend!

blog of NCSU's Rachel Levy

Grandma Got STEM

Why this blog?

Perhaps, like me, you are tired of hearing people say "how would you explain that to your grandmother?" when they probably mean something like "How would you explain the idea in a clear, compelling way so that people without a technical background can understand you?" In other words, "How would you explain that to a novice?"

Category Archives: *Statistics*

Nagambal "Swarna" Shah

Posted on May 4, 2014 by Rachel Levy

Thank you to Prof. Natasha Brewley, who shared the photo above and post below on the occasion of Dr. Nagambal "Swarna" Shah's Retirement Party May 3, 2014. Dr. Swarna Shah has been a source of inspiration and support for many ... Continue reading →

Posted in Mathematics, Statistics, Uncategorized | Leave a comment

Gertrude Cox

Posted on July 5, 2013 by Rachel Levy

Thanks to Stephanie Zimmer for this submission to Grandma got STEM. Gertrude Cox was the first head of the Department of Experimental Statistics in the School of Agriculture at North Carolina State College (a forerunner of the Department of Statistics at ... Continue reading →

Posted in Mathematics, Statistics | Leave a comment

Mary R. Anderson-Rowland

Posted on February 28, 2013 by Rachel Levy

I am a STEM grandma – I have seven wonderful grandchildren ages 6-17. My PhD is in

Song is just 1 of many edutainment forms (red ones are in CAUSEweb.org/fun)

[adapted from Lesser & Pearl (2008)]

- Art Gallery
- Cartoon/Comic Strip
- Celebration Days
- Clothing
- Food
- Games
- Game Shows
- Humor/Jokes
- Kinesthetic Activity (e.g., dance)
- Literature
- Magic
- Media Bloopers
- Poem
- Puzzle/Wordplay
- Quotation
- Skits
- Song/Rap
- Statistics (fun) book
- Short Story
- Strange News
- Striking Examples
- Video/movie

some **edutainment resources** in stat ed

- **CAUSEweb.org/fun** (since 2005):

usage guidance,
literature,
& some 1000-odd items!

- Study of Fun **research cluster** (since 2009)

- **column** in *Teaching Statistics* (since 2019)

Why statistics edutainment?

- *College GAISE II*: “Use games… to engage students, teach concepts and gather data.” [see Shonda Kuiper’s work]
- Helps “build rapport,” part of Accessibility and Inclusion Goal #2 of Dogucu, Johnson, Ott framework in March 2023 *JSDSE*
- May decrease anxiety and/or increase learning
- Humanizes the discipline/course/instructor

Annalisa Crannell, Jan. 8, 2008

MAA Haimo Award for Distinguished Teaching

- “Paradoxically, if our own intellectual lives are ‘all math, all the time,’ we face a lot of challenges when we try to woo others into our discipline.”
- “our mania for ‘balancing’ parts of our lives (teaching & research; work & family) compartmentalizes them in harmful ways …it’s possible to integrate—

  rather than merely balance”

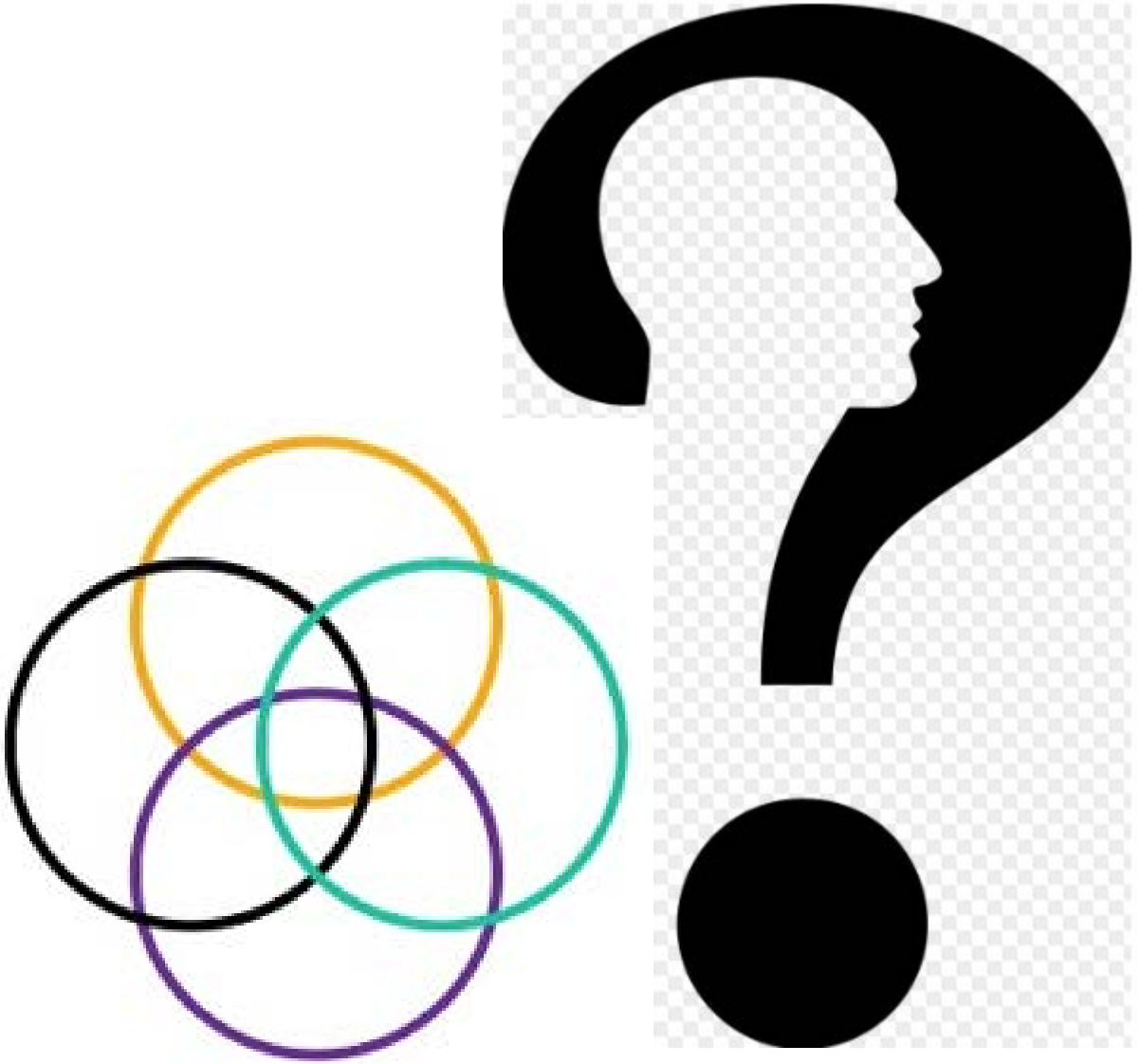
now, my most recent sci-comm adventure:

I launched the opening sci-comm module
for the 2022 debut of
UTEP's UG course "Research and Teaching Integration"

- for future STEM researchers
- for future STEM teachers

no sharp boundaries between:

- science education
- science communication
- science journalism
- scientific literacy
- scientific culture
- public understanding of science
- public awareness of science
- etc.



communication vs. education

- a difference:

whether audience includes general public

- a similarity:

moving to a more interactive/dialogic model

(Baram-Tsabari & Osborne 2015; Burns et al. 2003)

some sci-comm journals

- *Int'l. J. of Sci. Ed., Part B: Comm. and Public Engagement* (Taylor & Francis)
- *Public Understanding of Sci.* (SAGE)
- *Sci. Comm.* (SAGE)
- *J. of Sci. Comm.* (Sissa Medialab, Italy)

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(rare) example of comm. paper on teaching statistics

Communication Education ›
Volume 53, 2004 - Issue 1

Enter keywords, authors, DOI,

Submit an article

Journal homepage

153
Views

9
CrossRef
citations to date

Original Articles

“Of Course I'm Communicating; I Lecture Every Day”: enhancing teaching and learning in introductory statistics

Shaun S. Wulff & Donald H. Wulff

awareness of classroom communication patterns
(Lesser & Kephart, 2011)

from discourse analysis of 3 hours of my teaching, linguist K. Kephart noticed:

- **varying participation structures** (e.g., small-group and whole-class discussion)
- **instructor role as facilitator and co-learner** (e.g., inviting students to explain reasoning of their peers as well as their own)

Also, see if instructor always speaks after each student

disciplinary Communication Resources

- https://www.amstat.org/policy-and-advocacy/statistical-significance-series
- https://magazine.amstat.org/blog/2021/09/01/qanda_sept/
- https://statsandstories.net/
- https://www.worldofstatistics.org/
- Regina Nuzzo, ASA's (inaugural) Senior Advisor
  for Statistics Communication and Media Innovation

- NCTM: *Communications Handbook* (1993), *Communications Guide* (2004)
- AMS: https://www.ams.org/publicoutreach/

AMSTATNEWS
The Membership Magazine of the American Statistical Association

What's Our Point? Flipping the Paradigm for Communication in Statistics and Data Science

