SCRATCH to R: Toward an Inclusive Pedagogy in Teaching Coding

Shu-Min Liao
Amherst College

CAUSE/JSDSE webinar series

Welcome!

Host and Moderator:
Leigh Johnson
Capital University

What's new in the journal?

Upcoming CAUSE/JSDSE Webinars

DATAFEST Townhall
January 26, 2023
3 PM EST
Link to register

Next CAUSE/JSDSE Webinar
February 21, 2023
4 PM EST

USCOTS 2023

COMMUNICATING with about DATA

United States Conference on Teaching Statistics

https://www.causeweb.org/cause/uscots/uscots23

Abstracts for posters or beyond activities in the USCOTS Posters and Beyond session submitted before **Sunday January 29, 2023** will receive feedback from the session organizers by **February 20th**.

Final abstracts should be submitted by **Sunday March 5, 2023**. Abstracts submitted between **January 30th** and **March 5th** will be considered for selection, but will not receive feedback from the session organizers.

Shu-Min Liao

Shu-Min Liao
sliao@amherst.edu

Shu-Min Liao is an Assistant Professor of Statistics at Amherst College. Her research interests include fully nonparametric theory and methodology, model-free multivariate dependence measures for categorical data, and STEM education research focused on DEIA (Diversity, Equity, Inclusion, and Accessibility) topics.

A little more about Shu-Min…..

You may knew me via some of my recent works:

❖ JEDI Corner : "**At the Rise of JEDI: Lessons Learned from Fall of Jedi Order in *Star Wars***"

❖ CSD (Committee on Statistics and Disability):

❑ JEDI Corner: "**Disabilities as Assets and Strengths**"

❑ CSD Webinar @**January 20th** (Friday): "**Transitioning Between School and Work with Disabilities**"
(Register here: https://amstat.zoom.us/webinar/register/WN_i1G1bJGrSjyQj2jbjpg5nQ)

❖ CAUSE Research **Reading Group** (with Megan Mocko): continue this year!

❖ JSM 2022 Birds of a Feather (BoF) session on **Inclusive Pedagogy** (with Mine Dogucu)

❑ Useful Resources for Inclusive Pedagogy

❖ ICOTS 11: "**A Call for Being Human in Undergraduate Statistics**"

If not, hope you will get to know me via today's webinar on my SCRATCH project 😊

Where it began…

- **Summer 2020** - the first summer during the pandemic; stuck at home

- Fall 2020 - First time teaching in a remote environment

- Two biggest worries when preparing for teaching materials (STAT 230):

(1) How to **build a remote learning community**; and

(2) How to **teach R coding** via remote instructions.

- Another challenge: Balance between Family (child care) and Work

- Ended up taking a **SCRATCH online lesson** with my boy

Why SCRATCH?

