UNT | COLLEGE OF INFORMATION
Department of Information Science

MULTIPLE LITERACIES LAB

Living Multiliteracies Webinar Series

Computational Thinking: Systematic Problem Solving in the School Library and Life in General

Hosted by Dr. Jennifer Moore

Wednesday, March 24, 2021

7:00-8:00 P.M. CST

Webinar will begin at 7pm Central Standard Time

Join us for

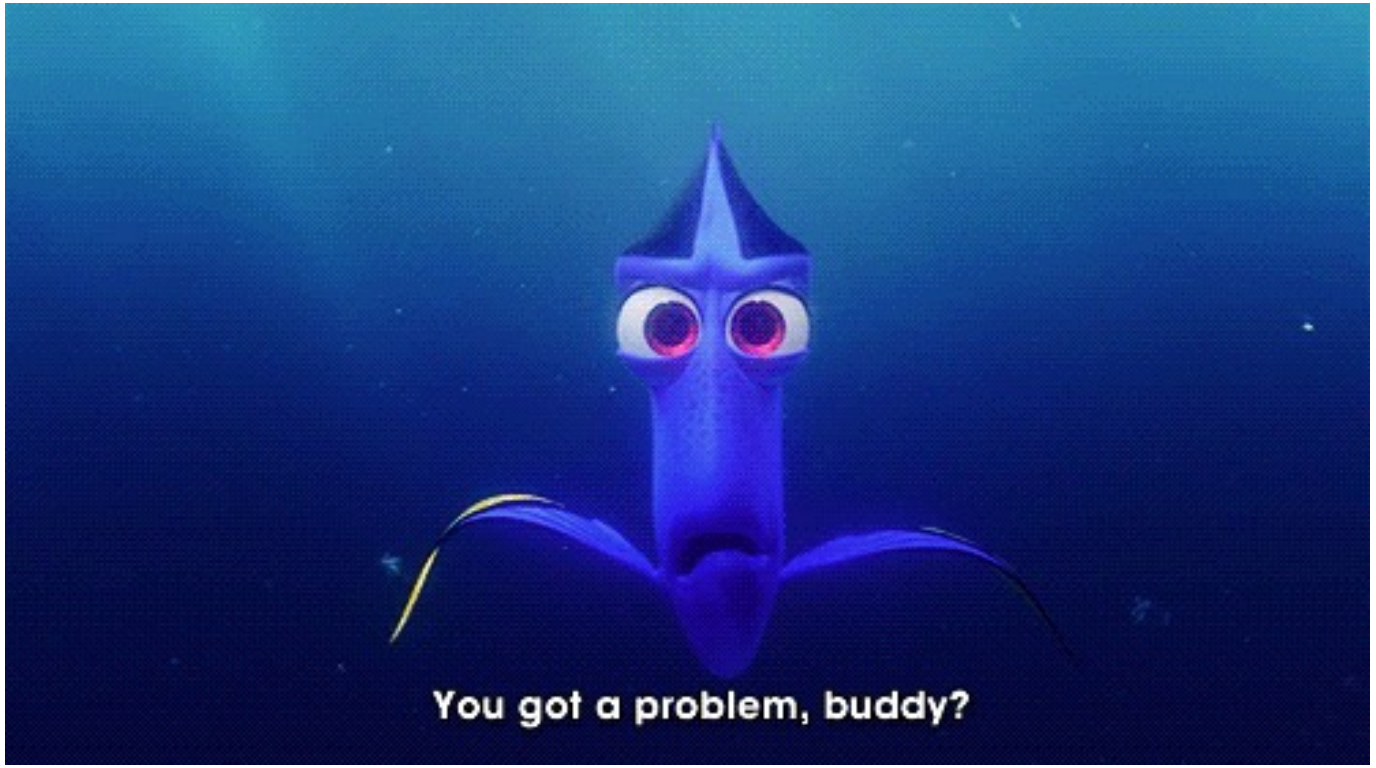
The 49th Annual Conference of the International Association of School Librarianship
The 24th International Forum on Research on School Librarianship

July 12-16, 2021 - Broadcasting virtually from Denton, Texas

For more information visit https://iasl2021.unt.edu/

- Welcome!

- ✓ Current/future school librarians
- ✓ Current teachers
- ✓ Anyone with an interest in learning about computational thinking (CT)


You got a problem, buddy?

Problems Solved

- Organizing craft room, closet, kitchen, etc.
- Training for a half marathon
- Choosing a pet
- Teaching persuasive writing, poetry, math concept
- Planning a vacation
- Buying a home
- Fixing a lawn mower
- Building a garden space
- Starting a new colony
- Exploring simple machines
- Plus many more!

Objectives

- ✓Define computational thinking and its components
- ✓See examples of problem solving in K-12 and life outside the classroom/library
- ✓Recognize the benefits of teaching CT to our K-12 learners
- ✓Enjoy entertaining gifs

What Is Computational Thinking (CT)?

- Raise your hand if you have heard of it.
- Multiple definitions, dependent upon entity writing

Commonalities?