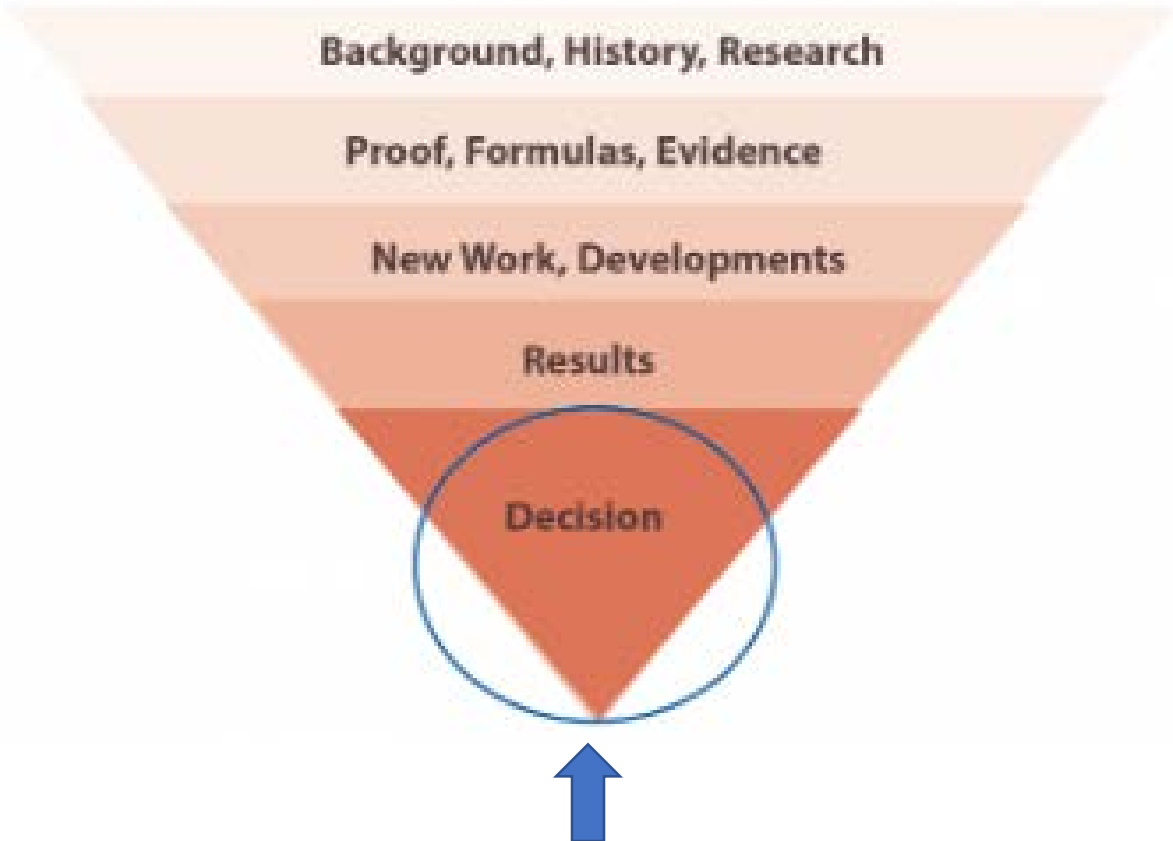
1 SEPTEMBER 2021 1,005 VIEWS ONE COMMENT

Elizabeth Mannshardt is an adjunct associate professor in the department of statistics at North Carolina State University, associate director of the US Environmental Protection Agency's Information Access and Analytic Services Division, chair-elect of the ASA Section on Statistics and the Environment, and vice chair of the ASA Committee on Career Development.

Mannshardt (2021) paradigms

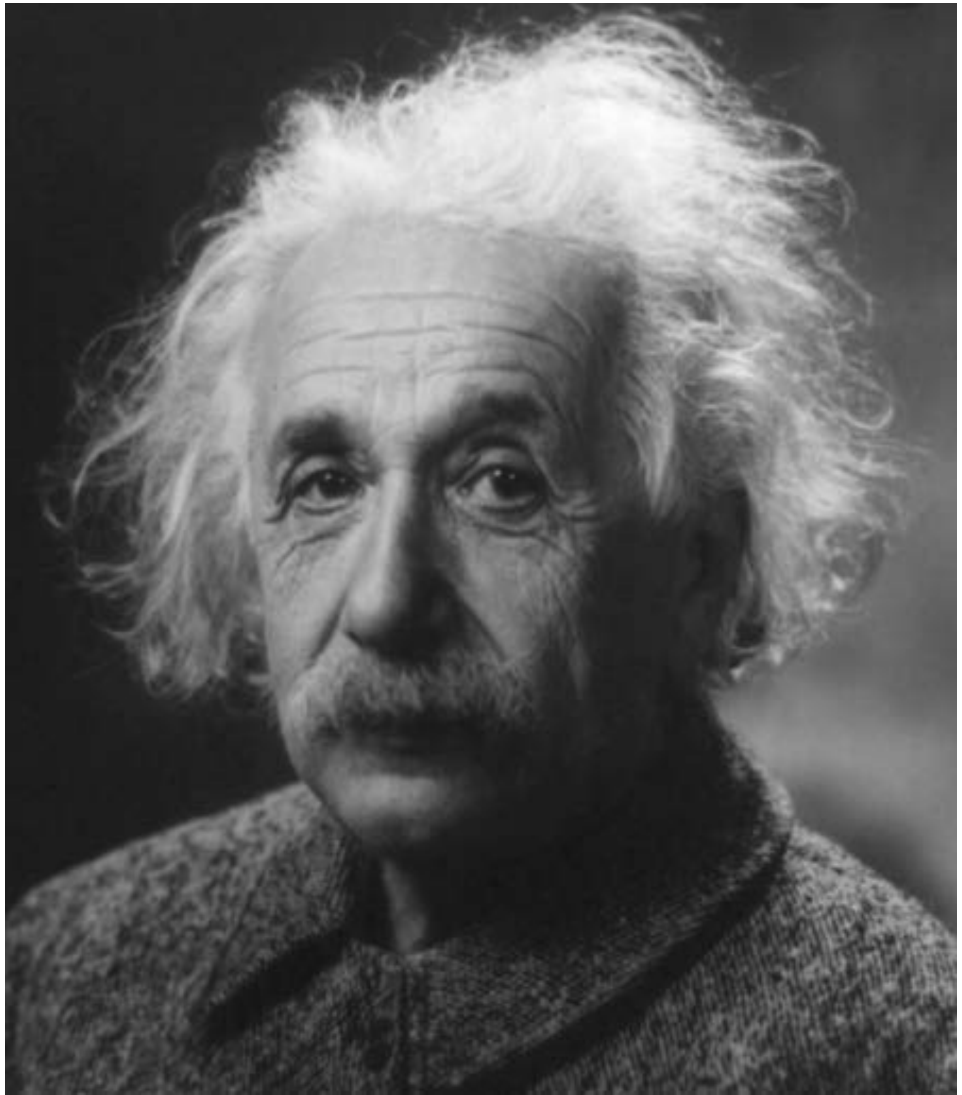
Traditional: go up to your point

Flipped: lead with your point



POLL: “If you can't explain it **simply**, you don't understand it well enough.”

- Disagree
- Agree



related statement by
American psychologist Jerome Bruner
(p. 33 of his 1960 text, *The Process of Education*)

"Any subject can be taught effectively
in some intellectually honest form
to any child
at any stage of development."

monthly mag *WIRED* has 23 videos explaining topics at 5 increasing levels of complexity:
https://www.wired.com/video/series/5-levels

- child
- teen
- undergrad major
- grad student in field
- colleague in field

Musician Explains One Concept in 5 Levels of...

5 LEVELS

Expert Explains One Concept in 5 Levels of...

5 LEVELS

Oculus' John Carmack Explains Virtual Reality in 5...

5 LEVELS

Biologist Explains One Concept in 5 Levels of...

5 LEVELS

Neuroscientist Explains One Concept in 5 Levels of...

5 LEVELS

Astronomer Explains One Concept in 5 Levels of...

5 LEVELS

Laser Expert Explains One Concept in 5 Levels of...

5 LEVELS

Sleep Scientist Explains One Concept in 5 Levels...

5 LEVELS

Physicist Explains One Concept in 5 Levels of...

5 LEVELS

Astrophysicist Explains One Concept in 5 Levels of...

5 LEVELS

Hacker Explains One Concept in 5 Levels of...

5 LEVELS

Nanotechnology Expert Explains One Concept in 5...

5 LEVELS

Physicist Explains Origami in 5 Levels of Difficulty

Computer Scientist Explains Machine Learning in 5...

Neuroscientist Explains Memory in 5 Levels of...

Computer Scientist Explains One Concept in 5...

Musician Explains One Concept in 5 Levels of...

5 LEVELS

Expert Explains One Concept in 5 Levels of...

5 LEVELS

Oculus' John Carmack Explains Virtual Reality in 5...

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5 LEVELS

Neuroscientist Explains One Concept in 5 Levels of...

LEVELS

Astronomer Explains One Concept in 5 Levels of...

5 LEVELS

Laser Expert Explains One Concept in 5 Levels of...

5 LEVELS

Sleep Scientist Explains One Concept in 5 Levels...

5 LEVELS

Physicist Explains C 5 Levels of...

5 LEVELS

Astrophysicist Explains One Concept in 5 Levels of...

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Hacker Explains One Concept in 5 Levels of...

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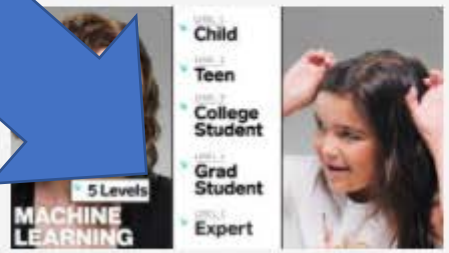
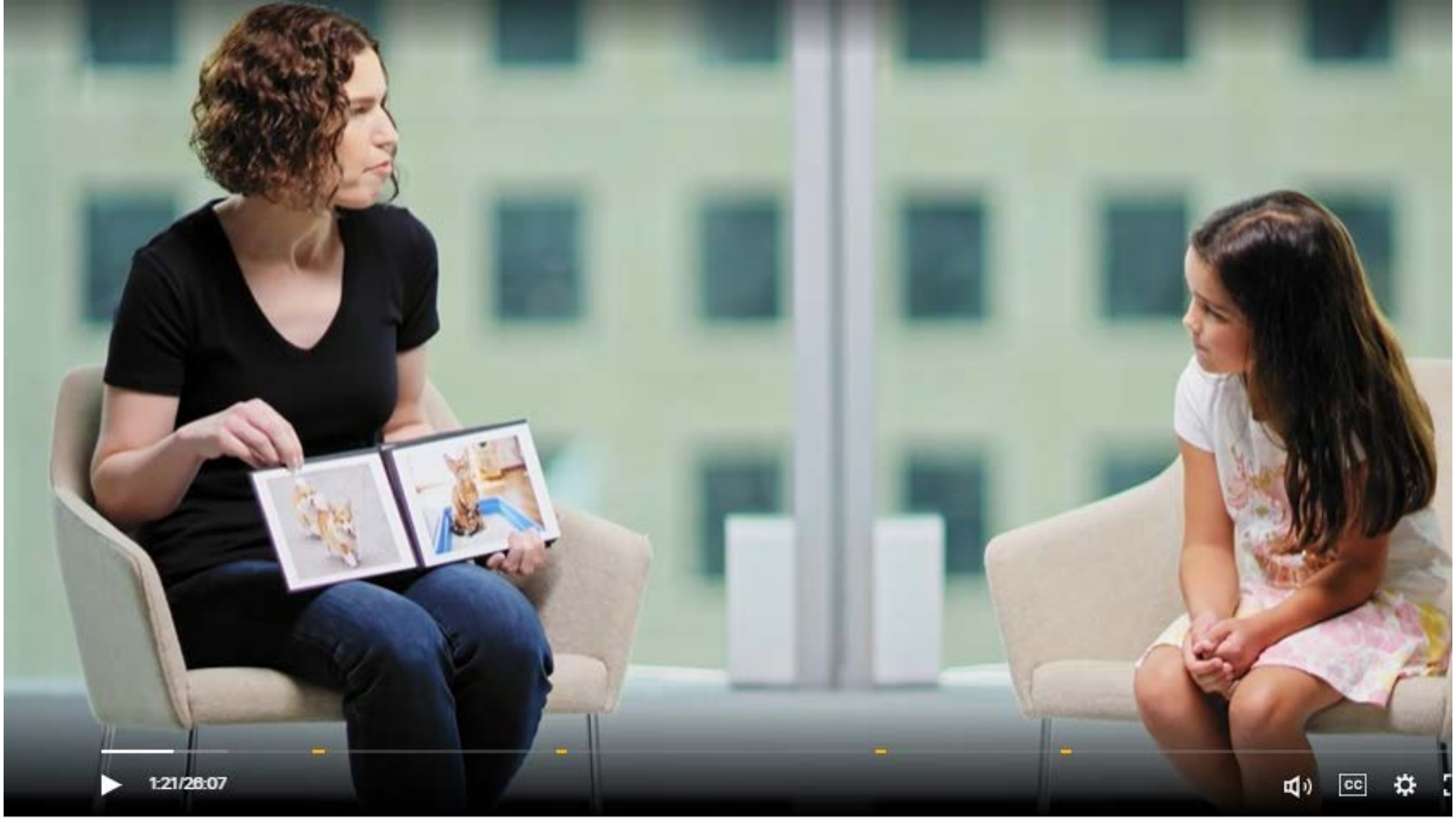