❖ Try SCRATCH yourself: https://scratch.mit.edu/

 ➢ **What's your (first) impression about SCRATCH?**

❖ **Text-based** vs. Visual **Block-based** coding

 ➢ "**Learnability**" of block-based languages

❖ **Block-to-Text approach**

 ➢ **Harvard CS50 course: SCRATCH to C**

 ➢ **Berkeley CS10 course: Snap! to Python**

 ➢ **Code.org CSP course: Droplet blocks to JavaScript**

 ➢ **Dann et al (2012) @ CMU: Alice 3 to Java [Findings]**

❖ Student **Self-Efficacy** on coding

SCRATCH Introduction Project

- My SCRATCH Introduction Project: https://scratch.mit.edu/projects/418218201/
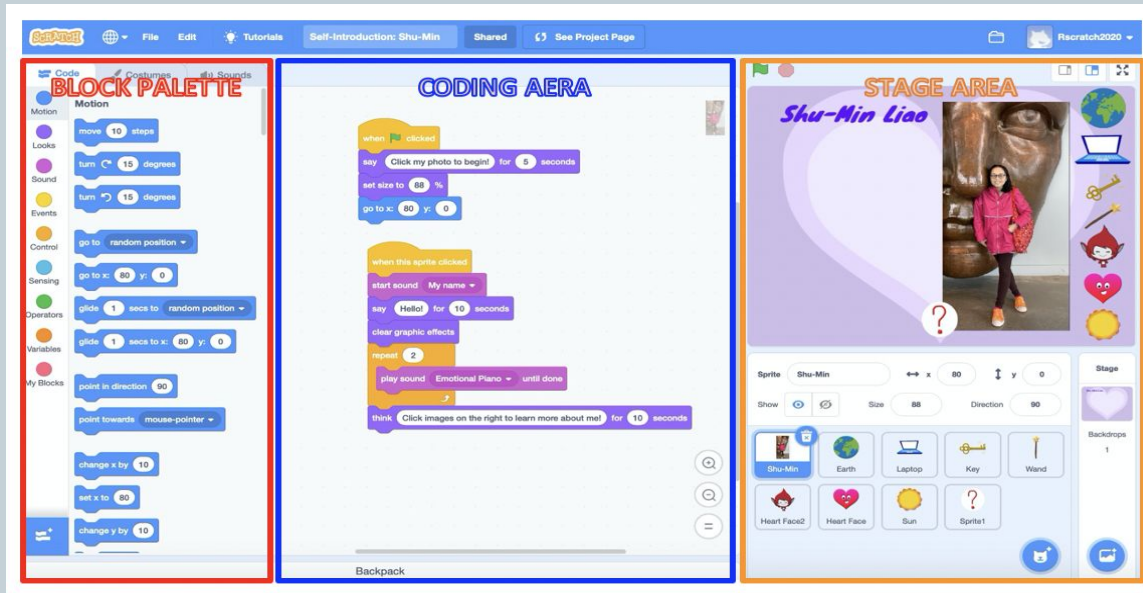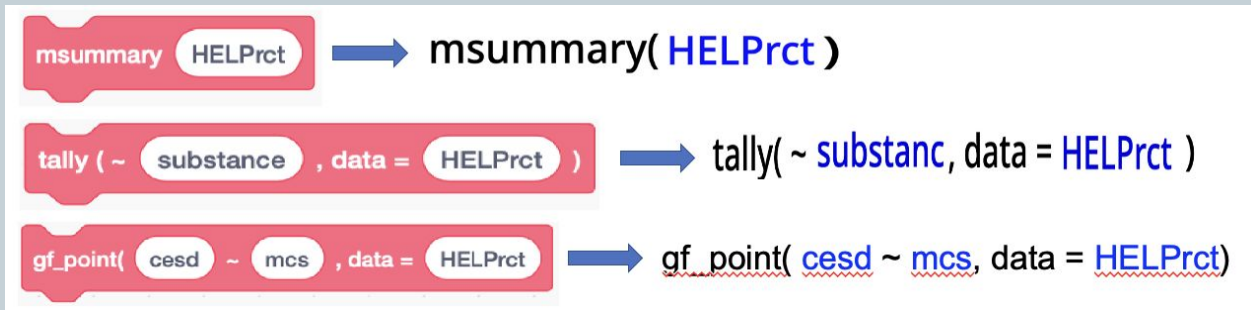

*" I liked the fact that we were allowed to be **creative** with our SCRATCH projects ... I had a lot of fun. I also really liked the **problem solving** aspect of it. "*

Transition from SCRATCH to R

- SCRATCH vs. R demo: https://scratch.mit.edu/projects/484845989/

- Template of R Mosaic Package:

"I thought the analogy of SCRATCH vs R was helpful for my understanding."

Finding: Disparities in student coding self-efficacy

- Q1: "On a scale of 0 (being extremely unpleasant) to 10 (being extremely pleasant), how comfortable do you feel about using R?"

☐ **R novices**: students who had never used R before (all were first-year students)

☐ **R progressors**: students who responded with a score of 5 or lower to Q1.

