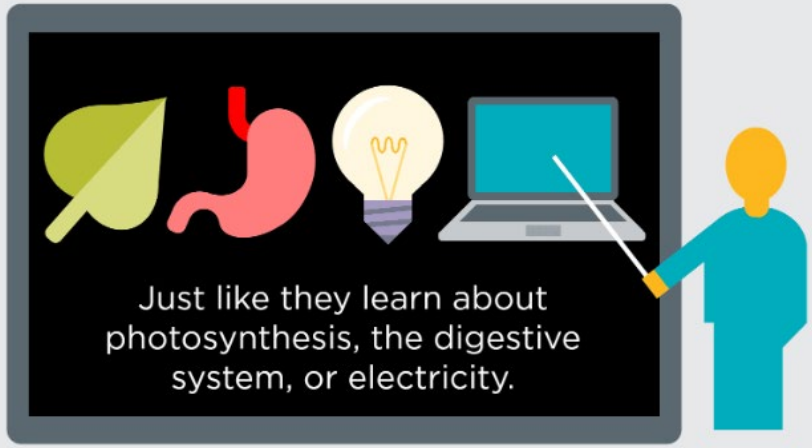

UMASS
AMHERST
College of Information and Computer Sciences
UMassAmherst
College of Social & Behavioral Sciences
SPRINGFIELD PUBLIC SCHOOLS
First School House Erected 1679
UMassAmherst
COLLEGE of EDUCATION
CSforALL
FIVE COLLEGE
CONSORTIUM
SageFox
CONSULTING GROUP

Why CS in Springfield?

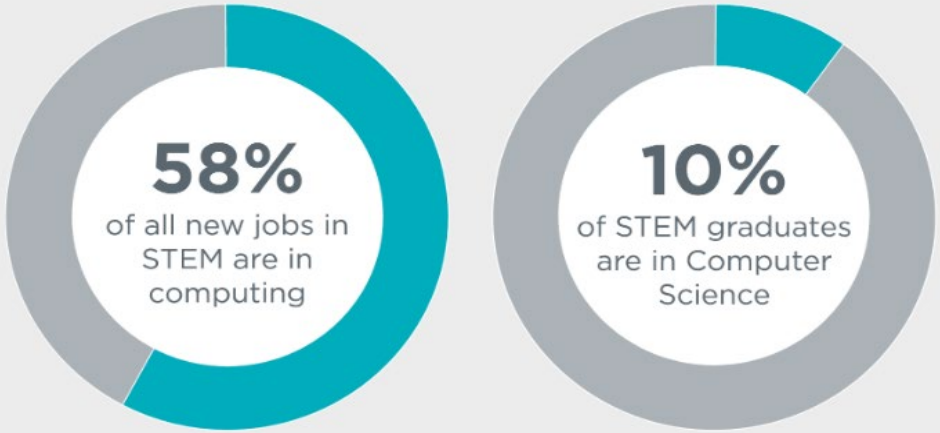
Why computer science?

Computer science is foundational



Every 21st century child should have a chance to learn about algorithms, how to make an app, or how the internet works.

The "STEM" problem is in computer science



Computing jobs are the #1 source of new wages in the US

500,000
current openings

These jobs are in every industry and every state, and they're projected to grow at twice the rate of all other jobs.

http://zitscomics.com/comics/january-16-2015/

Context

SPS Local Context

2nd largest district in New England

- 61 schools including 8 Alternatives and 3 Specialty Schools
- 25,604 Students
  - 21.9% Special Education
  - 15.6% English Language Learners
  - 77.1% Economically Disadvantaged