Computer Scientist Explains Machine Learning in 5...

Neuroscientist Explains Memory in 5 Levels of...

Computer Scientist Explains One Concept in 5...



giving machines
many examples
to teach them to
recognize cats or dogs

5 LEVELS | SEASON 1 | EPISODE 14

Computer Scientist Explains Machine Learning in 5 Levels of Difficulty

UTEP students given a 5-levels assignment

"Each student chose a science topic
they were comfortable discussing in 5 levels.

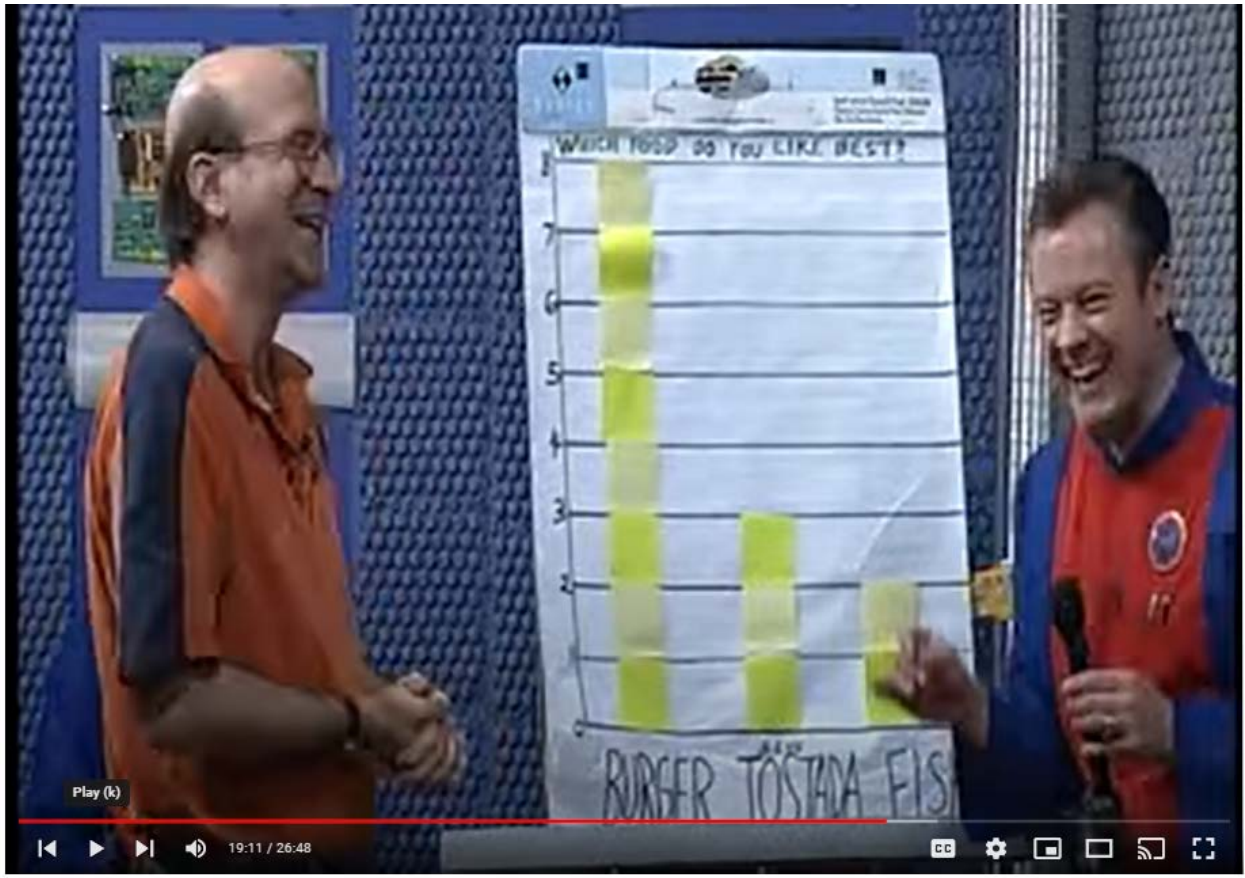
This exercise created a good base for the rest of the course
as we revisited those topics throughout the
PBL [Project-Based Learning] and
IDR [Interdisciplinary Research] sections."

-- Amy Wagler, RTI course co-instructor

teaching (polls/surveys) at multiple levels

Lower elementary grades

KCOS-TV's *Blast Beyond*
Seas. 2, Ep. 2; 1/24/12



Blast Beyond: Polls and Surveys

Upper elementary grades

August 6-12, 2016 issue of
weekly syndicated feature
in 500+ newspapers (20 M readers)

The Mini Page
Issue 32, 2016
Founded by Betty Debnam
Next Week: Bats!

The Power of Polls

We've been hearing a lot about polls as the U.S. presidential election nears. What do polls tell us, and how is the data collected?

The science of **statistics** involves collecting and analyzing **data**, or information, then interpreting and presenting the results. Two common methods of collecting data are **experiments** and **surveys** (or polls).

There have been and there will continue to be many polls before the elections on Nov. 8. These polls help track the latest trends of Americans' voting behaviors and candidate choices.

Selection matters

It takes too much time and money to try survey all 225 million eligible U.S. voters. Instead, **statisticians** (people who gather and analyze data) use a **sample** (as few as 1,000 or so people) to estimate the opinions of the general public. Scientific opinion polls were started by George Gallup about 80 years ago.

Pollsters care about the **quality** of the sample, not just the **quantity**. They will get more accurate results from a random sample that represents the whole population than from a sample taken only from, say, wealthier Americans.

Wording matters

Look at two different versions of the same question and decide which one is trying to make you answer a certain way:

1. "Don't you agree that pizza tastes better than spinach?"
2. "Which tastes better — pizza or spinach?"

Timing matters

Most surveys are conducted within a window of only a few days. If a survey lasted longer, the last people to respond would have been exposed to news events and candidate remarks that might make them answer differently than if they had been asked at the beginning of the window.

Order matters

Sometimes the order of questions may affect the answers we get. Consider the question "Who do you prefer for president: Donald Trump or Hillary Clinton?" Would your answer be affected if you first asked this question: "Do you think women have equal opportunities to succeed in our country?"

Graphing matters

When you read the results of a poll, make sure they're not misleading. For example, suppose in a poll Clinton gets 50 votes and Trump gets 45, and the numbers are displayed like this:

The numbers 45 and 50 are actually close. But because the graph begins at 40 instead of 0, when you compare the rectangles, it looks as if Clinton has twice the number of votes!

Mini Fact: When people are given two or more options, the option listed first is slightly more likely to be chosen than any other option.

Try your own poll

Suppose you want to know the favorite sport of your classmates. You might give them a survey with choices from the four biggest leagues in the U.S.: basketball, football, baseball and hockey. (You can also add a choice called "Other" in case some people have a favorite sport that is different, such as volleyball or soccer.)

Using the grid below, make a **bar chart** with the results you get from your classmates. For example, if three classmates like baseball the best, you would color in three bricks just above the word "Baseball." After filling in the correct number of bricks in each of the four columns, you will have a visual representation of which sport is most preferred and how close behind the other sports are.

Baseball	Football	Basketball	Hockey

Resources

On the Web:
- bit.ly/1Pu8dE1
- youtu.be/iVeCN6dTvzo

At the library:
- "See How They Run" by Susan E. Goodman
- "Getting the Inside Scoop on Elections" by Martha Searle Halter

Try 'n' Find

Words that remind us of polling are hidden in this puzzle. Some words are hidden backward or diagonally, and some letters are used twice. See if you can find:

BAR, DATA, ELECTION, ESTIMATE, EXPERIMENT, OPTION, ORDER, POPULATION, QUALITY, QUANTITY, QUESTIONS, RANDOM, RESULTS, SAMPLE, STATISTICS, SURVEY, TIMING, WORDING.

