

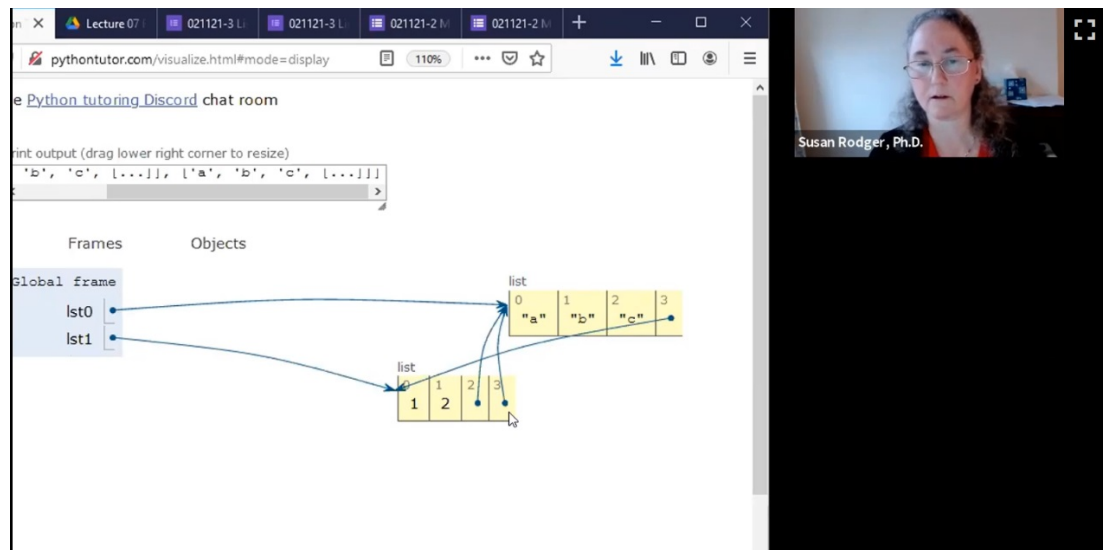
Changes From Teaching in a Pandemic: You Have to Make Your Own Cookies Now

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Illinois Summer CS
Teaching Workshop

Virtual

August 11, 2021

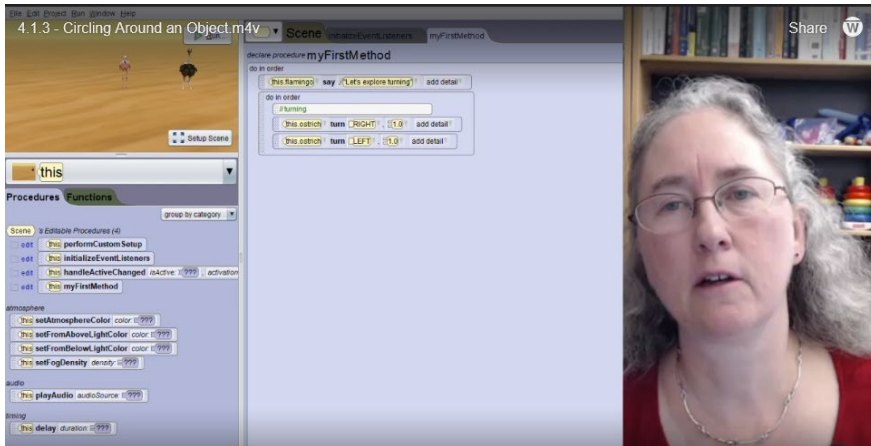
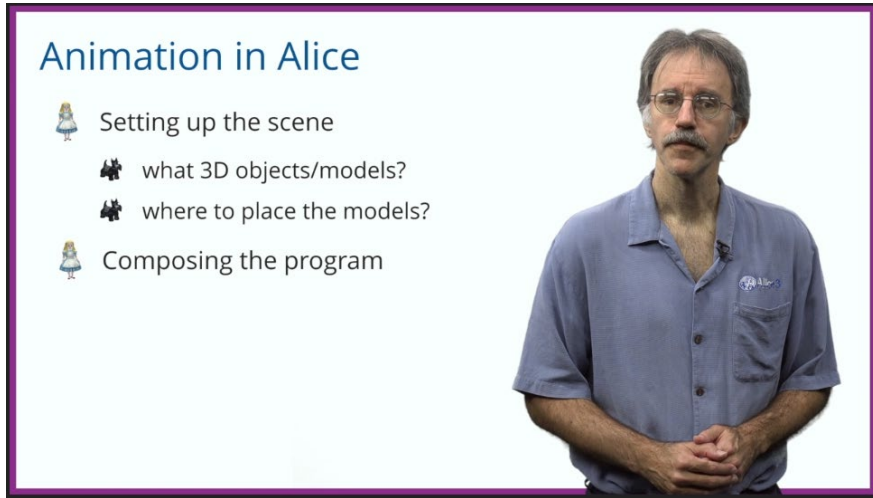