3rd largest employer in WMass

- 2,231 Unit A members
- 4,500 employees

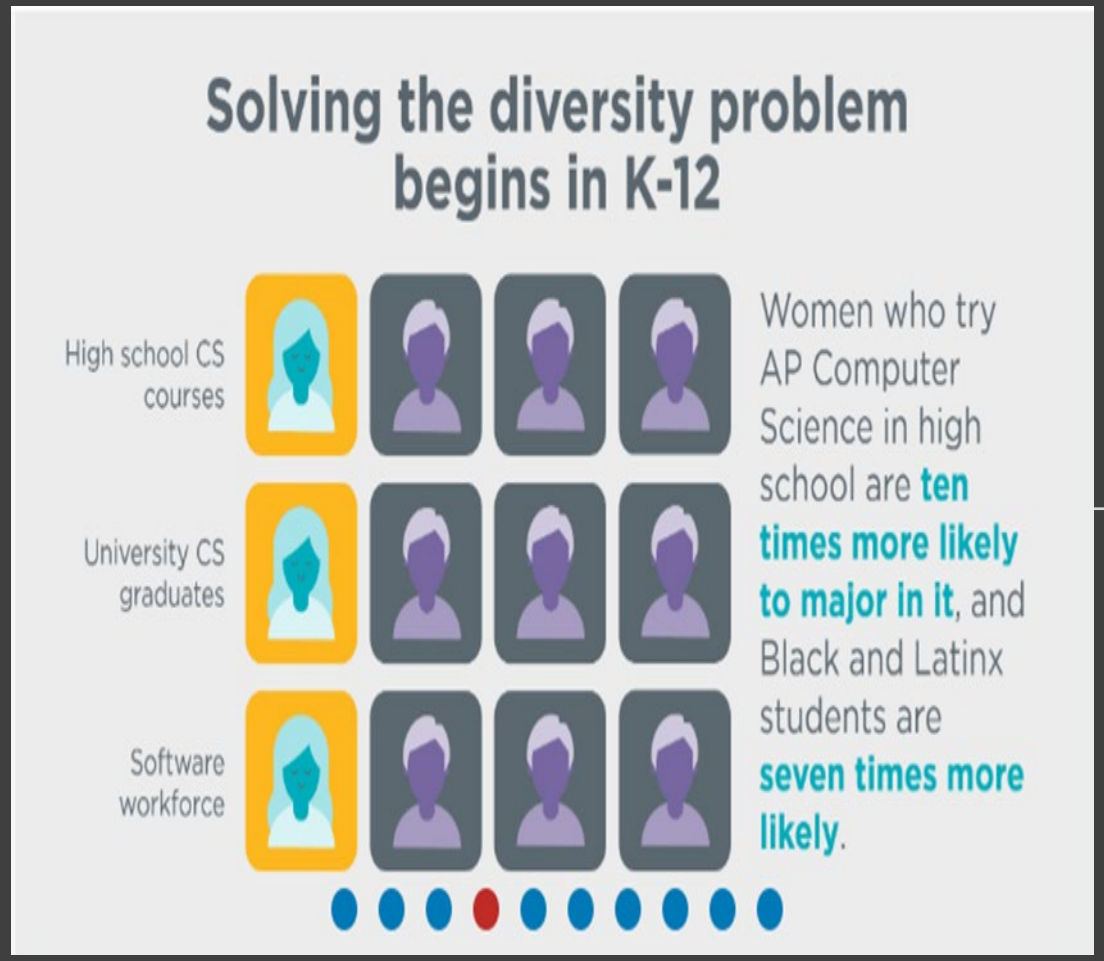
Community profile

- City-wide unemployment rate of 6.5%, state 3.5%
- Median household income $35.7K, MA $70.9K

Annual budget

FY2018: $500M all funds

ALL of SPRINGFIELD's students should benefit from CS opportunities and careers



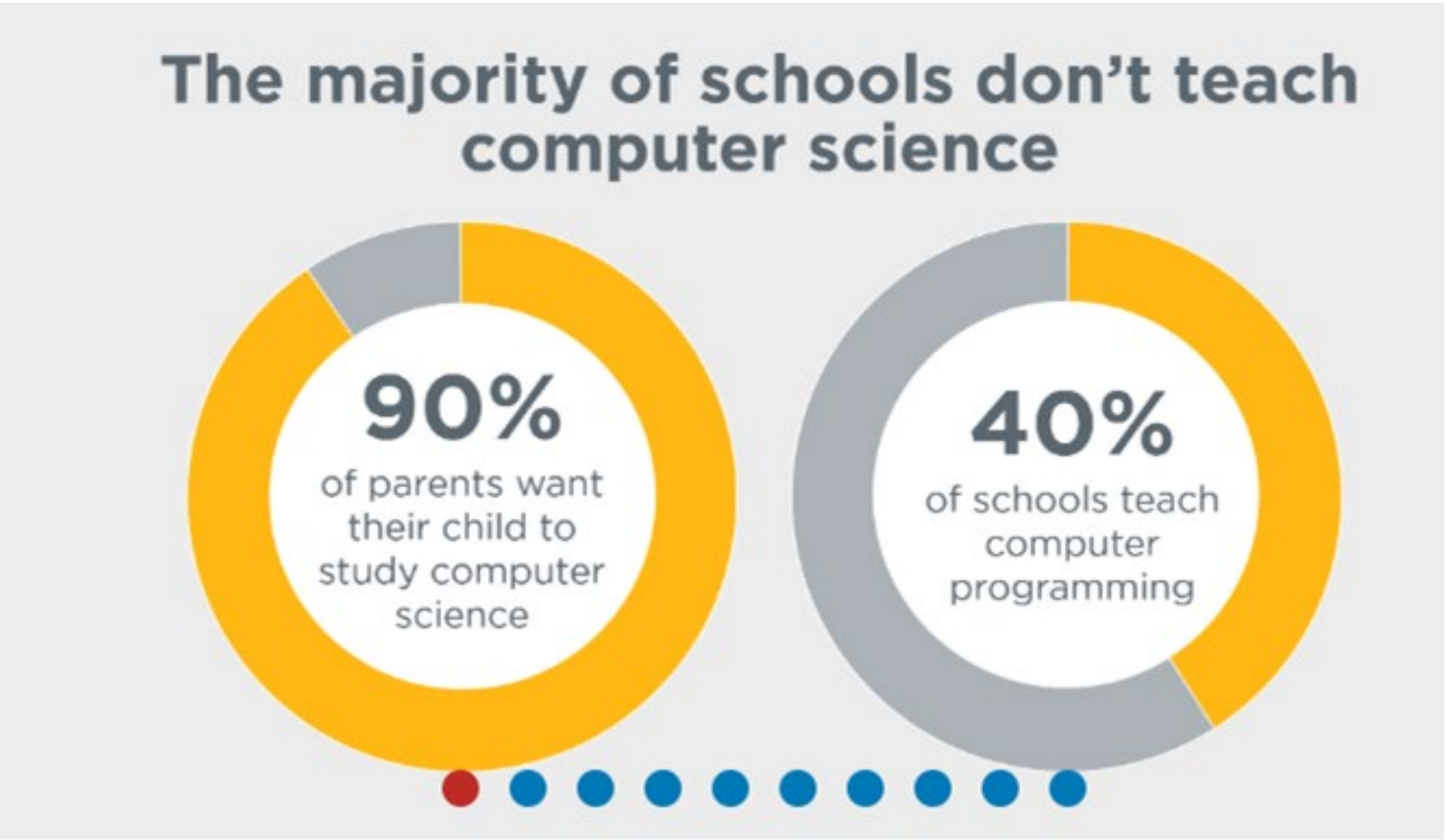
Springfield's students are:

19.6% African American

65.0% Hispanic/Latino

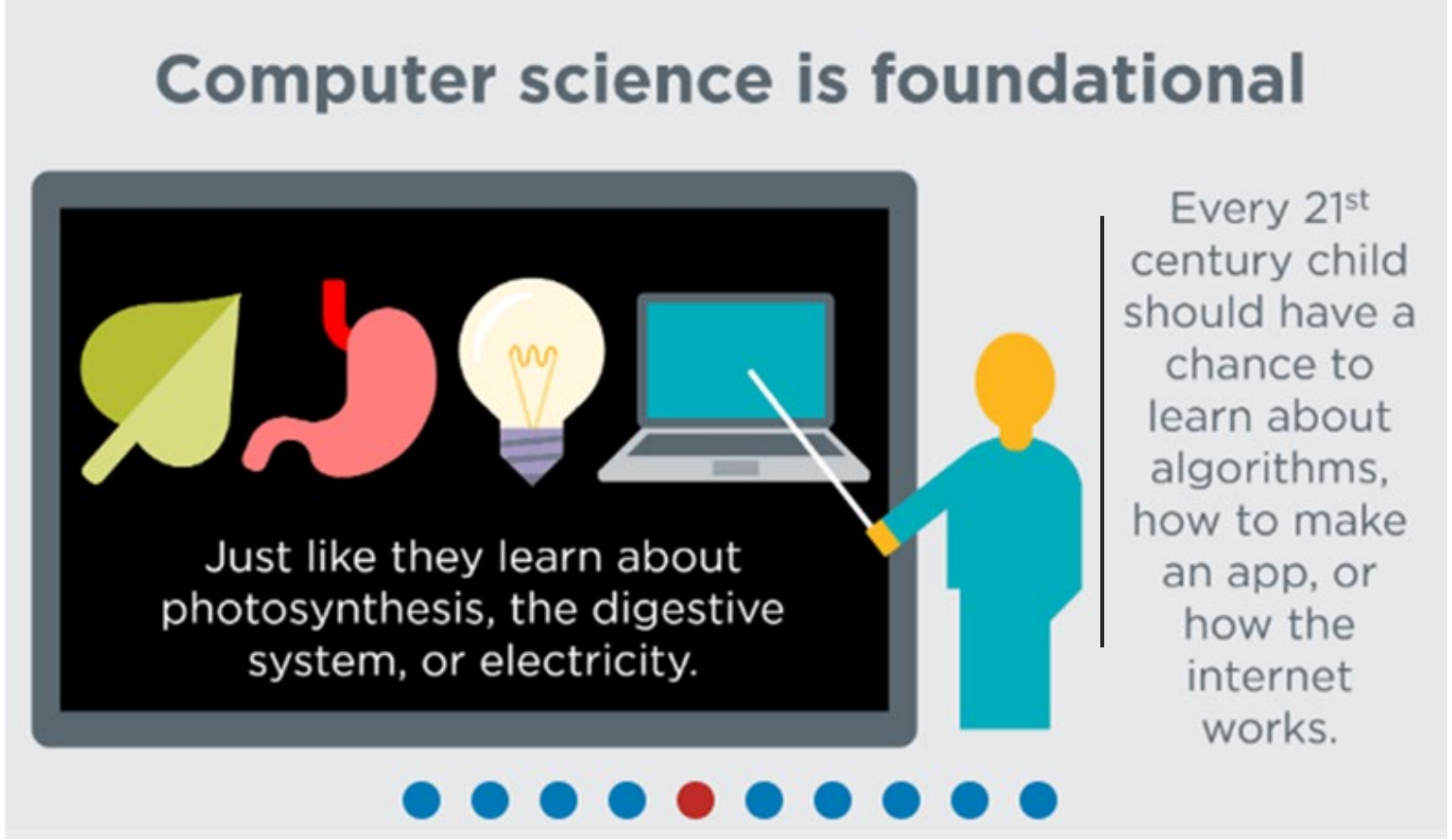
27.4% First Language Not English

21.9% students with disabilities



Parents want students to learn computer science

Of 58 schools in Springfield, 5 high schools, 2 middle schools, and about 5 elementary schools presently teach computer science



And . . .
students in Springfield are less likely to have opportunities to learn CS outside the classroom

Computer Science is Fundamental to the future, regardless of career choice

In the 2018-19 school year, there are 265 high school student enrolled in a computer science course, this is 3.6% of Springfield high school students

Massachusett

18,048
Open computing jobs
(3.1x the state average demand rate)