N	E	N	U	N	J	N	Y	E	V	R	U	S	Y	A
N	S	O	H	S	T	A	T	I	S	T	I	C	S	V
O	T	I	T	N	E	M	I	R	E	P	X	E	Y	S
I	I	T	G	N	I	M	I	T	A	T	A	D	T	A
T	M	C	R	E	S	U	L	T	S	H	Q	G	I	M
P	A	E	A	D	G	G	N	I	D	R	O	W	L	P
O	T	L	V	O	R	D	E	R	E	Y	A	U	A	L
L	E	E	Q	U	E	S	T	I	O	N	S	B	U	E
W	H	P	O	P	U	L	A	T	I	O	N	N	Q	K
V	Y	T	I	T	N	A	U	Q	R	A	N	D	O	M

Cook's Corner

Veggies and Tahini-Lemon Yogurt Dip

You'll need:
- 6 ounces low-fat plain yogurt
- 2 tablespoons tahini (sesame paste)
- Juice and zest of 1 lemon
- 1/2 teaspoon ground cumin
- Favorite vegetables (carrots, celery, zucchini, yellow squash, cherry tomatoes, broccoli, jicama or green beans)

What to do:
1. In a medium bowl, whisk together yogurt, tahini, 2 teaspoons lemon juice, 1 teaspoon zest and cumin.
2. Clean and cut vegetables into dipping-size pieces.

Mini Jokes

Polly: Where do you store the results of surveys?
Peter: In a poll vault!

Eco Note

A Gallup poll from March tells us Americans from all political parties are increasingly concerned about climate change. In fact, 64 percent worry about our environment "a great deal." Poll your family to find out if climate change is a concern for them.

Thank You

The Mini Page thanks Dr. Larry Lesser, professor of mathematics education at the University of Texas at El Paso, and Judah Lesser for help with this issue.

Teachers:

higher levels

- statistical literacy course (e.g., Ch. 3-4, Utts' *Seeing Through Statistics*)

$$\frac{1}{\sqrt{n}}$$ vs.

$$z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}\cdot\frac{N-n}{N-1}}$$

- Course for undergraduate stats majors

- Graduate course (Cochran's *Sampling Techniques*) I took at UT-Austin

outreach
at multiple levels

STATISTICS CELEBRATION DAYS

(# of Google results, 3/2/23)

- **Florence Nightingale Day, 4K**
- **Mathematics and Statistics Awareness Month, 17K**
- **World Statistics Day, 72K**

STATISTICS CELEBRATION DAYS

(# of Google results, 3/2/23)

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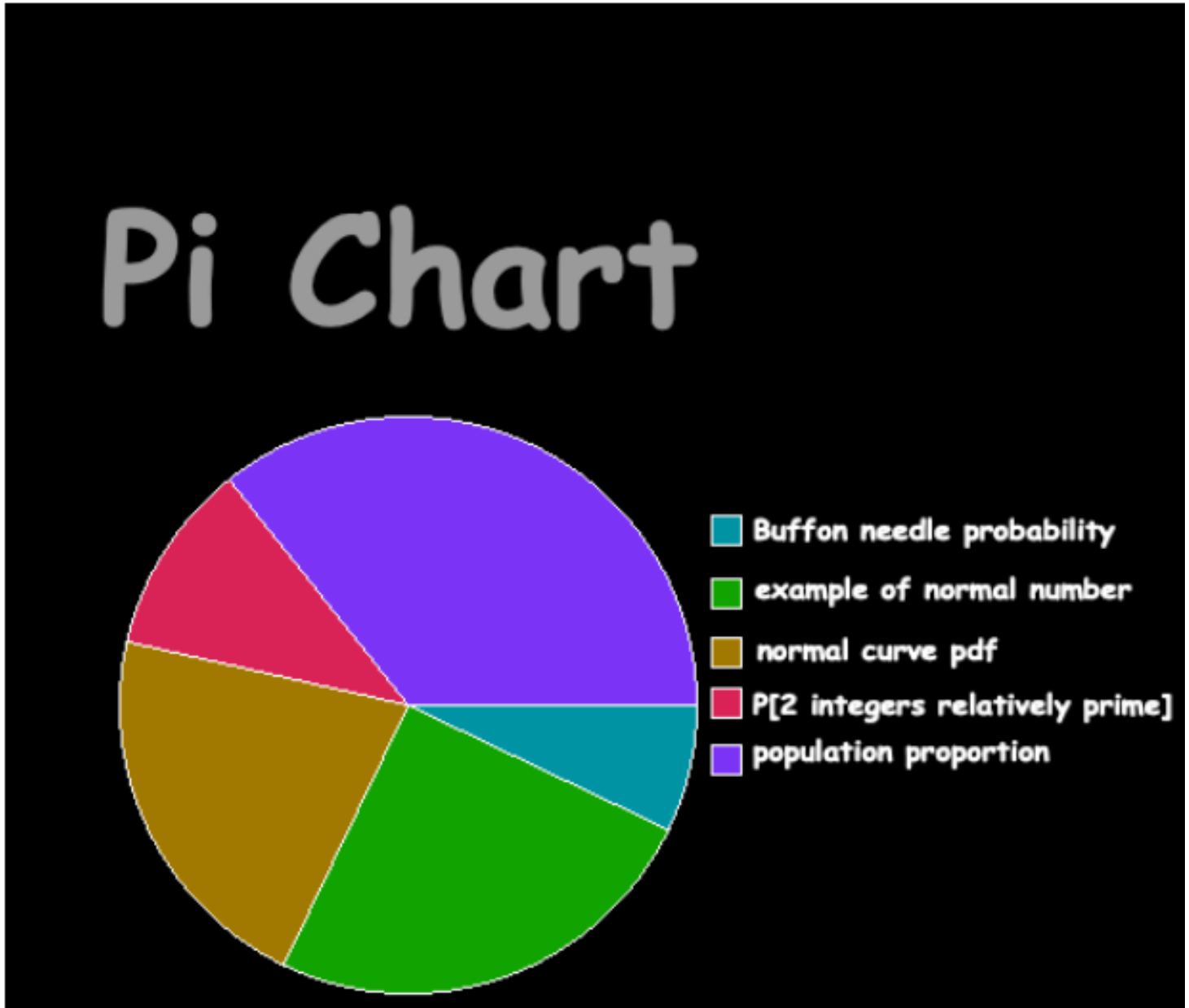
- **World Statistics Day, 72K**
- ***Pi Day, 3.7 M***

Statisticians' favorite uses of Pi



Lesser cartoon at CAUSEweb.org/fun

https://larrylesser.com/pi-day/

- For college students (UTEP)
- For high school (e.g., Emery)
- For middle school (e.g., Henderson, EPJA)
- For elementary school (e.g., Canutillo)

Figure 2. Discovering pi activity: using stars to measure around and across the circle.

Jaime Ramos "frankly" computing pi

"…I have made this letter longer

because I lack the time to make it shorter" – Blaise Pascal (1656)

Related to "simpler level": briefer communication

Related to “simpler level”: briefer communication

- 20-minute prepared part of *JSDSE* webinar

Related to “simpler level”: briefer communication

- 20-minute prepared part of *JSDSE* webinar

- 3-minute thesis competition

Related to “simpler level”: briefer communication

- 20-minute prepared part of *JSDSE* webinar
- 3-minute thesis competition
- 2-minute video abstract

Related to “simpler level”: briefer communication

- 20-minute prepared part of *JSDSE* webinar
- 3-minute thesis competition
- 2-minute video abstract
- 90-second “elevator pitch” competition

Related to “simpler level”: briefer communication

- 20-minute prepared part of *JSDSE* webinar
- 3-minute thesis competition
- 2-minute video abstract
- 90-second “elevator pitch” competition
- 75-second radio program script

“Desert Diary” on KTEP

regional cultural/natural history

I launched (and wrote most scripts for) a Statistics/Math category.

Have your students try this: 150 words (no visuals) for general audience

Desert Diary
Math/Mark and Recapture

Centennial Museum
Desert Diary Index Page
Desert Diary Math Page

Counting a population of animals in a big open space like a desert, is not as simple as standing and counting. Biologists use a mathematical method called "capture-recapture". Let's say you capture 100 snakes in a desert region. You carefully put a tag on them, then set them free. Later, you capture a fresh sample of 100 snakes and find that 20 of them have tags. Under certain assumptions, the proportion of snakes in our second ("recapture") sample that are tagged should equal the proportion of snakes from the total desert population we took our first sample from.

So now let's solve for that unknown total population: 20 out of 100 equals 100 out of what? The answer....: 500 snakes! This capture-recapture technique doesn't apply only to counting animals. Every 10 years the US Census tries to count all the country's humans and then the recapture phase is the Post-Enumerative Survey. I hope this captured your attention, because in the desert, math counts!

Contributor: Lawrence M. Lesser, Mathematical Sciences, University of Texas at El Paso.

Desert Diary is a joint production of the Centennial Museum and KTEP National Public Radio at the University of Texas at El Paso.

Desert Diary
Mammals/Desert Weather

Centennial Museum
Desert Diary Index Page
Desert Diary Math Page

Meteorologists use mathematics and statistics to analyze weather data for patterns and deviations. An example of one pattern: people who live in desert areas typically experience bigger daily temperature ranges than people who live in other regions. The Heat Index of how hot it "feels" is mathematically calculated from humidity AND temperature. This supports our observation that a 90° day in the dry Chihuahuan Desert feels cooler than a 90° day in Houston!

Desert weather also involves probability, but what does a forecast of "70% chance of rain" REALLY mean? It doesn't mean that 70% of the land will get wet. It is a statement of historical data—that 70% of the days with these weather conditions resulted in rain. If it does NOT rain tomorrow, that doesn't mean that the forecaster was WRONG—it's still true that it rains on about 70% of days with these conditions. Of course, forecasts of 70% chance of rain would be rare in the desert!

Contributor: Lawrence M. Lesser, Mathematical Sciences, University of Texas at El Paso.

Desert Diary is a joint production of the Centennial Museum and KTEP National Public Radio at the University of Texas at El Paso.

communicating
stat ed research
at multiple levels

how Spanish-speaking **emergent bilinguals** learn statistics…

(part of my stat ed research on language: https://LarryLesser.com/ell-scholarship/)

- for researchers: 28-page paper in Nov. 2009 *Stat. Ed. Research Journal*
- for teachers: brief article in spring 2011 *Statistics Teacher Network,* adapted from recommendations in 2009 *SERJ* paper
- for general audience: fall 2016 UTEP magazine (& online extra) for alumni

Larry Lesser and Amy Wagler (left), faculty in the Department of Mathematical Sciences, and their graduate students have been doing some of the first and most definitive research on how Spanish-speaking English learners learn statistics. Since Spanish is the dominant language of 80 percent of English learners in the U.S. and is also the world's most common non-English language other than Chinese, their work clearly has international implications and has been published in international top-tier journals such as Statistics Education Research Journal.

