R is for Rhyme? Statistics Class "Stanza Part" with Poetry!

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Abstract

Poetry is one statistics educational fun modality. I explore 3 poem types: statistics as major subject, statistics language/imagery applied to something nonstatistical, and statistics-informed structure (e.g., shape or sampling). At a mid-sized public R1 open-access HSI university, I write and incorporate statistics poetry for 40-student sections of statistical literacy and offer them (extra-credit) opportunities to create their own art. Our student-randomized experiment included only one poem (yielding 3% improvement), so more research would be interesting to study possible benefits of poetry such as: making content memorable, consolidating concepts (to fit concise form), breaking stereotypes, lowering anxiety, building community, distinguishing everyday and statistical language, and having easier entry than, say, songwriting. I overview some examples and references for having students use poems to explore connections with language, content or structure.

Key Words: engagement, poetry, fun, STEAM, edutainment, art

1. Poetry as a Modality of Educational Fun in Statistics

1.1 My Poetry Background

I took an upper-division undergraduate poetry seminar course from Susan Wood during my college years and later published poetry in venues such as *Talking Writing*, *BorderSenses Literary Magazine*, *Rio Grande Review*, *Poetica Magazine*, and *Drash: Northwest Mosaic*. This qualified me for the Poets & Writers Directory (https://www.pw.org/directory/writers/lawrence_larry_lesser) and what is especially distinctive is that some 4/5 of my 85+ published poems (https://larrylesser.com/poet-larry-ate) draw from the teaching and learning of mathematics or statistics.

Some of these STEM poems were anthologized, won national contest awards, or appeared in STEM journals (*The Mathematical Intelligencer*, *Journal of Humanistic Mathematics*, *Radical Statistics*, *Teaching for Excellence and Equity in Mathematics*, *Amstat News*, *Poetrishy*, *Teaching Statistics*, or *Journal of Mexican American Educators*). Some have been read at a conference, local and non-local readings/talks, a National Endowment for the Arts Big Read event hosted by the Thomas Branigan Memorial Library, a podcast, a video zine, a gallery opening, an NPR-station radio interview, etc. I organized (with Gizem Karaali and Douglas Norton) evenings of mathematical poetry/art at five national Joint Mathematics Meetings since 2015 and judged (with Gizem Karaali and JoAnne Growney) the first AMS student math poetry contests in 2019 and 2020 (see http://www.ams.org/programs/students/math-poetry, which has useful resources at the end;

note that the winning poem in the middle school student category in the 2020 AMS Math Poetry Contest is a statistics one). I have a related book chapter (Karaali and Lesser, 2021) and my STEM poems/songs are part of my overall sometimes-funded efforts (e.g., Lesser, Pearl, & Weber, 2016; Lesser, Pearl, Weber, Dousa, Carey, & Haddad, 2019) to use such edutainment to humanize STEM, reduce anxiety, and support student learning of statistics.

1.2 Types of Edutainment in Statistics

Poetry is one of 20+ modalities of educational fun used in teaching statistics (Lesser & Pearl, 2008) and the searchable, curated https://www.CAUSEweb.org/fun collection currently has almost 1000 items spanning 13 modalities and there is selected literature at https://www.CAUSEweb.org/cause/resources/fun/references. The collection currently includes about 60 entries in the poetry category. Examples of groupings of statistical poetry in academic periodicals include *Journal of Humanistic Mathematics* (Lesser, 2020) and the *Significance* feature on Eveline Pye (Champkin, 2011). While I also enjoy writing (and teaching with) content-rich songs and have written about mathematics/statistics lyric-writing (Lesser, 2014, 2015), I have recently found that poetry can be easier for me (or my students) to create or perform in a classroom setting or share in a colloquium for one or more departments (e.g., Lesser, 2021).

Our IRB-approved student-randomized experiment reported in Lesser, Pearl, & Weber, (2016) included only one poem (yielding 3% improvement) so more research would be interesting to conduct on possible benefits of using poetry, such as: making content memorable, consolidating concepts (to fit concise form), breaking stereotypes, lowering anxiety, building community, distinguishing everyday and statistical language.

1.3 Types of Poetry in Statistics

Adapting Emmons' (2017) taxonomy, we explore these poem types: (1) statistics as major subject, (2) statistics language/imagery applied to something nonstatistical, and (3) statistics-informed structure (e.g., sampling or shape).

1.3.1 Statistics as major subject

My poem "Confounded" (Lesser and Pearl, 2019) focuses on an instance of Simpson's paradox (without using the term). My poem "Worry Lines" (Lesser, 2020) focuses on percentiles of a normal distribution.

1.3.2 Statistics language/imagery applied to something non-statistical

My poem "Mindful Means" (in April 2018 *Amstat News*) uses statistics language to explore the increasingly popular topic of mindfulness (and mindfulness meditation).