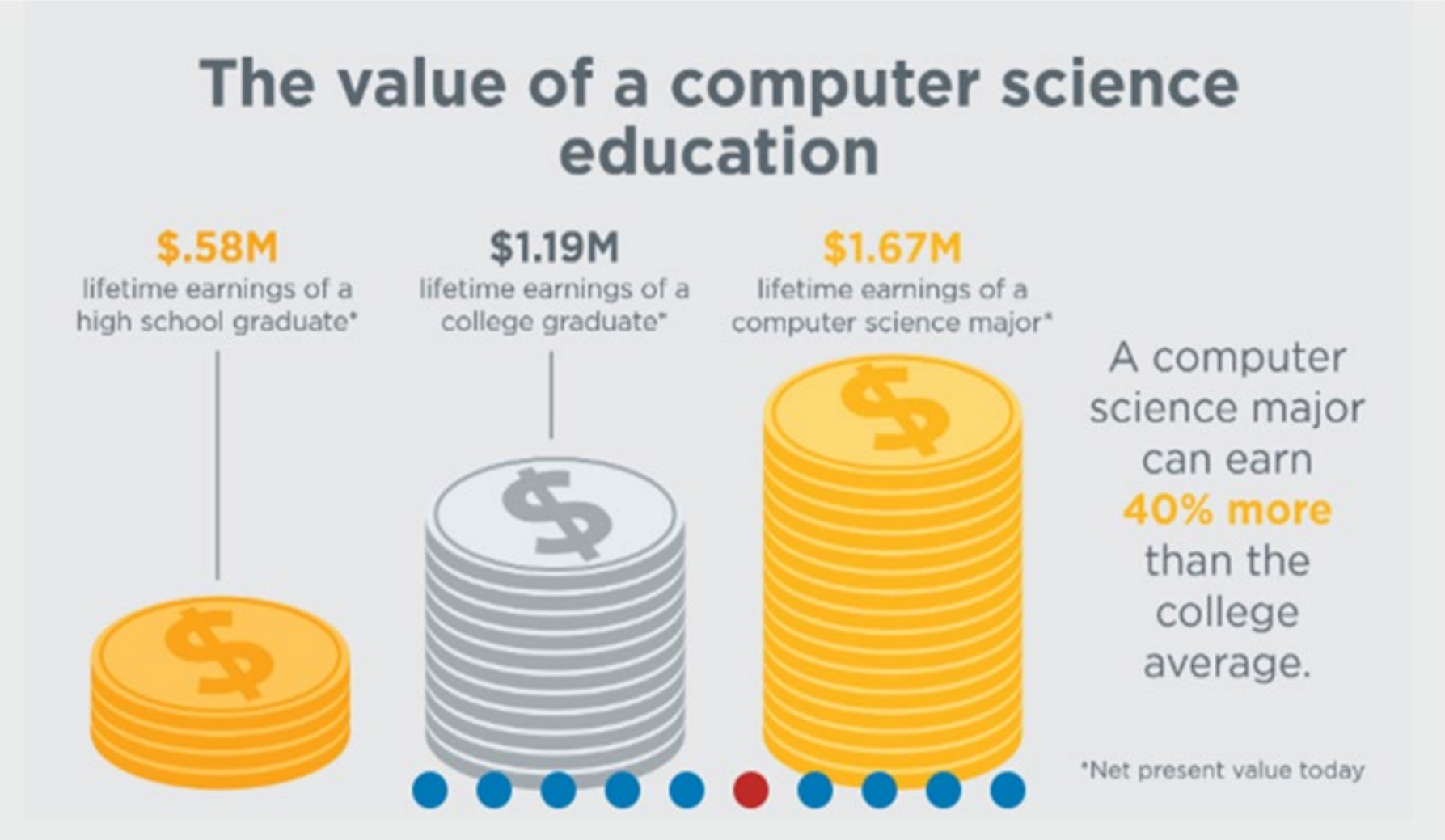
1,953
Computer science graduates

Policy Environment (**rubric**):

- ✓ Dedicated state funding for CS PD
- ✗ Does not require all high schools to offer CS
- ✓ K-12 CS curriculum standards

▼ AP Stats

- 37% of schools teach AP CS
- 3,407 AP CS exams were taken last year
- 24% of them were female
- 552 were underrepresented minorities


The value of a computer science education
$.58M
lifetime earnings of a high school graduate*
$1.19M
lifetime earnings of a college graduate*
$1.67M
lifetime earnings of a computer science major*
A computer science major can earn 40% more than the college average.
*Net present value today

What does equity look like in Springfield?

Construct a Universal Definition of What "ALL" Means

- What does equity mean for the RPP?
- What does equity mean for the students?
- What does equity mean for the Design Team members?
- What does equity mean for "all" teachers in the district?

• Professional Development provided throughout the year to create an understanding of what does equity mean for all aspects of this grant.

History of CS in Springfield

- Cohort Planning 16- 17
- Partnership with UMASS
- What is CS in Springfield? Define
- CS Planning Committee
- K, 3, and 7 integrated lessons 17-18

What is this work?