Computer Science at Duke University,

- Undergraduate, Graduate programs
- 400 BS/BA degrees/year
 - 100 minors/year
- CS1 and CS2
 - 300-500 students/semester
- Faculty
 - Tenure-track faculty
 - Professor of Practice
 - Lecturer
 - Teaching Associates



Fortunately Equipment from Coursera course ...



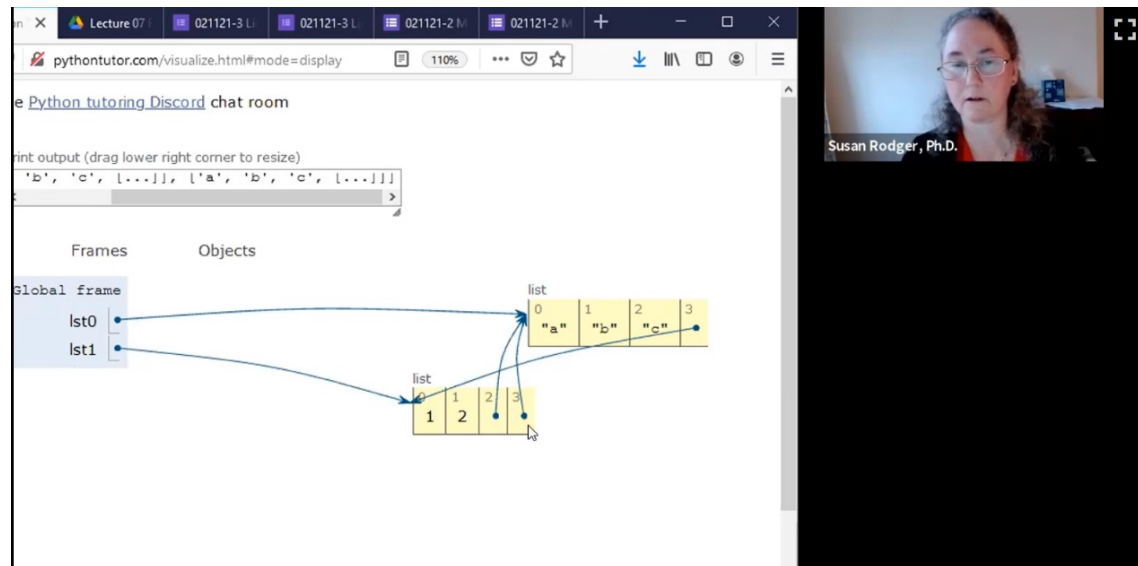
March 2020 – Pandemic hits

- Teaching in person -> Teaching online
- Spring break -> one week to prepare

From this



To this



Three helpers

to interrupt me while I'm teaching

Keeah



Moe



Beanie



How did the Pandemic affect teaching?

What will we keep going forward?