To read about Lesser and Wagler's work and to see more photos and videos of UTEP scientists abroad, visit utep.edu/magazine

Share human interest / passion / personal angle

Share stats – Spanish is dominant language of 80% of EBs in the U.S. and is world's most common non-English language other than Chinese

Share my story (Lesser, 2015) –

Professional (teaching UTEP/El Paso students)

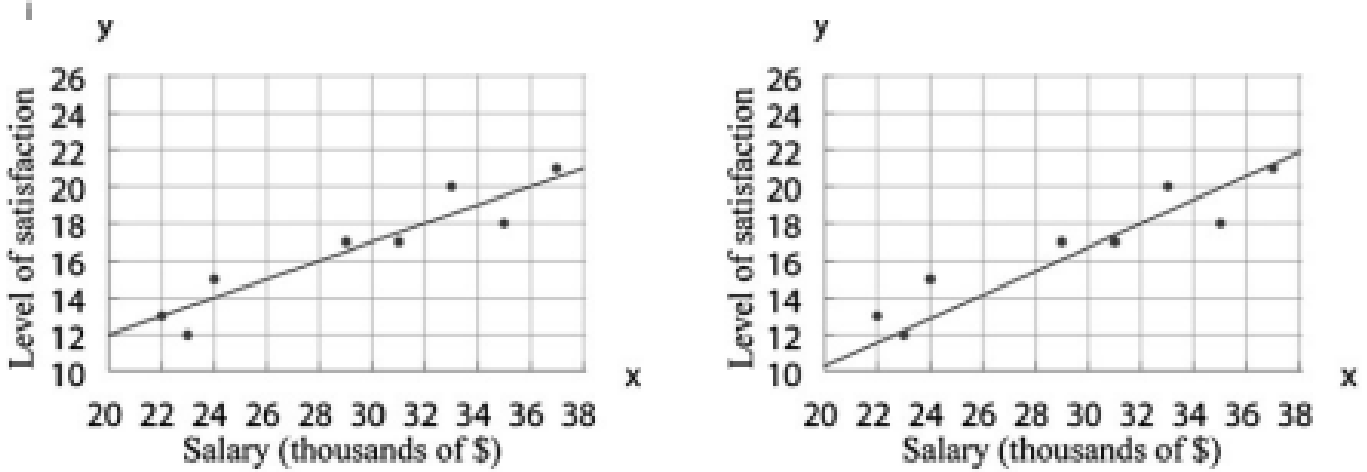
Personal (my own EB experience)

Cultivate empathy – demo

Can you tell what's asked in this example?

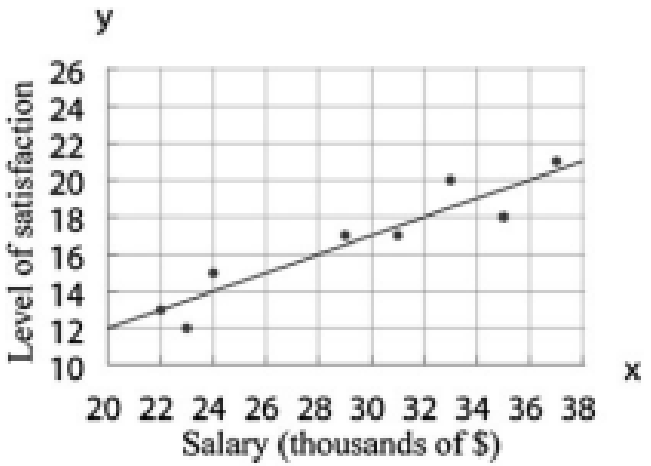
from *Stochastik in der Schule* (Sorto, White & Lesser, 2012), translated from Sorto, White & Lesser (2011)

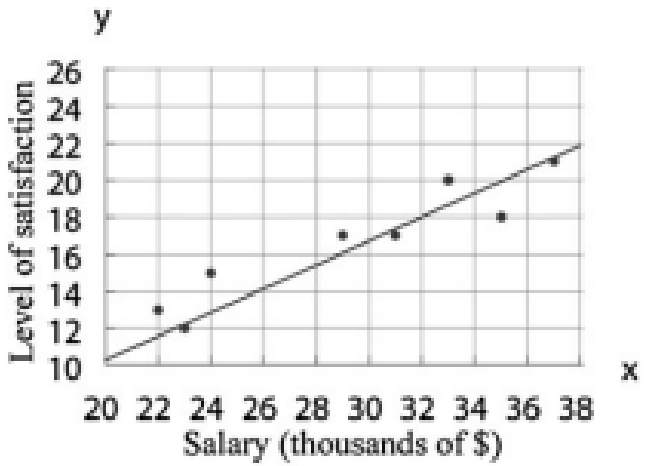
Aufgabe 3: Zwei Studenten haben unabhängig voneinander die ihrer Meinung nach beste Gerade gezeichnet. Die Graphen in Abbildung 2 zeigen ihre Geraden. Wenn Sie zu entscheiden hätten, welche der beiden Geraden besser zu den Daten passt, was wäre dann Ihre Wahl? Gibt es irgendetwas in diesem Zusammenhang, was Sie ausrechnen könnten?



What strategies did you try?

Aufgabe 3: Zwei Studenten haben unabhängig voneinander die ihrer Meinung nach beste Gerade gezeichnet. Die Graphen in Abbildung 2 zeigen ihre Geraden. Wenn Sie zu entscheiden hätten, welche der beiden Geraden besser zu den Daten passt, was wäre dann Ihre Wahl? Gibt es irgendetwas in diesem Zusammenhang, was Sie ausrechnen könnten?

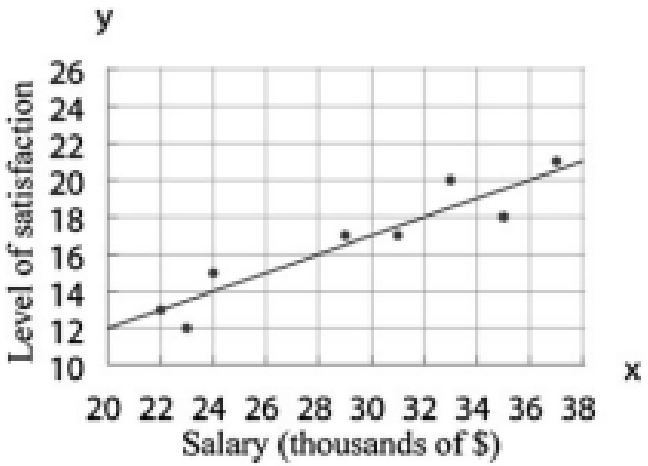


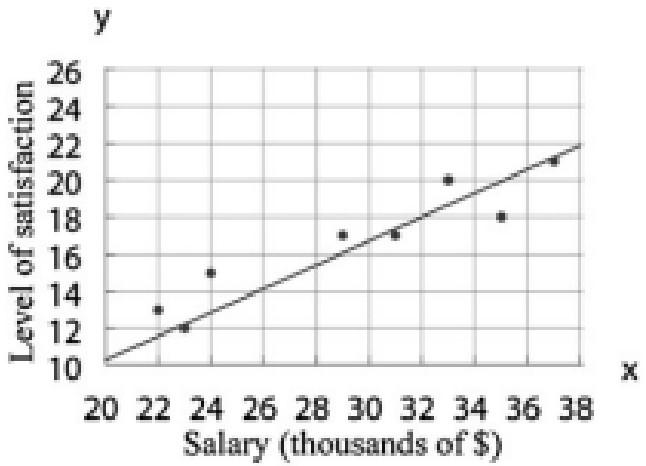


Was that enough to access the problem?

Aufgabe 3: Zwei Studenten haben unabhängig voneinander die ihrer Meinung nach beste Gerade gezeichnet. Die Graphen in Abbildung 2 zeigen ihre Geraden. Wenn Sie zu entscheiden hätten, welche der beiden Geraden besser zu den Daten passt, was wäre dann Ihre Wahl? Gibt es irgendetwas in diesem Zusammenhang, was Sie ausrechnen könnten?

Task 3: Two students separately drew what they thought was the best line. The graphs in figure 2 show their lines. If you had to decide which of the two lines fits the data better, how would you decide? Is there anything you could compute?





Beyond multiple levels….

try communicating in new ways/forms

Taylor & Francis posted my video abstract (for JSDSE)

Watch the video on Vimeo

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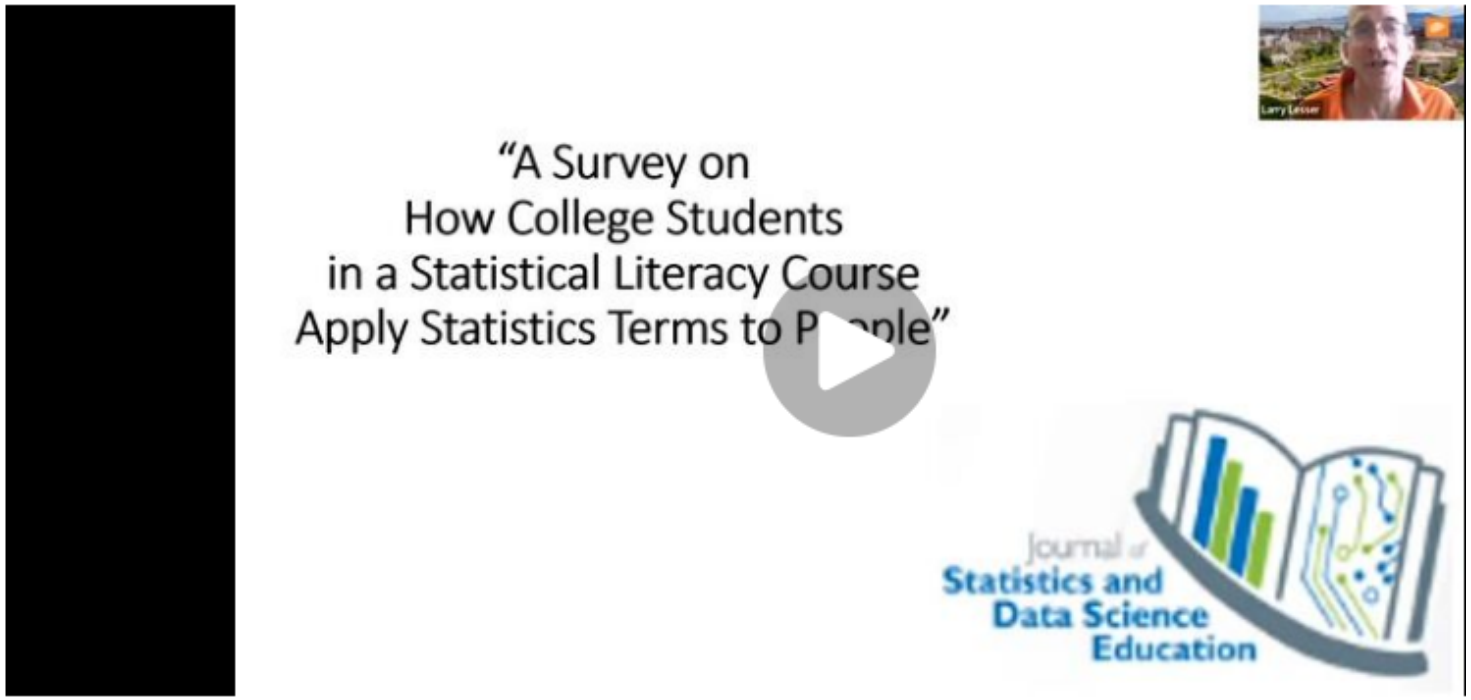