Jeannette Wing

Computational thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can effectively be carried out by an information-processing agent.

Google

Computational thinking (CT) is a problem solving process that includes a number of characteristics, such as logically ordering and analyzing data and creating solutions using a series of ordered steps (or algorithms), and dispositions, such as the ability to confidently deal with complexity and open-ended problems. CT is essential to the development of computer applications, but it can also be used to support problem solving across all disciplines, including math, science, and the humanities. Students who learn CT across the curriculum can begin to see a relationship between subjects as well as between school and life outside of the classroom.

ISTE/CSTA

Computational thinking (CT) is a problem-solving process that includes (but is not limited to) the following characteristics:

- Formulating problems in a way that enables us to use a computer and other tools to help solve them.
- Logically organizing and analyzing data
- Representing data through abstractions such as models and simulations
- Automating solutions through algorithmic thinking (a series of ordered steps)
- Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources
- Generalizing and transferring this problem-solving process to a wide variety of problems

ALA OITP

Computational thinking refers to an underlying set of skills foundational to computer science though also transferable to broader applications for college and career readiness. Mastery can be seen in the ability to ask and answer questions using procedural thinking; the ability to define, model, and solve complex and ill-defined problems; and the ability to create personal meaning by processing information and creating connections to transform data into understanding.

In a nutshell…

Computational thinking involves an ordered (or systematic) problem-solving process that is transferable from computer science and K through 12 education into other facets of our lives, including college, career, and everyday life issues.

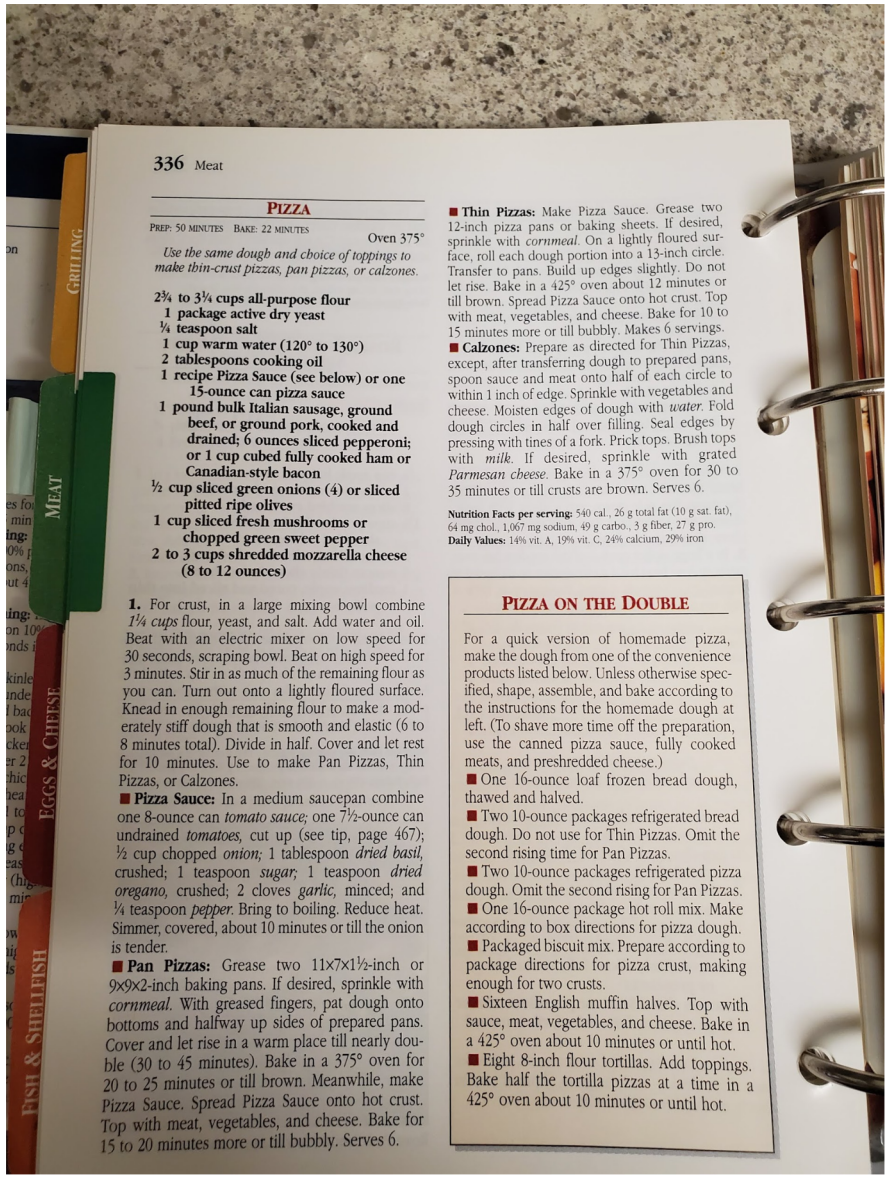
How do you make a milkshake?