1) Student Mental Health

- Students
 - Isolated
 - Distraught
 - Survival – Formed Study Groups
 - For some - Led to cheating on exams
- Faculty
 - Not a counselor
 - Need to check in with students

Made some relaxing videos

- Log into class early and play the videos
- Students talk to you



1) Student Mental Health

Going forward

- More Compassion
- Continue to check in with students
- Go to class early, stay late

2) Lecture Structure

- In-person lectures To online
 - Flip the course
 - Before lecture
 - Watch short content videos/reading
 - Take online quiz
 - Lecture
 - Repeat:
 - Review topic
 - Group problem solving
 - Team Teach large courses

2) Lecture Structure

Going forward

- Keep Flipped classroom structure
- More problem solving during lecture

3) Group Problem Solving in Lecture

- Before Pandemic:
 - Talk to the person near you
- During Pandemic
 - Virtual rooms
 - Randomly assigned

3) Group Problem Solving in Lecture

Going forward

- Randomly assigned seating
- Change every 2-3 weeks

4) Lab/Discussion Sessions

- Could have been in person
 - Decided no
 - Taught by UTA/TA
 - Didn't want them to have to make the choice
 - Would they follow safety guidelines?
 - Deal with students who don't practice safety
- Training of each lab was held virtually
- Lab/discussions held similar to before, just online

4) Lab/Discussion Sessions

Going forward

- We didn't change much here, just online, taught in a similar format

5) Course Grade and Exams

- Course grade – lowered exam weights
 - Final Exam 10%
- Spread out exams
 - More, shorter exams
- Different types of exams
 - Paper to online (type in and program)
- Different types of questions
 - Can't ask what is the output?
 - Instead ask what code do you write to get this output

5) Course Grade and Exams

Going forward

- Students always have stress
 - Continue more and shorter exams
- Back to paper exams, weights on exams back up

6) Programming Assignments

- Not much change here in courses
- Office hours we will continue in person and online
 - Online is great for late hours
- Independent Study – Writing Apps
 - From Twitter data to Covid data

Independent Study: Apps

Twitter -> Covid



6) Programming Assignments

Going forward

- Apply to real life and current data

7) Tools and Techniques for Problem Solving in intro courses.

- Problem Techniques – more important in pandemic
- CS 1 -How do you get from problem to code?

Novices Struggling (1)...

- First year students don't know how to program at the end of the course!
 - ITiCSE Working Group 2001
 - *Multi-national, multi-institutional study of assessment of programming skills of first-year CS students*, SIGCSE Bulletin 33, 4 (Dec 2001), p. 125-140
- Over 200 students, average score 21%

Novices Struggling (2)...

- First year students weak in predicting the outcome of short code segments!
 - ITiCSE Working Group 2004
 - *A multi-national study of reading and tracing skills in novice programmers*, SIGCSE Bulletin 36, 4 (Dec 2004), p. 119-150
- Fragile grasp of skills needed for problem solving