Taylor & Francis posted my video abstract (for JSDSE) & a cartoon abstract (for JMA)

Watch the video on Vimeo

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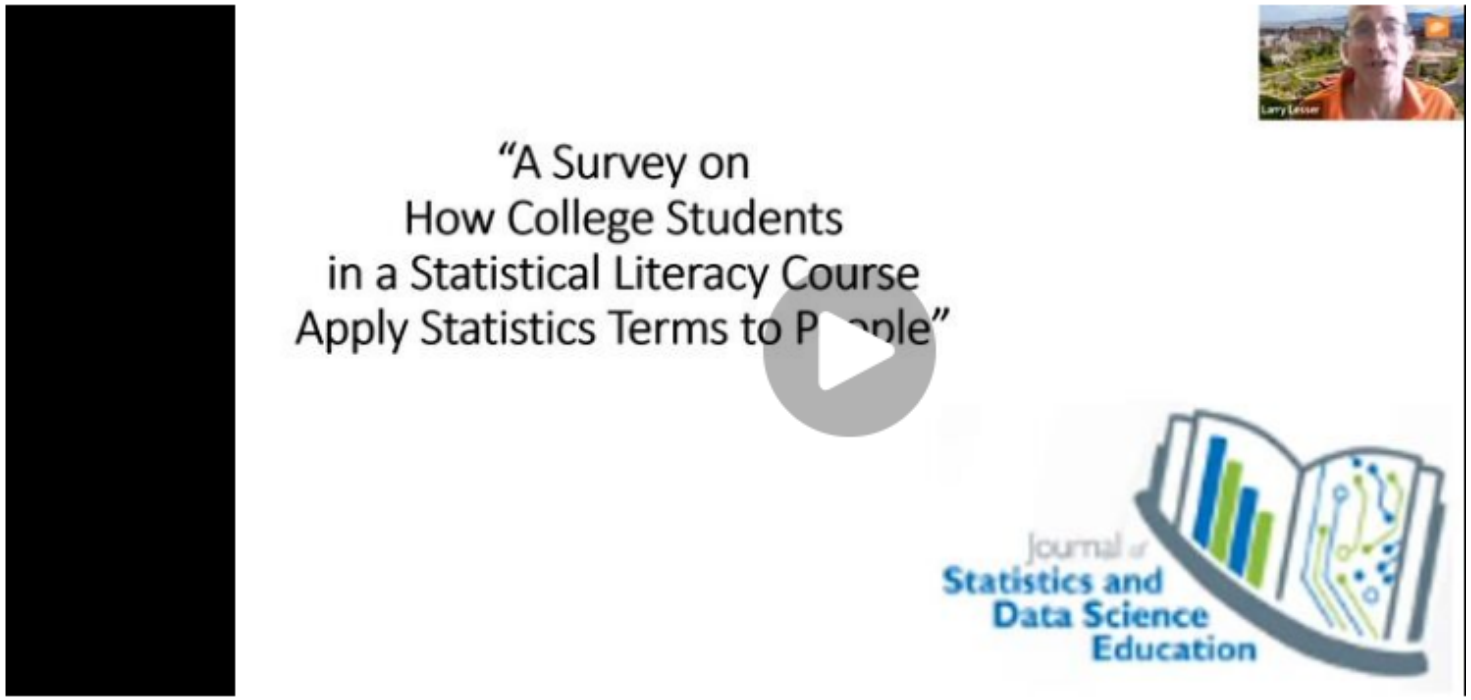
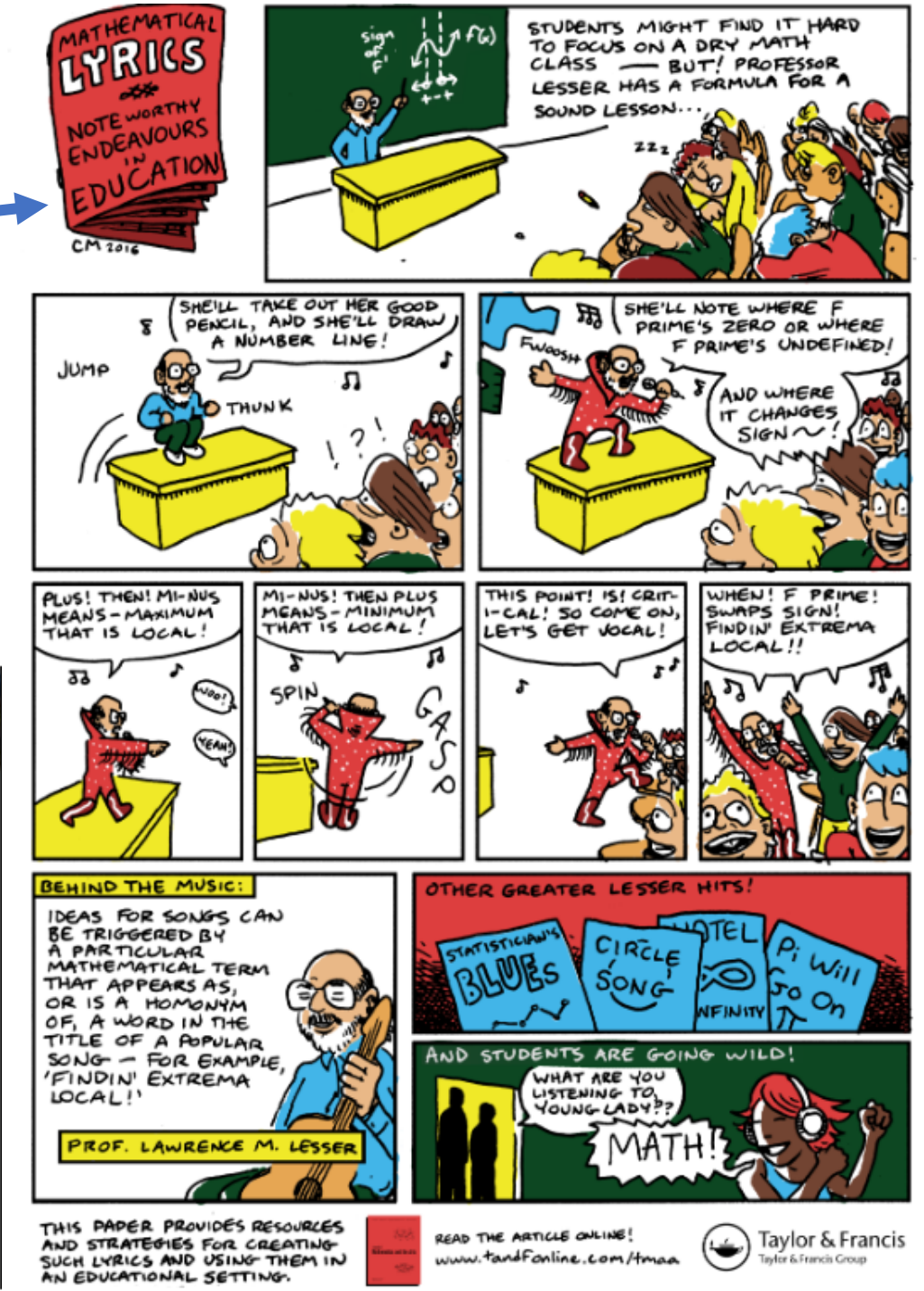
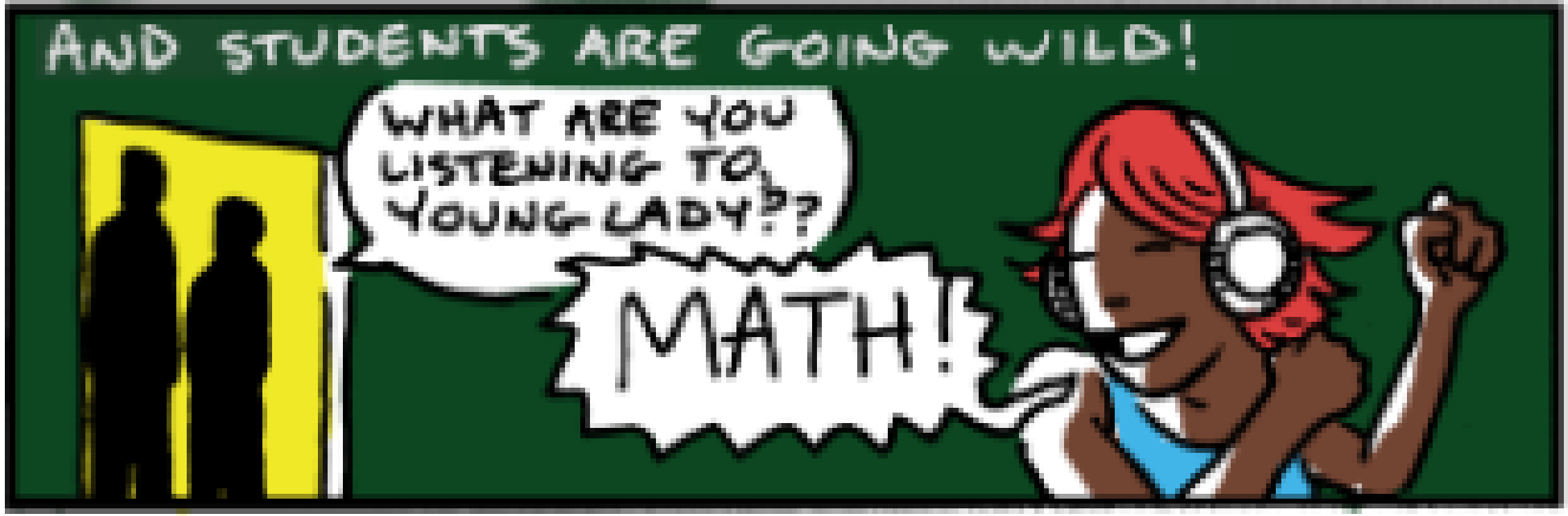