A Tasty Example

- So very many articles
- Milkshake recipe
  - One recipe for vanilla
  - One recipe for chocolate
  - One recipe for strawberry
- Or one recipe for vanilla followed by a few sentences of adaptations needed to make other flavors.

Pizza Anyone?

- General pizza recipe
- Variations for pan pizza, thin pizza, and calzones
- Also variations for dough



336 Meat

PIZZA

PREP: 50 MINUTES BAKE: 22 MINUTES Oven 375°

Use the same dough and choice of toppings to make thin-crust pizzas, pan pizzas, or calzones.

2¾ to 3¼ cups all-purpose flour
1 package active dry yeast
¼ teaspoon salt
1 cup warm water (120° to 130°)
2 tablespoons cooking oil
1 recipe Pizza Sauce (see below) or one 15-ounce can pizza sauce
1 pound bulk Italian sausage, ground beef, or ground pork, cooked and drained; 6 ounces sliced pepperoni; or 1 cup cubed fully cooked ham or Canadian-style bacon
½ cup sliced green onions (4) or sliced pitted ripe olives
1 cup sliced fresh mushrooms or chopped green sweet pepper
2 to 3 cups shredded mozzarella cheese (8 to 12 ounces)

1. For crust, in a large mixing bowl combine *1¼ cups* flour, yeast, and salt. Add water and oil. Beat with an electric mixer on low speed for 30 seconds, scraping bowl. Beat on high speed for 3 minutes. Stir in as much of the remaining flour as you can. Turn out onto a lightly floured surface. Knead in enough remaining flour to make a moderately stiff dough that is smooth and elastic (6 to 8 minutes total). Divide in half. Cover and let rest for 10 minutes. Use to make Pan Pizzas, Thin Pizzas, or Calzones.

■ **Pizza Sauce:** In a medium saucepan combine one 8-ounce can *tomato sauce;* one 7½-ounce can undrained *tomatoes,* cut up (see tip, page 467); ½ cup chopped *onion;* 1 tablespoon *dried basil,* crushed; 1 teaspoon *sugar;* 1 teaspoon *dried oregano,* crushed; 2 cloves *garlic,* minced; and ¼ teaspoon *pepper.* Bring to boiling. Reduce heat. Simmer, covered, about 10 minutes or till the onion is tender.

■ **Pan Pizzas:** Grease two 11×7×1½-inch or 9×9×2-inch baking pans. If desired, sprinkle with *cornmeal.* With greased fingers, pat dough onto bottoms and halfway up sides of prepared pans. Cover and let rise in a warm place till nearly double (30 to 45 minutes). Bake in a 375° oven for 20 to 25 minutes or till brown. Meanwhile, make Pizza Sauce. Spread Pizza Sauce onto hot crust. Top with meat, vegetables, and cheese. Bake for 15 to 20 minutes more or till bubbly. Serves 6.

■ **Thin Pizzas:** Make Pizza Sauce. Grease two 12-inch pizza pans or baking sheets. If desired, sprinkle with *cornmeal.* On a lightly floured surface, roll each dough portion into a 13-inch circle. Transfer to pans. Build up edges slightly. Do not let rise. Bake in a 425° oven about 12 minutes or till brown. Spread Pizza Sauce onto hot crust. Top with meat, vegetables, and cheese. Bake for 10 to 15 minutes more or till bubbly. Makes 6 servings.

■ **Calzones:** Prepare as directed for Thin Pizzas, except, after transferring dough to prepared pans, spoon sauce and meat onto half of each circle to within 1 inch of edge. Sprinkle with vegetables and cheese. Moisten edges of dough with *water.* Fold dough circles in half over filling. Seal edges by pressing with tines of a fork. Prick tops. Brush tops with *milk.* If desired, sprinkle with grated *Parmesan cheese.* Bake in a 375° oven for 30 to 35 minutes or till crusts are brown. Serves 6.

Nutrition Facts per serving: 540 cal., 26 g total fat (10 g sat. fat), 64 mg chol., 1,067 mg sodium, 49 g carbo., 3 g fiber, 27 g pro.
Daily Values: 14% vit. A, 19% vit. C, 24% calcium, 29% iron

PIZZA ON THE DOUBLE

For a quick version of homemade pizza, make the dough from one of the convenience products listed below. Unless otherwise specified, shape, assemble, and bake according to the instructions for the homemade dough at left. (To shave more time off the preparation, use the canned pizza sauce, fully cooked meats, and preshredded cheese.)

■ One 16-ounce loaf frozen bread dough, thawed and halved.
■ Two 10-ounce packages refrigerated bread dough. Do not use for Thin Pizzas. Omit the second rising time for Pan Pizzas.
■ Two 10-ounce packages refrigerated pizza dough. Omit the second rising for Pan Pizzas.
■ One 16-ounce package hot roll mix. Make according to box directions for pizza dough.
■ Packaged biscuit mix. Prepare according to package directions for pizza crust, making enough for two crusts.
■ Sixteen English muffin halves. Top with sauce, meat, vegetables, and cheese. Bake in a 425° oven about 10 minutes or until hot.
■ Eight 8-inch flour tortillas. Add toppings. Bake half the tortilla pizzas at a time in a 425° oven about 10 minutes or until hot.