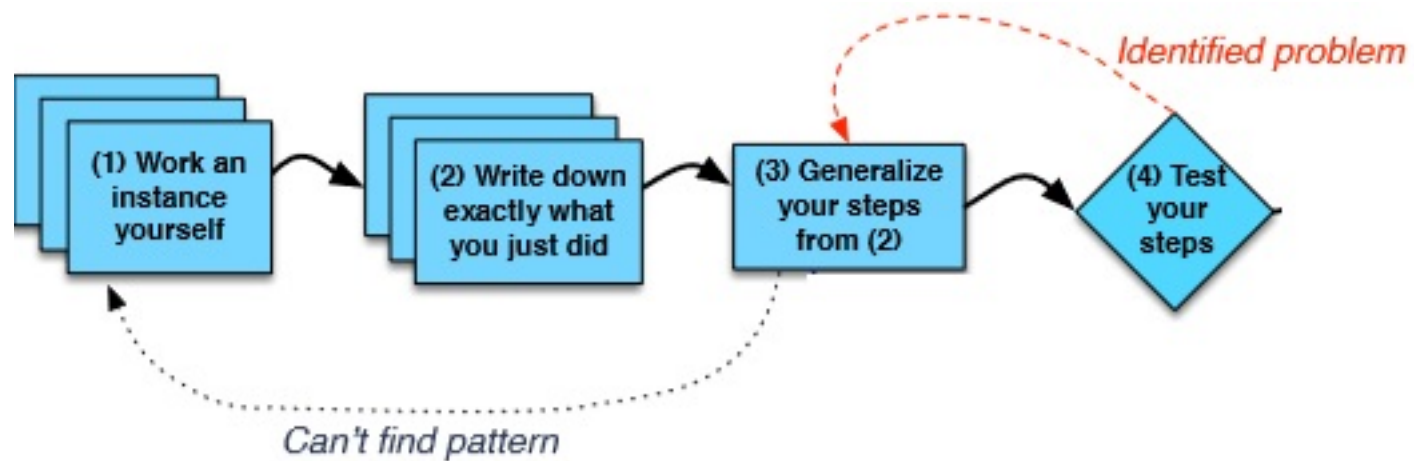
Problem Solving Defined Many Ways

- Computational Thinking
 - Abstraction, algorithmic thinking, decomposition, pattern recognition
- Problem-based learning (PBL)
 - Steps: 1) examination of the case, 2) identification of problem, 3) brainstorming, etc.
- Others
- All are very abstract!

Stuck on solving a problem?
Don't know where to start?

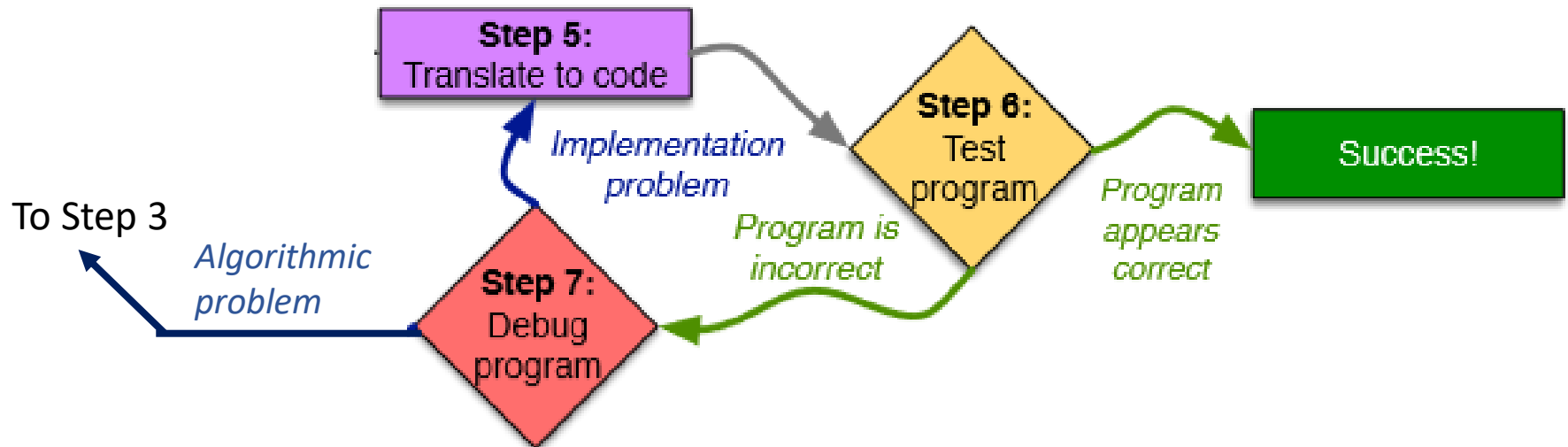
- Use the 7 step process!
- CompEd 2019, Translation from Problem to Code in Seven Steps, Hilton, Lipp and Rodger

