Project SMILES:
Student-Made Interactive Learning with Educational Songs in Introductory Statistics

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Overview

SMILES (Student-Made Interactive Learning with Educational Songs) for Introductory Statistics is developing and field-testing an innovation in online learning where students create a song by filling in key words associated with a learning objective. Twenty-two songs with lyrics addressing introductory statistics concepts were written and professionally recorded for the project. These interactive songs *challenge students to make conceptual connections and construct examples or context,* thereby fostering statistical literacy and reasoning skills. By reducing statistics anxiety (a key impediment to student success) and enhancing student learning, the potential impact is striking.

Student Feedback Study

Students in an Introductory Statistics class at Penn State University engaged with three SMILES songs in a review session as part of a computer lab at the end of the semester. That part of the lab took a total of 18 minutes (6 minutes per song). Data were collected on student actions with the interface (keystroke data) and on their responses to a survey taken at home. 84 students took the survey of whom 77 gave informed consent for use in our research.

Proposed Field Test

To evaluate the songs' efficacy, we will conduct a randomized controlled field test involving twenty college level introductory statistics instructors (15 will be from two-year colleges and most with predominately African-American or Hispanic student populations) in order to assess the value of interactive songs in enhancing student learning and reducing student anxiety.

To participate in the field test, please contact:

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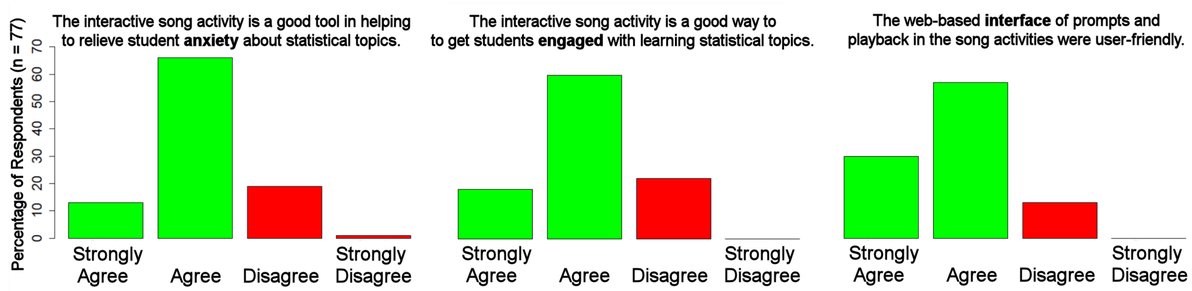
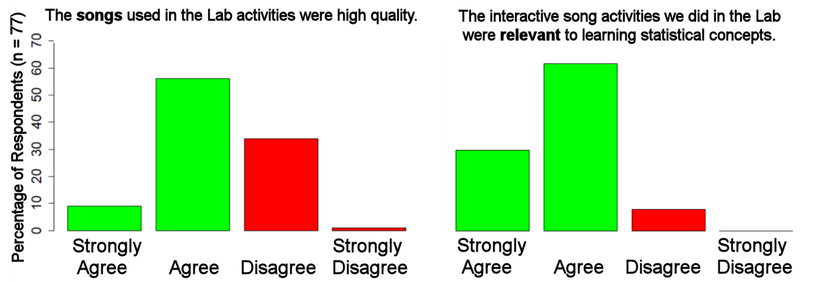
Some Results from the Student Feedback Study

Student Responses to Likert Items in Student Feedback Study





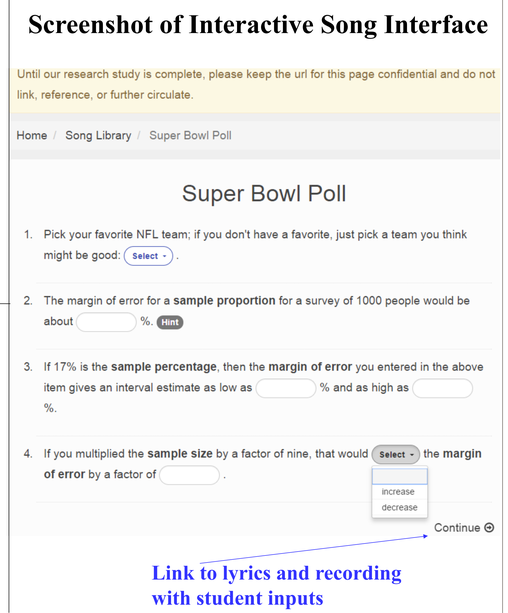
Learning Objectives and Prompt Completion Rates for Piloted Songs

"Levels of Measurement": 98.8%
Give 4 levels of measurement (nominal, ordinal, interval, ratio scales) in appropriate hierarchical order and give examples of each level in a real-world context.

"Height of Confidence": 97.8%
Reason about the factors that affect the width of a confidence interval (sample size, confidence level, standard deviation).

"Super Bowl Poll": 87.0%
Apply margin of error in the context of a poll question, including that variability decreases with the square root of sample size.

Screenshot of Interactive Song Interface



Interactive Songs in Education

Interactive songs are a novel learning resource that holds great potential for teaching literacy and reasoning skills in statistics and other STEM disciplines. The *web-based, machine-run,* and *auto-graded* characteristic of this resource will provide easy access to students anywhere anytime, and will address instructor hesitations regarding in-class use. *For instructors*, interactive songs will be readily adaptable regardless of pedagogy (e.g., as easily incorporated in a flipped class as in an online class, or a lecture/lab course), and provide a simple bridge to the statistics education reform movement for groups like two-year college adjuncts who are less connected. Most importantly, *for students*, these professional-quality interactive songs will be designed to engage, lessen anxiety, and foster active learning that enhances statistical reasoning skills. To enhance their value, the interactive songs developed by the SMILES project involved a unique artist/scientist collaborative to create original high-quality musical resources.

References

https://www.causeweb.org/cause/resources/fun/

http://www.math.utep.edu/Faculty/lesser/Fun.html

VOICES Conference (registration now open!): https://www.causeweb.org/voices/

Lesser, L.M., Pearl, D.K., & Weber, J.J. (July 2016). Assessing fun items' effectiveness in increasing learning of college introductory statistics students: Results of a randomized experiment. *Journal of Statistics Education*, *24*(2), 54-62.

Lesser, L. M.; et.al. (2013). Using fun in the statistics classroom: An exploratory study of college instructors' hesitations and motivations. *Journal of Statistics Education*, *21*(1), 1-33.

Lesser, L. & Pearl, D. (2008). Functional fun in statistics teaching: Resources, research, and recommendations. *Journal of Statistics Education*, *16*(3), 1-11.

INSPIRATION FOR THE INNOVATION: Trumpower, D. (2010). Mad Libs Statistics: A 'Happy' Activity. *Teaching Statistics*, *32*, 17-20.

INSTRUMENT (SAM): Earp, M.A. (2007). *Development and validation of the Statistics Anxiety Measure*. University of Denver.

Acknowledgements

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SMILES songs written by Amy Adler, Gregory Crowther, Dominic Dousa, Monty Harper, Larry Lesser, and Tom Toce, spanning 22 topics in an introductory statistics course and informed by GAISE and GOALS documents.

SMILES recordings supervised by Steven Haddad.

Website developed by Bob Carey.