To implement new MA DLCS Standards in K-5 for ALL students

Digital Literacy and Computer Science (DLCS) Overview

The standards for Kindergarten to grade12 are organized by **grade span**: Kindergarten to grade 2, grade 3 to grade 5, grade 6 to grade 8, and grade 9 to grade 12. Within each grade span, standards are grouped in four **strands**: Computing and Society, Digital Tools and Collaboration, Computing Systems, and Computational Thinking. Each strand is further subdivided into **topics** comprised of related **standards**. Standards define performance expectations, as well as what students should know and be able to do. Standards from different strands or topics may sometimes be closely related. Standards in every grade span and strand demonstrate a range of cognitive complexity such as reflected in Bloom's Revised Taxonomy: remembering, understanding, applying, analyzing, evaluating, and creating.[1]

Vision

Digital Literacy and Computer Science (DLCS) knowledge, reasoning, and skills are essential both to prepare students for personal and civic efficacy in the twenty-first century and to prepare and inspire a much larger and more diverse number of students to pursue the innovative and creative careers of the future. The abilities to effectively use and create technology to solve complex problems are the new and essential literacy skills of the twenty-first century.

Learning Progression

Grade Spans	Strands			
	CAS: Computing and Society	**DTC: Digital Tools and Collaboration**	**CS: Computing Systems**	**CT: Computational Thinking**
K-2	a. Safety and Security b. Ethics and Laws c. Interpersonal and Societal Impact	a. Digital Tools b. Collaboration and Communication c. Research	a. Computing Devices b. Human and Computer Partnerships c. Networks d. Services	a. Abstraction b. Algorithms c. Data d. Programming and Development e. Modeling and Simulation
3-5				
6-8				
9-12				

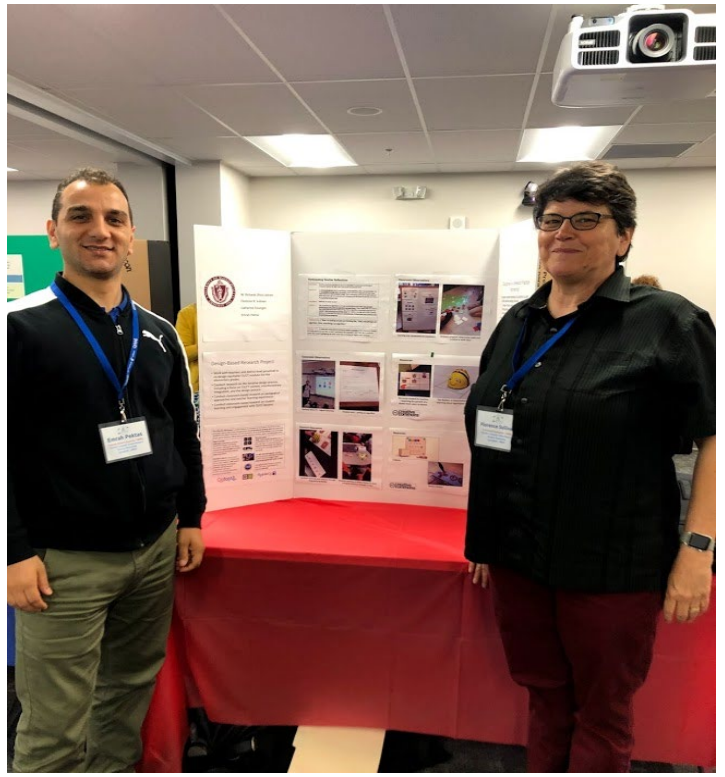
Practices: Connecting, Creating, Abstracting, Analyzing, Communicating, Collaborating, Research

With a particular focus on computing systems and computational thinking standards

Why these grade level?

- Grade Spans

What is a Research Practitioner Partnership (RPP)?



Partnership with UMASS

CSforAll RPP Grant from NSF

- National Science Foundation – Research Practitioner Partnership Grant for CS Education
  - $2 million grant awarded to UMass Amherst
    - Google providing an additional ~$120,000 in support
- Grant Objectives
  - Develop 16-24 CS/CT modules in each grade, K-5, that can be taught by an elementary homeroom teacher in the context of and alongside other content area standards
  - Implement CS/CT modules in all K-5 classrooms by providing PD to all elementary school teachers on CS/CT generally and teaching CS/CT modules specifically
  - Engage Design-Based Implementation Research Ensure that, at the end of four years, every student in K-5 in the Springfield Public Schools is taught every standard in the MA DLCS framework

University Based Press Releases

https://www.umass.edu/education/values/fostering-collaboration-among-teachers

https://www.cics.umass.edu/news/adrion-collaborators-receive-grant-bring-csforall-springfield-public-schools