Problem Solving to Code – Steps 1-4



1. Work small examples by hand
2. Write down what you did in words (algorithm)
3. Find Patterns (generalize algorithm)
4. Work another example by hand (algorithm work? If not, go back to 3, or 1)

Problem Solving to Code – Steps 5-7



5. Translate to code

6. Test several cases

7. Debug **failed** test cases

Problem Solving to Code

7 Step Process

1. Work small examples by hand
2. Write down what you did in words (algorithm)
3. Find Patterns (generalize algorithm)
4. Work another example by hand (algorithm work? If not, go back to 3, or 1)
5. Translate to code
6. Test several cases
7. Debug **failed** test cases

Student Anecdotes

- From CompSci 101
 - “I just want to tell you that I tried the seven step method, and **I worked on all of my code** for one or two hours **before I even looked at the computer**. AND IT WORKED! I got all my code right on the first try! For the first time ever, I don’t have to go to the help lab ...”

Student Anecdotes

- From Coursera course
 - “I have been programming for a couple of years. Learned from so many resources but **none said how to write the algorithm**, they just say you should write your algorithm first. The steps illustrated here are beautiful and definitely help to understand how to decompose a problem.”

7) Problem Solving

Going forward

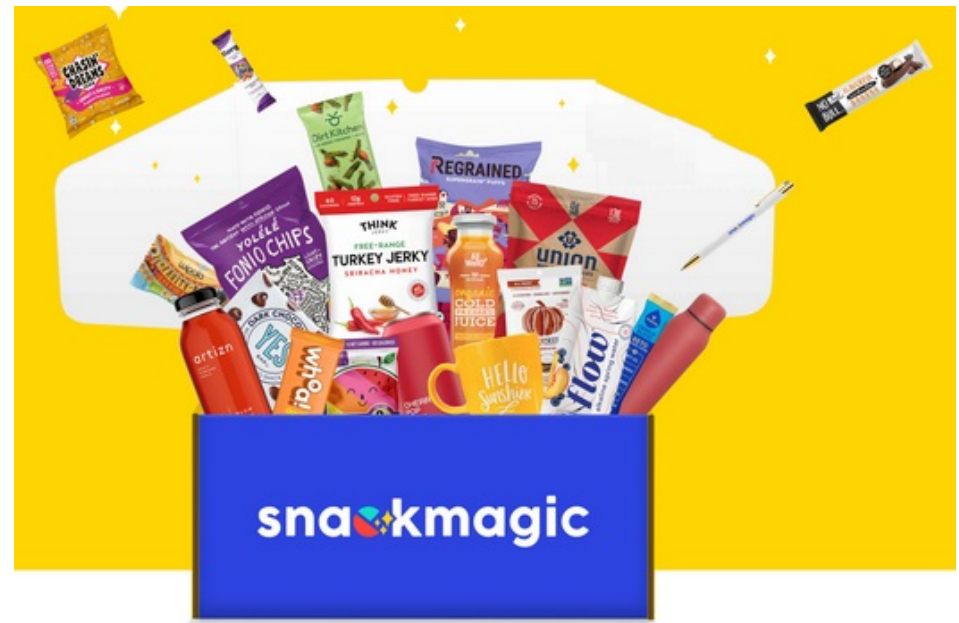
- Don't just teach programming, but also teach problem solving techniques

8) Food

- Food at events
 - Lunch talks
 - Student evening events
 - Training sessions for UTAs for course
- Community
- Pandemic → No food

Send food to recipients

- CRA-WP Graduate Cohort Event
- SnackMagic
 - Given budget - Pick out your snacks
 - Snacks shipped



Cookies for CS 1 - Python



CS 1 had around 300 students



CS 2 - April 2020

<https://bit.ly/makeJavaCookies>

MAKING JAVA COOKIES

by
Susan Rodger



MAKING JAVA COOKIES

by
Susan Rodger



8) Food

Going forward

- Not sure food will be allowed in classrooms for awhile.
- Making videos encourages students to think about cooking!

Questions?