GRILLING
MEAT
EGGS & CHEESE
FISH & SHELLFISH

Better Homes & Gardens. (1996). Pizza recipe. *Better Homes and Gardens New Cook Book*. Des Moines, IA: Meredith Corporation, p. 336.

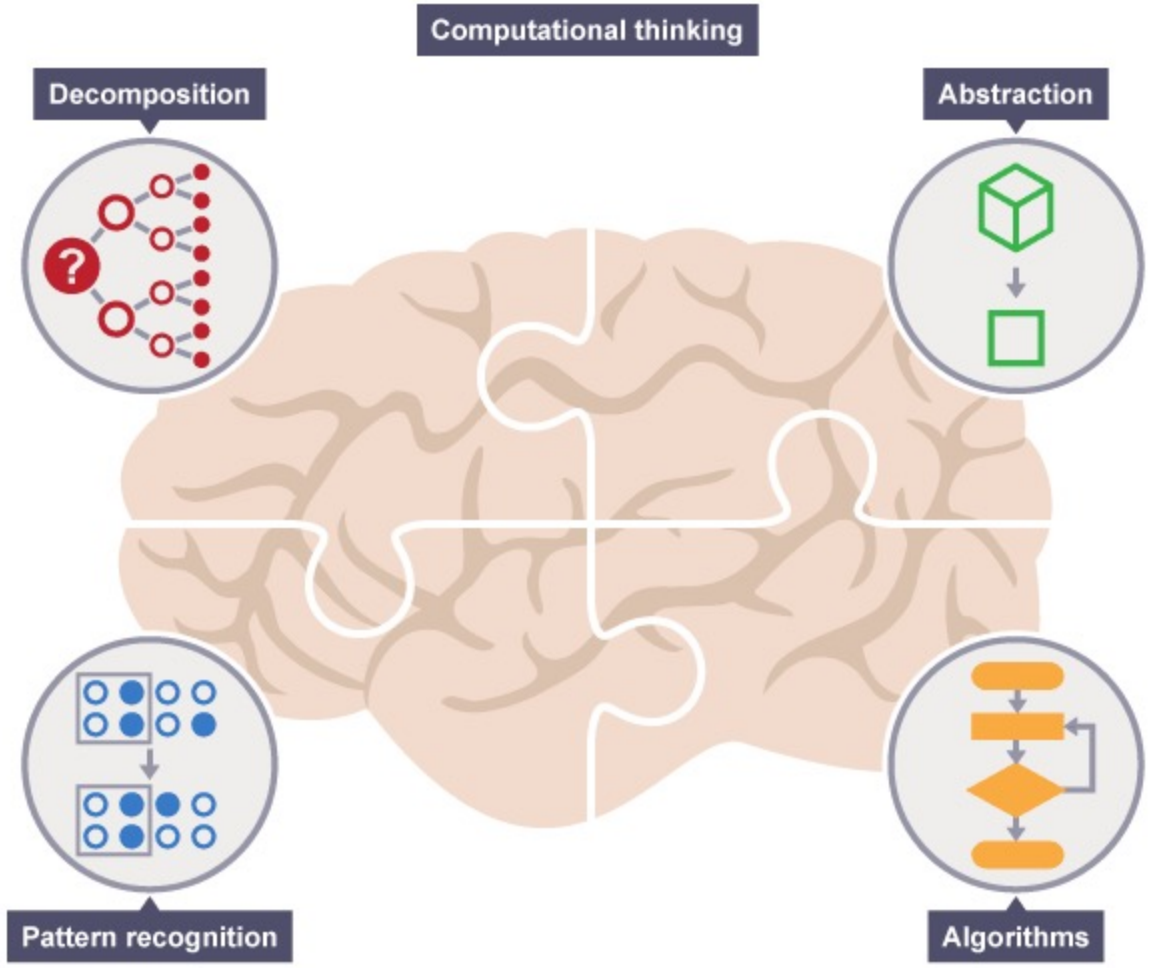
CT Concepts

Decomposition: Breaking down data, processes, or problems into smaller, manageable parts