READ THE ARTICLE ONLINE!
www.tandfonline.com/hmaa

Taylor & Francis
Taylor & Francis Group

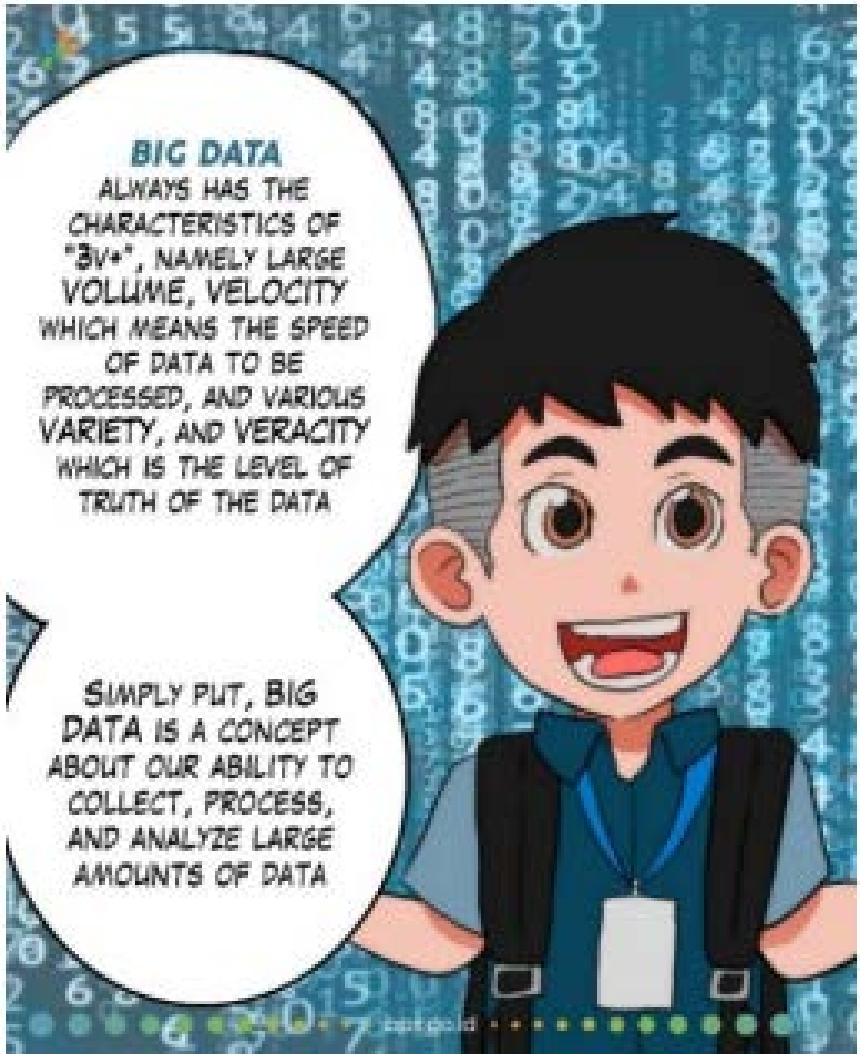
"May I listen to music while learning stats?"

vs.

"**May I learn stats while listening to music**?"

btw, Indonesia Big Data literacy comics reached 17.5K FB and 44.5K Instagram accounts (Faris, 2022)

Figure 4. Slide 6 of Second Edition of Big Data Comic



what if conferences used Mike Morrison's streamlined **#betterposter** template?

- Avoids assuming all will stop and read "wall of text" for 10 minutes
- More punchline-focused, billboard-style so <u>all</u> walking by get the gist
- QR code links to full paper and the poster.

ACTION ITEMS we can try!

- Analyze communication patterns in one's class
- Assess readability of curriculum materials with 3 free tools demoed in Wagler/Lesser 5-minute eCOTS 2016 videoposter
- Try some form of edutainment (CAUSEweb.org/fun)
- Try presenting/writing at different "levels" or "genres" (op-ed, etc.)
- Be open, be ready!
- (More) research needed on framing effects

culmination….

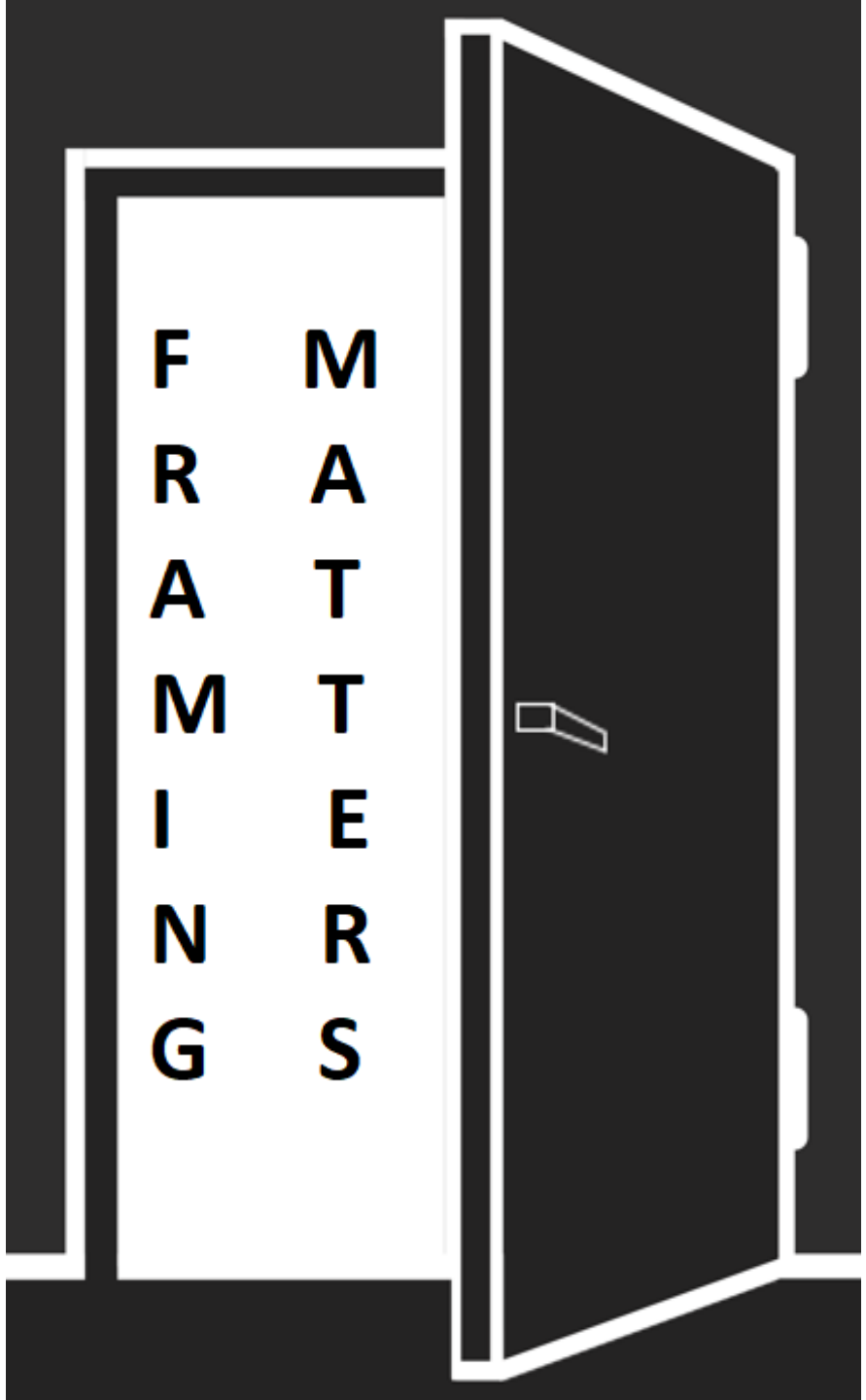
- *THANKS* to Kelly, Allan, Andrew, etc.!
- Handout now at: **LarryLesser.com/uscots23**
- After I give a “Pro Tip” for this hotel, questions are welcome (& later: **Lesser@utep.edu**)

The Penn Stater
Hotel & Conference Center

for safety when inside…..