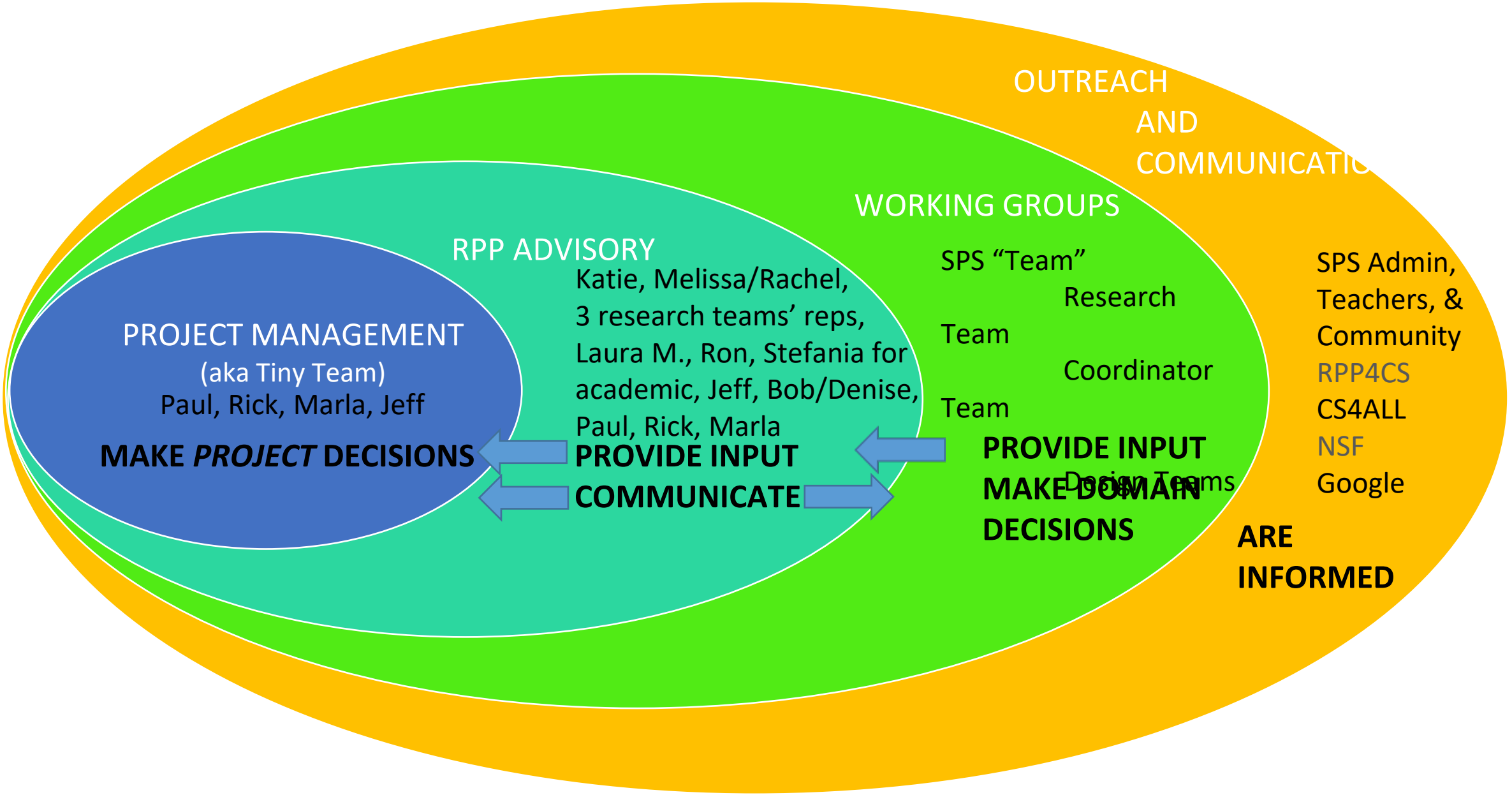
RPP, Administrator, and Teacher Roles

So What is an RPP?

Long-term, **mutually beneficial collaborations** that promote the production and use of rigorous research about problems of practice.

RPPs are intentionally organized, and hold promise for improving the **relevance** of the research produced, the **use** of research by organizations, and **outcomes** for youth.

Source: http://rpp.wtgrantfoundation.org/about


OUTREACH
AND
COMMUNICATIO
WORKING GROUPS
RPP ADVISORY
PROJECT MANAGEMENT
(aka Tiny Team)
Paul, Rick, Marla, Jeff
MAKE *PROJECT* DECISIONS
Katie, Melissa/Rachel,
3 research teams' reps,
Laura M., Ron, Stefania for
academic, Jeff, Bob/Denise,
Paul, Rick, Marla
PROVIDE INPUT
COMMUNICATE
SPS "Team"
Research
Team
Coordinator
Team
Design Teams
PROVIDE INPUT
MAKE DOMAIN
DECISIONS
SPS Admin,
Teachers, &
Community
RPP4CS
CS4ALL
NSF
Google
ARE
INFORMED

Project Management Team	• Manages the project's processes, responsible for making project decisions
RPP Advisory Team	• Provides input to project decisions, responsible for communicating between working groups and project management team
Working Groups	• Provide input to project decisions through reps on RPP Advisory, carry out specific project tasks per group, make decisions relevant to that task
Outreach & Communications	• Meetings and/or other forms of communication designed to keep stakeholders informed throughout the process

What research is supporting CSforAll in Springfield?

Role of PLCs in the Implementation of Computer Science Standards (Mazur and Woodland)

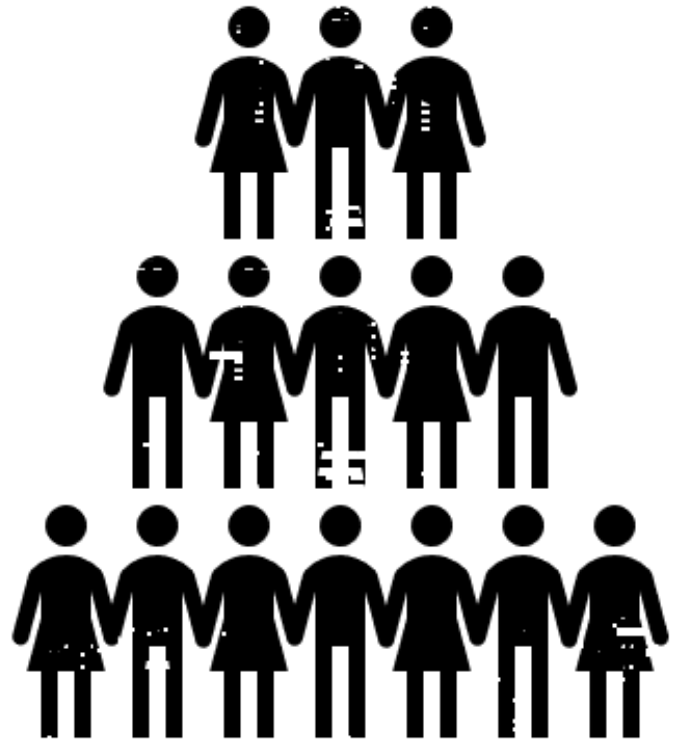
- Of what value are PLCs in the development of computer science curricula?
- What characteristics of PLCs produce high quality computer science lesson plans?
- What challenges and opportunities do teachers face as they work together to interpret computer science standards, and transform them into written and taught curricula?

