MAKING STATISTICS MEMORABLE: CREATION AND EVALUATION OF MNEMONICS

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Outline

- “Memorable” intro from Larry
- What does cognitive psychology tell us about memory?
- Role of memory in the introductory course.
- Which memory aids do you know and use?
- Rank 14 memory aids.
- Compare to students rankings.
- Brainstorm new memory aids on topics of interest.
- Share Findings.
- Evidence on Memory Aids.

Classifying the 31 statistics mnemonics in Lesser (2011):

Classification of mnemonics by function and form

		FORM		
		Letter-based	Image	Rhyme/jingle
FUNCTION	Fact	1, 2, 3, 5, 9, 13, 16, 18, 22, 23	4, 7, 20, 27, 28	15
	Process	8, 10, 11, 12, 17, 19, 21, 24, 25, 26, 30	6	14, 29, 31

Consistent with College *GAISE* (2016)?

- GAISE recommendation #2 (p. 3): “Focus on **conceptual** understanding.”
- GAISE Assessment section states “Assessment items to avoid on tests: traditional True/False, pure computation without a context or interpretation, items with too much data to enter and compute or analyze, or items that only test **memorization** of definitions or formulas.” (p. 106)
- Higbee & Kunihira (1985) suggest mnemonics “might help in learning the procedures more effectively by decreasing the attention required (achieving what Gagné and others have called ‘automaticity’), so more time can be spent trying to develop understanding.” They go on to suggest that greater ease in applying procedures may lead to greater enjoyment and success, which may increase future interest in the subject.

What cognitive psychology tells us

- Characteristics of information that make it more memorable
  - *It is meaningful and well understood*
  - *It can be visualized*
  - *It is related to other information already in memory (“elaboration”)*
  - *It can be expressed efficiently (short rather than long phrase)*
- Circumstances that make information more memorable
  - *It receives focused attention*
  - *It is interpreted and elaborated*
  - *It is repeated at spaced intervals*
  - *It is repeated in different contexts with different examples*
  - *There are opportunities to “practice” retrieving it*
- Learning to apply new information usually requires that
  - *It is well understood, such that it can be explained accurately by the learner*
  - *It is practiced multiple times with varied examples or contexts*
  - *It can be intentionally retrieved from memory*
  - *It automatically comes to mind in appropriate situations*

DEMO: Penny for your thoughts!
quick, without looking at a penny….

- point to **your right** if you think Lincoln faces to the **right**
- point to **your left** if you think Lincoln faces to the **left**
- point **up to the ceiling** if you're **not at least 95% confident**

DEMO: George Miller discovered empirically the average person can hold 7 +/- 2 items in short-term memory, so how might you remember these phone numbers?

- 214-1365
- 731-4159

FYI: there's a "phonetic code" to turn a string of arbitrary digits into (a smaller number of) words

HOW IMPORTANT IS MEMORY TO THE INTRODUCTORY STATISTICS CURRICULUM (FROM YOUR PERSPECTIVE)?

Create a line where 1 is high importance and 10 is low importance

Be prepared to discuss your reasoning.

NOW STAND WHERE YOUR STUDENTS WOULD BE FOR THE SAME QUESTION ?

Create a line where 1 is high importance and 10 is low importance

Be prepared to discuss your reasoning.

If you don’t offer memory aids, why not?

a) I believe memory aids are a crutch.

b) I believe memory aids don’t lead to critical thinking.

c) Students remember the memory aid, but not the related concept.

d) I haven’t come across any good ones for statistics.

e) Other reason(s)

f) I do use memory aids.

Rank memory aids on a Qualtrics Survey

In the Fall 2017, we gave students in an introductory statistics course a list of 14 memory aids and asked them to rank them.

https://ufl.qualtrics.com/jfe/form/SV_0jLvIbRLRuPUNHD

OR

https://tinyurl.com/y45wkt2l

Go to this one question survey and rank the memory aids.

- *1 = most helpful*
- *14 = least helpful*

Which Memory Aids, if any, do you use?

- In your groups, write down any memory aids that you have used in the statistics classroom.
- Now, go around the room and look at other memory aids used. If you see others that you have used, add a check mark.

Rank memory aids on the handout

In the Fall 2017, we gave students in an introductory statistics course a list of 14 memory aids and asked them to rank them.

Now, it is your turn. Rank the memory aids on your handout from 1 to 14.

- *1 = most helpful*
- *14 = least helpful*

Compare with the average student rankings for helpfulness from Fall 2017 Online Survey (in same order as handout)

Small number represents most helpful.

	Pop – Param, Sample- Stat	Explanatory variable on the x axis	SOCS	BINS	Skewed Left	O before P, obs minus pred	DOTS
Avg. Rank	5.2	7.3	9.4	11.1	7.0	8.9	11.6
	PHANTOM	Ho_ Hold	p-value song	If the p-value is low, the null must go	t- tiny, z - sizeable	PANIC	DF, degrees go down
Avg. Rank	5.3	5.1	10.6	3.8	6.4	7.0	6.2

Let’s have a *memorable* conversation!

- What content do you think students have trouble remembering?
- What memory aids might be helpful?
- How would you evaluate the new memory aids that you created?

Milo Schield's Memory Aid Evaluation

(in his JSM 2016 paper: www.statlit.org/pdf/2016-Schield-ASA.pdf)

- All spring 2016 students (N = 22) in "statistical literacy for managers" course asked on anonymous Moodle survey for most important items (open-ended) in course
- Same students then given alphabetized list of their collective 20 items and asked for their top choices.
- Highest rating was for mnemonic framework of 4 kinds of influence on a statistic:

  "Take **CARE**: **C**onfounding, **A**ssembly, **R**andomness and **E**rror/bias"

- "Their vote could be in support of any over-arching classification of all the various influences on a statistic….Their vote does strongly support the use of a classification with just a few categories. All too often, those supporting quantitative literacy or numeracy have lists of 10, 15, 20 or 25 items that one should consider…"

More references in our March 2017 *JSE* paper:

Mocko, M., Lesser, L., Wagler, A., & Francis, W. (2017). "Assessing Effectiveness of Mnemonics for Tertiary Students in a Hybrid Introductory Statistics Course" *Journal of Statistics Education, 25*(1), 2-11.

- "In 2014, a large sample (*n* = 1487) of college students were asked about the usefulness of a set of 19 published statistics mnemonics presented in class, and in 2015, the students (*n* = 1468) were presented 12 mnemonics related to inference and then asked whether or not they used mnemonics on that exam. This article discusses how students assess the usefulness of mnemonics and evaluates the relationship between using mnemonics and reducing anxiety. "

Thank you for coming --
We welcome your questions/feedback!

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