Pattern Recognition: Observing patterns, trends, and regularities in data

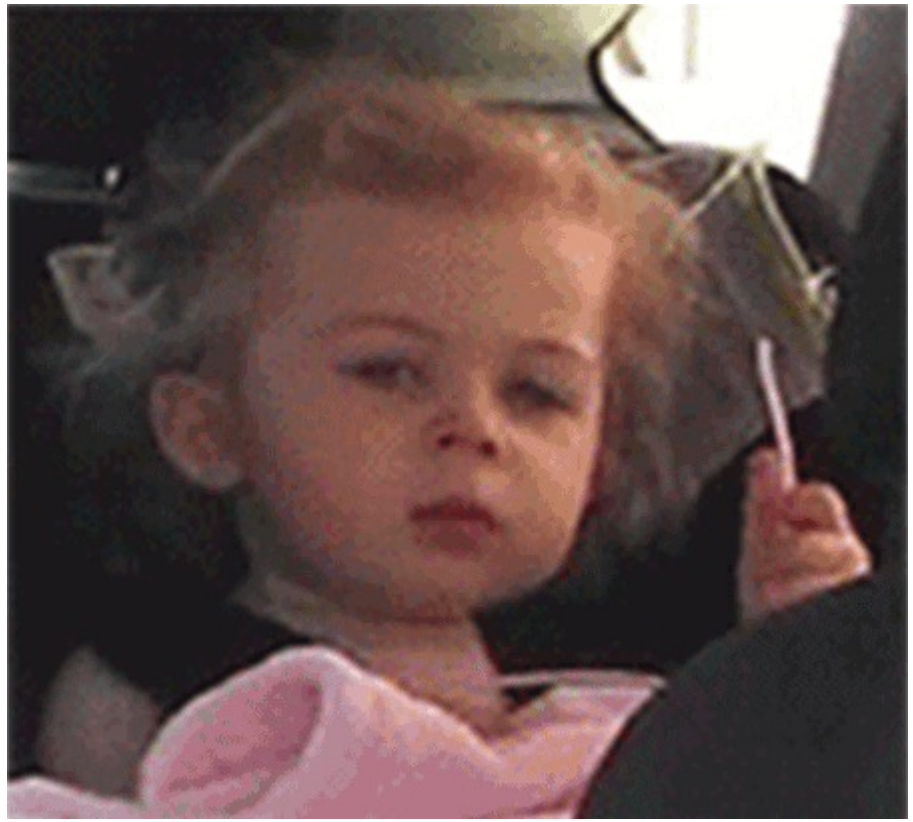
Algorithm Design: Developing the step-by-step instructions for solving this and similar problems

Abstraction: Identifying the general principles that generate these patterns by focusing on the important information only, ignoring irrelevant details; applying to similar problems



BBC: Bitesize

Great…



Problem solving process

Education [or other industry] buzzword

Education fad

MAXEY ADVENTURES

Problem Statement

- What is the problem you are needing to solve?
  - Bob & Linda: hamburgers
  - Tina, Gene, & Louise: spaghetti and meatballs
  - How can Bob create a meal that will please everyone?

Decomposition

- Breaking down data, processes, or problems into smaller, manageable parts Bob & Linda:
  - Search for recipes: hamburgers and spaghetti and meatballs
    - Ingredients
    - Cooking techniques

Pattern Recognition

- Observing patterns, trends, and regularities in data
  - Bob studies different recipes.
    - Hamburgers: ground beef, a hamburger bun, lettuce, tomatoes, pickles, onions, cheese, and condiments; cooked on a grill or stove top
    - Spaghetti and meatballs: pasta, marinara, meatballs made with a combination of pork and beef, and cheese (usually mozzarella and/or parmesan), and sometimes garlic bread; cooked on stove top and then oven

Algorithm

- Developing the step by step instructions for solving this and similar problems
  - Bob writes a recipe.
    - “Meatball” burger: combo of ground beef and pork, seasoned with oregano and garlic
    - Cooked on grill
    - Toasted bun with butter and garlic
    - Subs marinara for condiments
    - Fresh mozzarella cheese
    - Subs pickled pepperoncini for cucumber pickles

Abstraction

- Identifying the general principles that generate these patterns by focusing on the important information only, ignoring irrelevant details; applying to similar problems
  - Bob can combine other flavor profiles.
    - Greek-style burger: ground lamb, feta cheese, red onions, tomatoes, tzatziki sauce, and bread.
    - Hawaiian-style burger: Spam for the beef and topping it with grilled pineapple

A Different Approach

- Needed help cleaning house; feeling overwhelmed
  - Decomposition: by room
  - Pattern Recognition: litter box, dishes, dead plants, dirty laundry
  - Algorithm: plan; baby steps; start with most important
  - Abstraction: apply to outdoor area


SO?

But Why?

Top 10 skills in 2020

- Complex problem solving.
- Critical thinking.
- Creativity.
- People management.
- Co-ordinating with others.
- Emotional intelligence.
- Judgment and decision making.
- Service orientation.
- Negotiation.
- Cognitive flexibility.

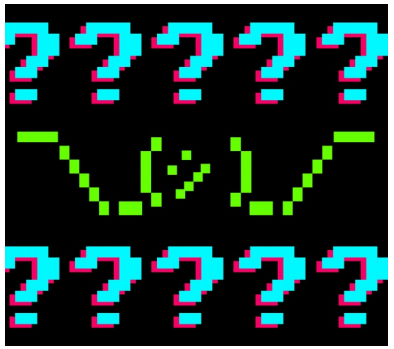
Top 10 skills in 2005 (compared with 2020 statistics)

- Complex problem solving.
- Co-ordinating with others (-3).
- People management (-1).
- Critical thinking (+2).
- Negotiation (-4).
- ~~Quality control.*~~
- Service orientation (-1).
- Judgment and decision making (+1).
- ~~Active listening.*~~
- Creativity (+7).