1.3.3 Statistics-informed structure

There certainly are familiar poem structures that have been used to write statistics poems, such as statistical haiku (e.g., my "Chi-ku", "Multivariate", and "Expected Value Haikus" in CAUSEweb.org/fun or my "99.73% and "Adjusted R Squared" in April 2021 *Amstat News*) or statistical limericks (e.g., my "Lottery Strategy", "Simpson's Paradox", and "Significance" in June 2021 *Amstat News*), but what is arguably more interesting is when the structure itself is informed by a statistical concept or tool, so let's share some of my examples that can be found in the CAUSEweb.org/fun collection:

"Permutation" is a short poem in which the punchline is itself a permutation — of the letters in the word *permutation*! "Matched Pairs" uses end-rhyme couplets to convey (literally and figuratively) tradeoffs of a design with matched pairs. "Systematic Sample from a

Children's Song" is formed by taking the first word and every third subsequent word from "Twinkle, Twinkle Little Star", a variation on "erasure", a type of found poetry made by deleting words from a larger piece of text, such as how recent US Poet Laureate Tracy Smith created "Declaration" by selecting words from the US Declaration of Independence.

In some shaped poems (also called graphic poems or concrete poems), the shape adds (or is the primary source of) important meaning. The visual nature of such poems calls for seeing the poem, not just hearing it. Examples of mine in statistics include "New Normal" (a bell-shaped poem in issue 117 of *Radical Statistics*), "MEANings" (visual mnemonics for the levelling and balance point interpretations of the mean that have been republished several times after first appearing in Lesser (2011)), "Variation" (http://mathematicalpoetry.blogspot.com/2018/05/variation-by-larry-lesser.html), and "By Design" (a square poem in Lesser (2020)). A secondary example is how my poem "Factor!al Countdown" (in the March 2021 *The Mathematical Intelligencer*) takes the shape of a factorial sign.

2. How Poetry Can Be Used in Teaching Statistics

2.1 Introduce a Topic
I illustrate in Lesser and Pearl (2019) how my poem "Confounded" can be used to introduce Simpson's paradox. A vehicle to explore the topic of matched pairs design is the "Matched Pairs" poem mentioned in Section 1.3.3. Because the rhymes are not always perfect, a reflection of how it can be impossible to match subjects perfectly, and the would-be final couplet is ruined by missing its second line, just as two subjects are effectively lost when one subject in a pair chooses to drop out of the study.

2.2 Explore or Apply a Concept
A vehicle to explore percentiles of the normal distribution is my poem "Worry Lines" (see Lesser (2020)), as students can be asked to explain why the percentile bands have negative concavity, why they have increasing spacing between lines, and how falling from 60th percentile to 40th percentile is "half a sigma." For the poem "Mindful Means," students can be asked to discuss what words in the poem have both non-statistical (e.g., mindfulness) and statistical meaning. For each of those words, the class can discuss whether the two meanings reinforce each other, oppose each other, or are simply unrelated.

2.3 Recall a Concept
Recall calls for a poem that is very focused and short — usually just a couplet. Examples include the mnemonics listed in Lesser (2011) for hypotheses (" 'Reject' means 'No!'; 'Not reject' means 'Maybe so' " (Moses, 1986)) or for variance ("variance has a square routine: mean of the squares minus square of the mean"). My poem/rap "What to Ask About a Study" (see CAUSEweb.org/fun) helps students critique a newspaper report of a statistical study, in the spirit of the "7 critical components" in Utts (2015). If poetry is expanded to include song lyrics, then CAUSEweb.org/fun has many additional examples such as my 10-second "What *P*-Value Means" jingle to recall the definition of a *p*-value or my 1-minute "Probability Rules Rap" to recall the rules of probability.

2.4 Address a Misconception
The CAUSEweb.org/fun collection includes my poem "Very Able to Know Each Variable" to address student confusion between a measurement variable and a tally for a category of a categorical variable. My poem "50-50" (Lesser, 2013) can be used to discuss

equiprobability bias. Using a college basketball context, my haiku (at https://www.CAUSEweb.org/cause/resources/fun/poems/expected-value-haikus) called "62% Shooter's 1-and-1" gives students the chance to verify that the expected number of points is indeed 1, an outcome less likely than either 0 or 2 points for this player. Students may initially "expect" the expected value to be the most likely value, which reveals an example of associated misconceptions or ambiguities (e.g., Kim and Fukawa-Connelly, 2019).

2.5 Make Real-World Connections

The poem "Mindful Means" mentioned in Section 1.3.2 connects to the current real-world trend of mindfulness. Statistics poems also have the potential to meaningfully highlight or connect to political or social issues in the larger world. For example, my poems "Test for Normality" and "Significance" in issues 118 and 128, respectively, in the journal *Radical Statistics* were vehicles for me to process thoughts about events following the 2016 and 2020 US Presidential elections and "Stochastic Terrorism" from Lesser (2020) is another. While they might be viewed by most as "too political" to use in most classroom settings, students who find and view these poems on their own may find them inspiring as an example of how one can use poetry as a vehicle to integrate statistical concepts and imagery with current events and thus come to a a more nuanced understanding.

2.6 Consolidate Understanding by Student-Created Examples

Creating a poem using a concise structure forces consolidation of the essence of a concept. One way to accomplish this is by using familiar short structures such as haiku. And by being looser than the strict 5-7-5 syllables per line, students can readily compose short verse for each topic or theme in the course, as did Keller (2006). More generally, faculty can give students structured assignments or extra-credit opportunities to create their own poem of any type (or, for that matter, a song, video, etc.), as discussed in Lesser (2018). Karaali and Lesser (2021) offer some further perspectives, resources, and tips to have students use poems to explore connections with language, content or structure.

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