Development of Computational Thinking Skills and Practices in Students (Sullivan and Adrion)

- How does student knowledge of computer science concepts and digital literacy change/grow as a result of engagement in DLCS lessons?
- How does student interest in digital learning and computational learning activities change/grow as a result of engagement in DLCS lessons?

Examining Barriers to and Opportunities for a Successful CSforAll Implementation (Branch and Veeragoudar-Harrell)

- What barriers and conduits can be identified in specific schools and communities to achieving CSforAll across the District?
- What characteristics of schools are obstacles to wide-scale dissemination?
- How do teacher/school incentives and disincentives to integrate CS, testing and teacher/administrator resistance to CS integration affect to wide-scale dissemination?



Coordinators 2019

Coordinators

Members: Katie Bevan, Rachel Chouinard, Laura Rita, Scott Wohlers, Melissa Zeitz
Team Chair: Katie Bevan
Frequency: 1.5 hours, 2x/month (every other week)
Purpose: The Coordination Team meets regularly in person to engage in dialogue about structures for teacher learning, evidence about the quality of teacher created lessons/modules, including written artifacts and observations of teaching, and about the quality of their collaborative processes. The team collaborates in order to:

- Ensure the creation and implementation of high-quality, equitable CT/CS lessons/modules,
- Establish a structure through which teachers access on-going support, guidance, and feedback from one another and the Coordinators about the development and implementation of high-quality, equitable CS/CT lesson modules,
- Positively influence students' perspectives and understandings of CS/CT, and
- Contribute to the development of a coherent Research-Practitioner Partnership.

Weekly Newsletter

In this issue:

- *Equity and Inclusion Training—RSVP*
- *Trifold Boards*
- *CSforALL Showcase*
- *Reminders*
- *Upcoming Dates*

You're Invited

Equity and Inclusion Training

June 11th, from 4:00 to 6:00pm at the PD Center.

If you are available, please join us as we further develop our knowledge and skill to prioritize equity in the implementation of computer science in the Springfield Public Schools.

We recognize this is a busy week and we would like you to prioritize attending one of the research focus groups on June 10th or June 13th.

Update: An Outlook invite was sent to all Design Team Teachers. Please RSVP

Trifold Board Delivery/Pickup Info

Please have boards ready by Wednesday, May 29th. This will allow us to have them set up for you on Thursday the 30th. Boards can be dropped off to the PD center on May 29th from 3:30-4:30. If you are unable to drop them off, arrangements can be made for them to be picked up. Please use the link below to tell us which method you would prefer.

http://bit.ly/CSforALL-TriFold

Reminders:

- *RSVP for Equity and Inclusion Training*
- *Use Bit-ly link to arrange drop off/pick up of trifold.*
- *If you need any tech support for piloting please reach out to Melissa Zeitz.*
- *All devices used throughout the modules will be available at the showcase for you to include in your display.*

Spread the Word!

CSforALL Showcase

Thursday, May 30th 4-6PM @ the PD Center

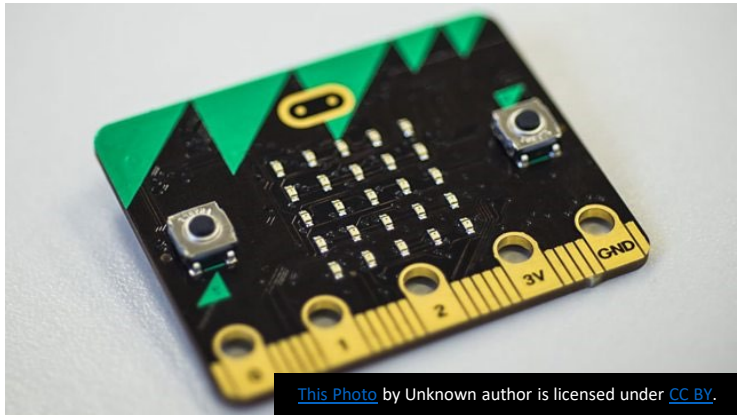
What are the deliverables for each design team?