World Economic Forum, *The Future of Jobs*

But Also More Why and What Does It Look Like?

…in a school library or classroom?



School Libraries?

- Largest inclusive classroom on campus and to interact with every student on campus
- Library programs offer innovative and customized informal and formal learning spaces for all, thus improving access to skill development and resources for all learners
- Teach technology skills and information literacy skills (among other myriad literacies)
- Opportunity to prepare students for their educational careers, their professional careers, and their everyday life issues

School Libraries?

- Student participation and engagement
  - Teaching students the CT process within the library setting offers a less intimidating environment, while providing the opportunity to practice the process in a collaborative manner.
- Innovative Learning
  - Computational thinking within the library can be seen in STEM/STEAM activities, coding, and project-based learning activities
- Access and Freedom
  - Libraries often house the manipulatives and provide the instruction needed to build computational thinking in a hands-on approach

School Libraries?

- CT is collaborative and hands-on, incorporating non-tech and tech elements
- Use of novels and stories to develop questions for identifiable problems that are relatable to the students
- Collaborating with teachers to enhance curriculum content in class with PBL (project-based learning activities)
- Providing opportunities to develop ways their technology skills can reach others at a communication level or in an assistive way
- Incorporating STEM and Code that provide computational thinking application
- Makerspaces offer many possible ways to use CT
- Your ideas: in chat

Former Student Amy W.

"I am very fortunate to be at a school where my library received a makerspace grant this year. The implementation of makerspaces has given me a wonderful opportunity to use computational thinking in my lessons. Each month I do a makerspace lesson with every class. The students are divided into groups and are given a problem that they must work collaboratively to solve. I tie each problem with a book that is read before the lesson before introducing the problem they will be working on. In each scenario, the students work collaboratively using the CT model in order to solve the given problem. It has been amazing to see the growth that the students have made in less than a year. They are more confident in their work and eager to take on new challenges."

Former Student Erin B.

“CT can connect with so many different content areas, and as a result, it can be approached in lots of different ways. When students were first exploring the steps of computational thinking, we applied it to jigsaw puzzles that they were working on. At times, we specifically name the steps and talk about how abstraction or pattern recognition can help us in a certain situation. The steps are posted on a chart that students can refer to during their time in the library. At other times, as we are preparing to begin an assignment, I can ask them, “How can we use decomposition to help us out here?” If students are truly going to learn and apply CT, they need to be applying it regularly. It is almost like learning a new language–you have to hear it and use it to make it stick. One of my favorite things that came out of our introductory lessons this year was hearing students make connections about how CT can help them in their lives. I asked them to add their ideas to a chart, and it was amazing to see their thinking. One group realized that they could use the steps to approach a big project that was coming up in math and science. Another connected it to playing video games, and another student shared that he could use CT to improve at his free throws in basketball. It is really a natural process, and once students learn about it and practice with it, the opportunities to apply are endless.”