☐ **R proficient**: students who responded with a score of 6 or higher to Q1.
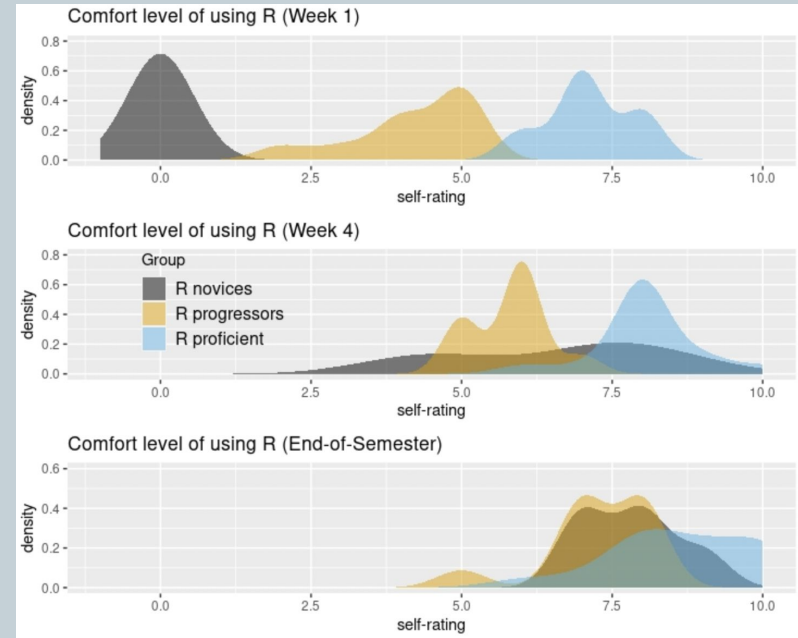
*"I thought that learning how to figure SCRATCH out on my own was really valuable, since it helped me adjust to **the learning curve** of using R for the first time."*

Finding: the most Disadvantaged Group

- From our teaching experience, **R progressors** is probably the most disadvantaged group among three; some of them usually "hide" themselves in the beginning of the semester, due to lack of confidence in their coding skills, while some may struggle through the whole semester, if no adequate and timely support is provided. After all, students who struggle are often *the most silent ones*, especially when they don't feel supported and "included" in class.

    → This pilot study confirmed our anecdotal experience:

    Unlike many R novices who were excited about learning R programming, R progressors had already learned R before but unfortunately didn't get a good first (or second) coding experience or didn't gain sufficient confidence in R coding from those prior experiences.

- Too often SDS educators (including us) tend to teach too much and too fast in the beginning of the semester and forget that **the doing-more-coding-exercises-on-your-own approach** might not work for all learners, especially those with poor prior experience or with low coding self-efficacy.

    "Doing the blocks with code helped to visualize what we are doing in R."

Finding: Remote Community Building

- **Belonging** and connection in the classroom play important roles in student success and well-being, especially for marginalized students, but it's particularly hard to foster those interpersonal relationships during the pandemic.

- The feedback from students was overwhelmingly positive on this regard. Almost all students (except one), regardless of their prior R background, agreed that this project helped them get to know **us (the professors)** and see us as human beings from the first day; … In addition, 83.8% of the class also agreed that it's easy to get to know **their peers** via those shared projects and found this an effective way in connecting themselves to their peers in a virtual space.

"It was nice to meet classmates *at our own pace*."

Some Questions for you…

- Are you ready to create "new knowledge and new designs (for your teaching) **from the margins**" (D'Ignazio and Klein 2021)?

- Are you ready to "go ahead and **bore your best students**" (Guzdial 2020a, b) and "reorient the department teaching culture towards a **growth mindset**" (Lin 2020)?

- Are you ready to help solve the STEM/SDS "**leaky pipeline**" problem and long-existing **learning inequity** issues by rethinking the way you teach coding (and everything)?

Q & A

Questions? Comments?

- Please feel free to share your feedback in the chat, or email to me via sliao@amherst.edu

- Please find all **references** and additional resources (including the **Project Guideline** and a **video tutorial**) in the paper:

  https://www.tandfonline.com/doi/full/10.1080/26939169.2022.2090467