fully extend deadbolt

into the door frame


FRAMING MATTERS

The Penn Stater
Hotel & Conference Center

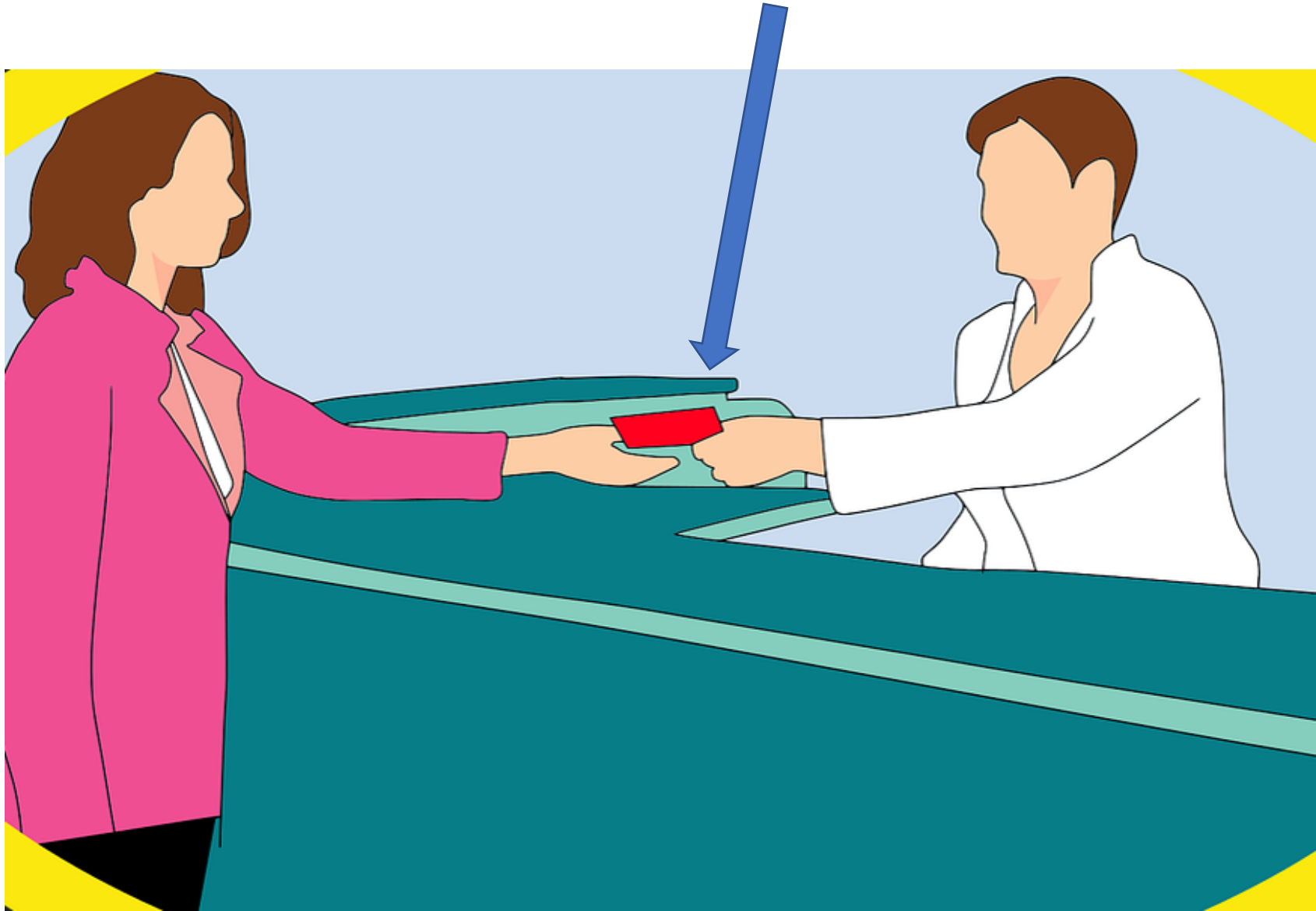
and if you get locked out…

https://www.busybeeslocksmith.com/services/house-lock-out/

The Penn Stater
Hotel & Conference Center

…tell the front desk your story, leading with your main point in simple language…

…‘cause ***communication is KEY***!



May our communications inform, inspire, & engage!

Baldi & Utts (2015) example of randomized experiment on gemfibrozil and risk of heart attack

“The same statistically significant data” could be communicated as:

- Relative risk reduction
- Absolute risk reduction
- Number need to treat
- Increase in chance of not having a heart attack

Raise your hand if you could do this task

(Kennedy & Crespo, 2020)

다음 방정식이 해가 없도록 하는 값을 찾아 빈 칸을 채우세요:

$8x - 3x + 2 - x = _____ x + _____$

Raise your hand if you could do the task now

(Kennedy & Crespo, 2020)

Schreiben Sie eine Nummer in jeder Zeile das erstellt eine Gleichung mit keine Lösung:

$8x - 3x + 2 - x = _____ x + _____$

Raise your hand if you could do the task now

(Kennedy & Crespo, 2020)

Escribe un número en cada raya para crear una ecuación sin soluciones:

$8x - 3x + 2 - x = _____ x + _____$

One strategy: seeking cognates

Schreiben Sie eine Nummer in jeder Zeile das erstellt eine Gleichung mit keine Lösung:

$8x - 3x + 2 - x =$ _____ $x +$ _____

Escribe un número en cada raya para crear una ecuación sin soluciones:

$8x - 3x + 2 - x =$ _____ $x +$ _____

Raise your hand if the task (now, in English) is what you thought it was (Kennedy & Crespo, 2020)

Write one number on each line to create an equation that has no solution:

$8x - 3x + 2 - x = _____ x + _____$

“2-way support” from Burns et al. (2003)

- While some scientists may be at the top of one or two mountains, they will be at the foot of many more. “Indeed, given the current state of scientific specialization, ignorance about a particular domain of science is almost as great among scientists working in another domain as it is among lay people.” All people are somewhere between a plain and a peak.

- Few are expert in all areas of statistics, data science, educational research, learning theory, curriculum, technology, pedagogy, DEI considerations, etc.

Speaking of levels….

Kaur (2023) suggests sharing a “slant slice,”
not just the lower layers of Bloom’s Taxonomy.

excerpts from *JSDSE* video abstract	notice
Phrases like “average person” or “random person” often appear in everyday conversation	opening believable observation in simple language
and sometimes even in our field’s journals!	Provocative – we do it, too!
So when students bring such phrases to statistics class, what do they mean by them, and could that be an obstacle -- or opportunity? ….	open-ended big questions
We recommend that terms should be applied to the salient trait or process, but NOT to a person….	punchline recommendation
Instructors should appreciate our practical teaching sequence for navigating these phrases. Researchers should appreciate additional literature, the raw data, details on our analysis and coding process, and tabulations	audience-targeted features memorable appendices: Assessment Background Coding Didactics

Briefer communication: triage when teaching (middle schoolers)

Chance, Medina, Silverbush (2023)

If you have only ____ hours….	….then….
1	Focus on: could this have happened by chance?
2	Bring in technology (e.g. app)
3	Use simulation models to explore patterns in randomness
4	Start with appreciation of variability
5	Start with describing distributions
6	Focus on modeling

COLA

German Lopez *New York Times* story, 3/21/23

- World's top climate scientists released warnings only in Celsius:

  "Earth could warm by up to 1.5°C above acceptable levels"

- historically biggest emitter of planet-warming greenhouse gases is a non-metric country
- Canadian climate scientist Katharine Hayhoe's analogy:

  how bad you feel with fever 2.7°F above normal

ELSEVIER

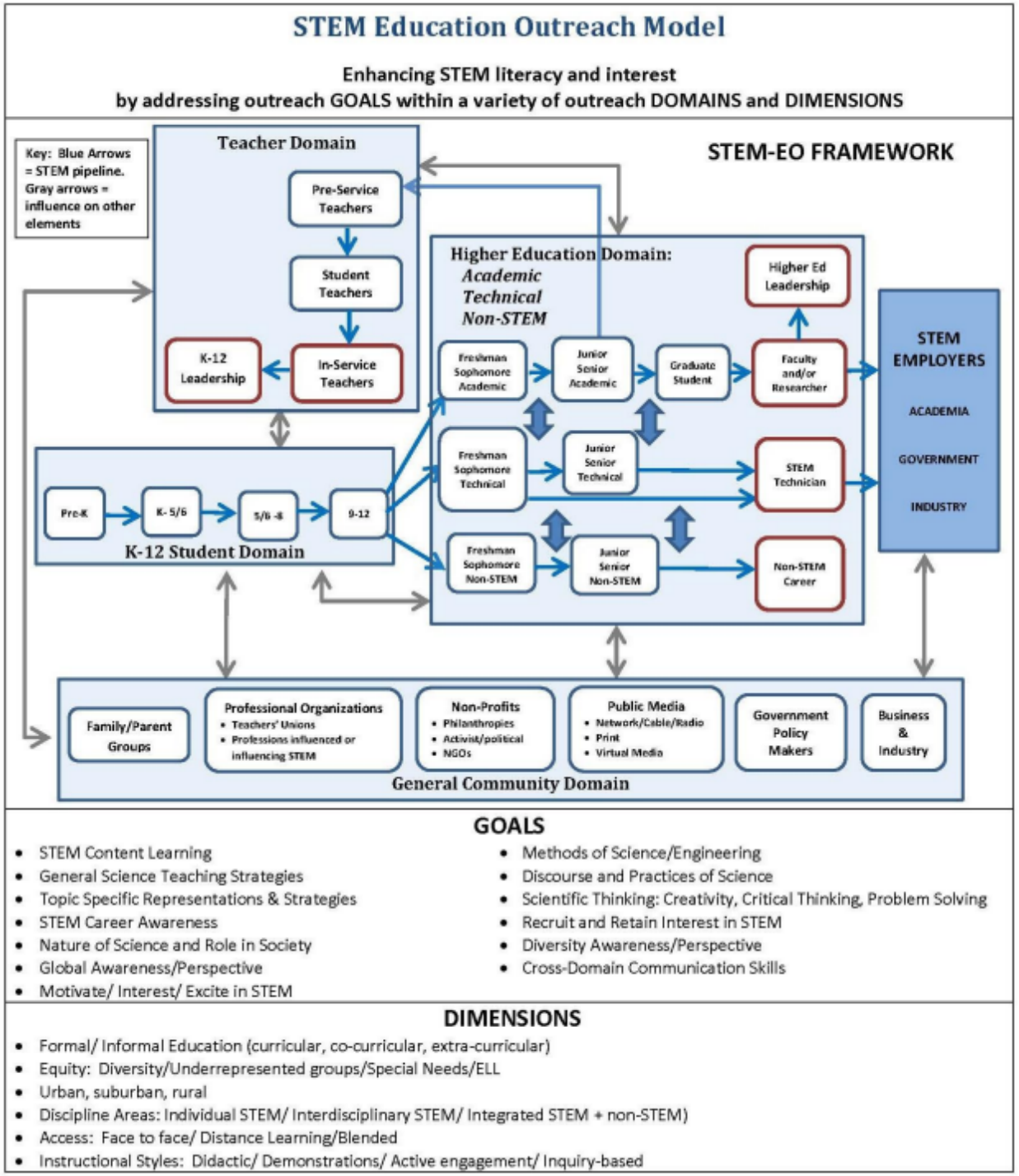
Global Environmental Change

Volume 21, Issue 1, February 2011, Pages 103-109

The future that may (or may not) come: How framing changes responses to uncertainty in climate change communications

Thomas A. Morton, Anna Rabinovich, Dan Marshall, Pamela Bretschneider

Penn State's

Annmarie Ward (2015)

"There has never been greater need for universities to support STEM education through their STEM-EO [education outreach] efforts … strategically, capitalizing on the … potential synergies inherent within that complexity." (pp. 8-9)