SBEC & ISTE

Educator Standards make their way into Texas law

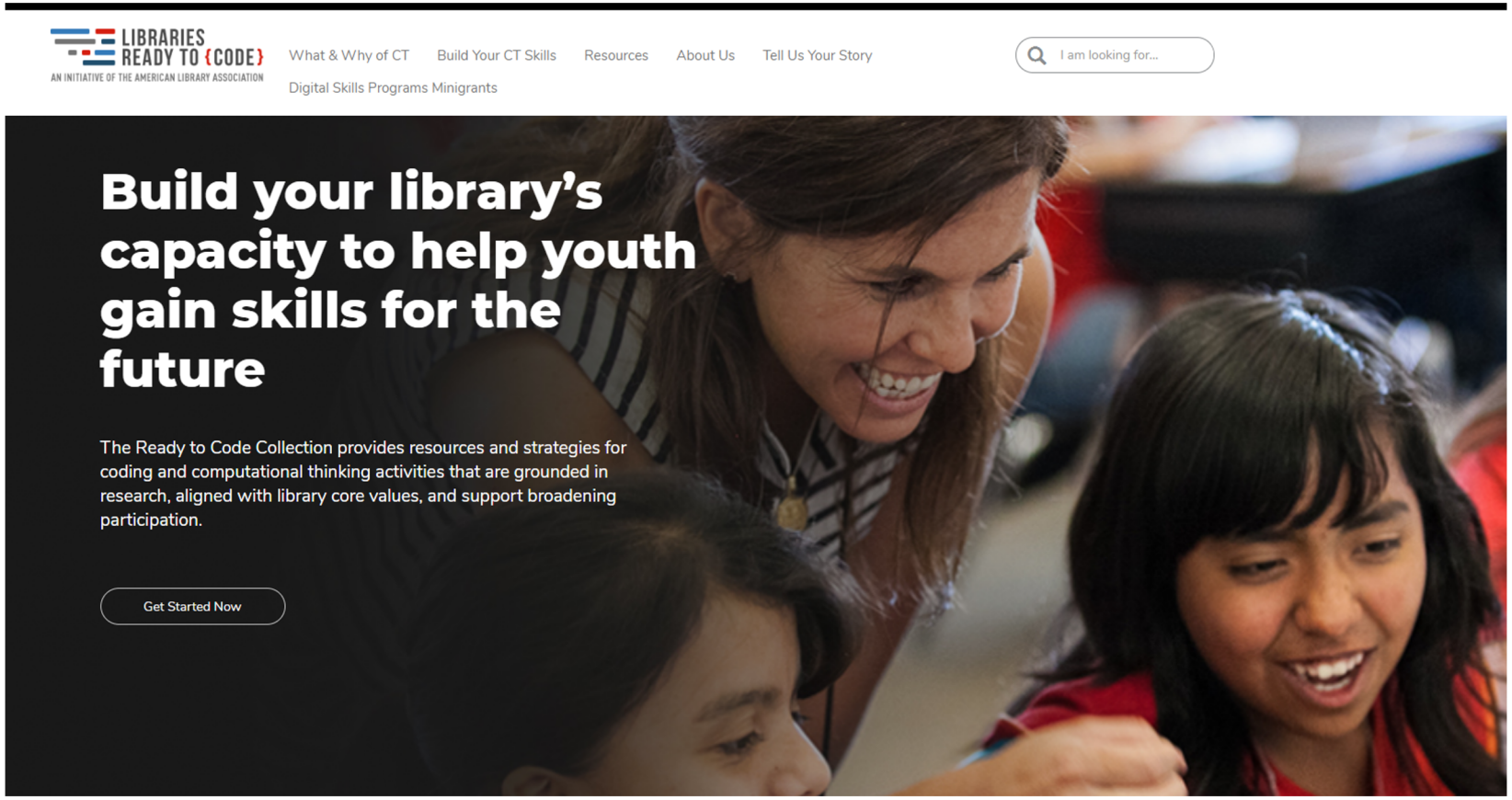
By Julie Randles 7/26/2017 Advocacy Professional learning

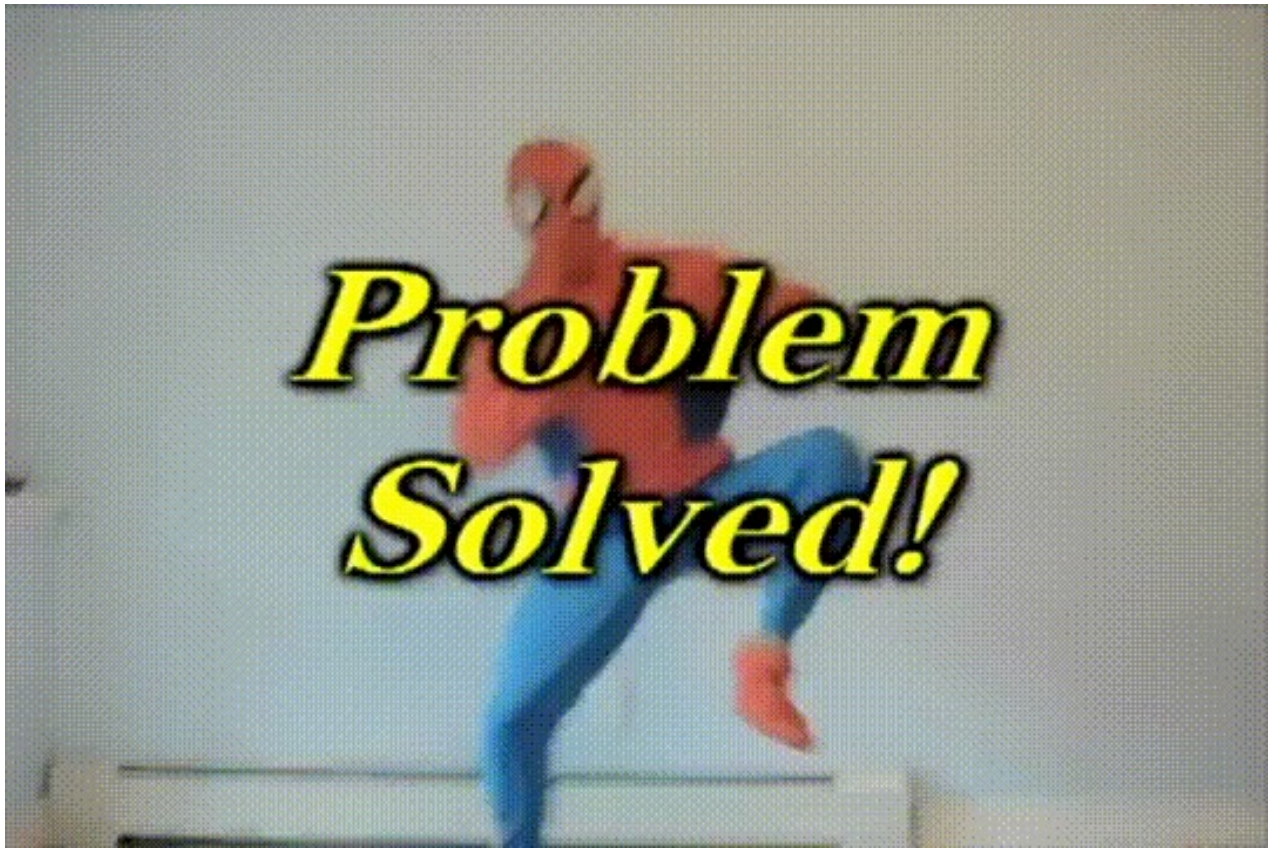
In the same month the new **ISTE Standards for Educators** were launched, the governor of Texas signed a bill requiring that preservice teachers be evaluated on their ability to teach in a digital environment, with the Educator Standards serving as the benchmark.

The June passage of Senate Bill 1839 made Texas the first state to include the Educator Standards in legislation.

SB 1839 also empowers the **Texas State Board for Educator Certification** (SBEC) to create rules governing the creation of continuing professional education courses for in-service educators to learn more about digital learning, and provides guidance on what digital learning means and how it can empower teachers to bring a more robust, complete and up-to-date educational experience to classrooms.

Resource Repository

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Thanks!

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#gmg

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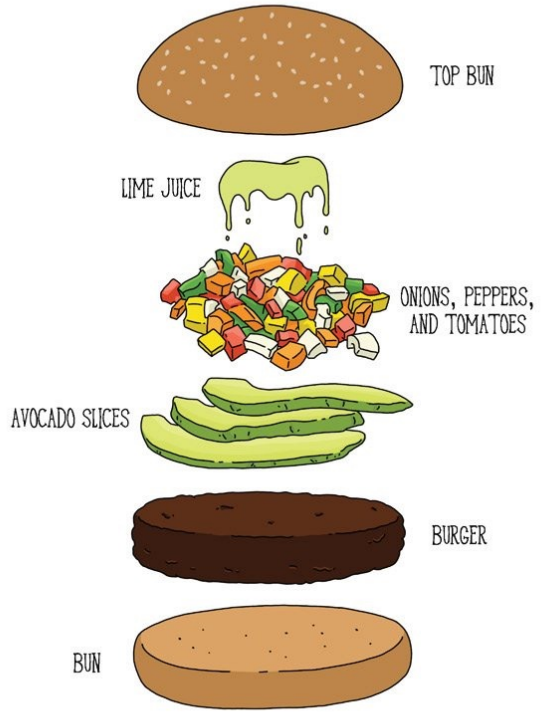

SWEET HOME AVOCADO BURGER

SEASON 4, EPISODE 18: AMBERGRIS

This delicious burger—an all-beef patty coated in a sweet lime sauce and topped with fresh avocado slices, sweet onions, tomatoes, peppers, sweet stevia leaves, and served on a whole wheat bun—is perfect on a hot summer day. Think fresh crunchy veggies meets tangy sweet limeade. Now add a burger.

MAKES 4 BURGERS

- 1 cup fresh lime juice
- ½ cup honey
- Salt
- 1 pound 85% lean ground beef
- Pepper
- 1 large Vidalia onion, chopped
- 3 Roma tomatoes, seeded and chopped
- 1 bell pepper, chopped
- ½ cup chopped stevia leaves (optional, but highly recommended)
- 1 teaspoon olive oil
- 4 whole wheat buns
- 2 avocados, halved, pitted, peeled, and sliced

1 Cook the lime juice, honey, and 1 teaspoon salt in a small saucepan set over medium heat until everything is completely dissolved. Allow it to cool.

2 Put the ground beef in a large resealable bag, and pour all but ¼ cup of the lime juice over the beef. Put the bag in the fridge and let the beef marinate for at least an hour.

3 Drain the beef, then form 4 patties and season with salt and pepper. Cook the burgers as you normally would.

4 While the burgers are cooking, mix the onion, tomatoes, pepper, and stevia leaves, if using, in a bowl with the olive oil and a dash of salt.

5 BUILD YOUR BURGER: Bottom bun, burger, a couple avocado slices, a scoop of the vegetables on top, 1 tablespoon lime juice, then top bun and done.

6 Put on you shades, and enjoy the summer heat with your burger that's citrusy sweet.

THE BOB'S BURGERS BURGER BOOK • 71

Image: Bouchard, L., & the Writers of Bob's Burgers. (2016). *The Bob's Burgers burger book: Real recipes for joke burgers.* New York, NY: Universe.

Register Now for April's Webinar!

UNT School & Youth Librarianship Master's Degree Program Overview: Living Multiliteracies- Hosted by

Dr. Sarah Evans and Dr. Tricia Kuon

Wednesday, April 21, 2021 at 7pm

Registration: https://unt.zoom.us/meeting/register/tZYsceuqpzsoGNPttFPowncZinevkVLZ0XN5

Check out full calendar of past and future Living Multiliteracies events here

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MULTIPLE LITERACIES LAB

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