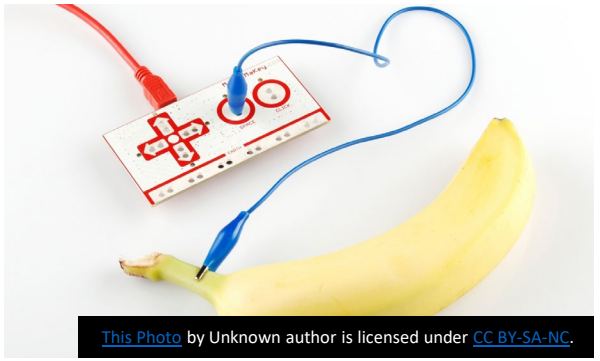
- Identification of standards to be covered in each grade level
  - With coordinators supporting vertical alignment
- Lesson modules that cover all CS/CT standards for each grade level
  - Detailed lesson plans that include scaffolding and differentiation strategies to ensure all students can access the content
- Piloting and refinement that results in lesson modules that have been taught and revised at least three times each
- Professional development of all grade level teachers on delivering lesson modules

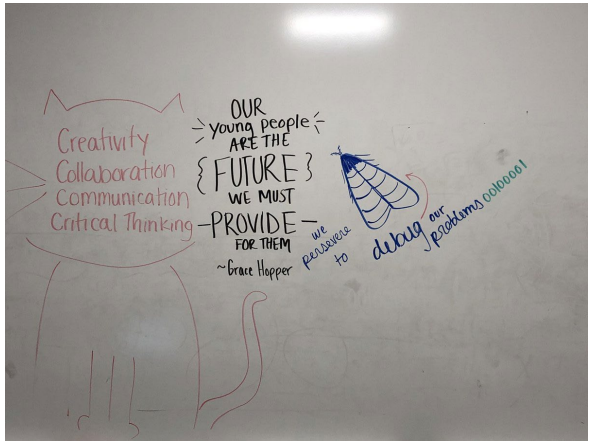
Design Team Members

Kindergarten and 3rd Grade Dyads

Professional Development







Launch CS
24 Hour Course

Springfield Designed PD 2019-2020

(Currently in the Planning Process)

Lesson Design

Breaking Down Standards

Grades 3 to 5: Computational Thinking [CT]

Abstraction [3-5.CT.a]

1. Use numbers or letters to represent information in another form (e.g., secret codes, Roman numerals, abbreviations).
2. Organize information in different ways to make it more useful/relevant (e.g., sorting, tables).
3. Make a list of sub-problems to consider, while addressing a larger problem.

Algorithms [3-5.CT.b]

1. Define an algorithm as a sequence of instructions that can be processed by a computer.
2. Recognize that different solutions exist for the same problem (or sub-problem).
3. Use logical reasoning to predict outcomes of an algorithm.
4. Individually and collaboratively create an algorithm to solve a problem (e.g., move a character/robot/person through a maze).
5. Detect and correct logical errors in various algorithms (e.g., written, mapped, live action, or digital).

Data [3-5.CT.c]

1. Describe examples of databases from everyday life (e.g., library catalogs, school records, telephone directories, contact lists).
2. Individually and collaboratively collect and manipulate data to answer a question using a variety of computing methods (e.g., sorting, totaling, averaging) and tools (such as a spreadsheet) to collect, organize, graph, and analyze data.

Programming and Development [3-5.CT.d]

1. Individually and collaboratively create, test, and modify a program in a graphical environment (e.g., block-based visual programming language).
2. Use arithmetic operators, conditionals, and repetition in programs.
3. Use interactive debugging to detect and correct simple program errors.
4. Recognize that programs need known starting values (e.g., set initial score to zero in a game).

Modeling and Simulation [3-5.CT.e]

1. Individually and collaboratively create a simple model of a system (e.g., water cycle, solar system) and explain what the model shows and does not show.
2. Identify the concepts, features, and behaviors illustrated by a simulation (e.g., object motion, weather, ecosystem, predator/prey) and those that were not included.
3. Individually and collaboratively, use data from a simulation to answer a question.

Kindergarten to Grade 2: Computational Thinking [CT]

Abstraction [K-2.CT.a]

1. List the attributes of a common object, for example, cars have a color, type (e.g., pickup, van, sedan), number of seats, etc.

Algorithms [K-2.CT.b]

1. Define an algorithm as a sequence of defined steps.
2. Create a simple algorithm, individually and collaboratively, without using computers to complete a task (e.g., making a sandwich, getting ready for school, checking a book out of the library).
3. Enact an algorithm using tangible materials (e.g., manipulatives, your body) or present the algorithm in a visual medium (e.g., storyboard).

Data [K-2.CT.c]

1. Identify different kinds of information (e.g., text, charts, graphs, numbers, pictures, audio, video, collections of objects.)
2. Identify, research, and collect information on a topic, issue, problem, or question using age-appropriate digital technologies.
3. Individually and collaboratively, propose a solution to a problem or question based on an analysis of information.
4. Individually and collaboratively, create information visualizations (e.g., charts, infographics).
5. Explain that computers can save information as data that can be stored, searched, retrieved, and deleted.

Programming and Development [K-2.CT.d]

1. Define a computer program as a set of commands created by people to do something.
2. Explain that computers only follow the program's instructions.
3. Individually or collaboratively, create a simple program using visual instructions or tools that do not require a textual programming language (e.g., "unplugged" programming activities, a block-based programming language).

Modeling and Simulation [K-2.CT.e]

1. Describe how models represent a real-life system (e.g., globe, map, solar system, digital elevation model, weather map).
2. Define simulation and identify the concepts illustrated by a simple simulation (e.g., growth and health, butterfly life cycle).

http://www.doe.mass.edu/frameworks/dlcs.pdf

Teacher-led lesson module design, piloting, and refinement

	18-19	19-20	20-21	21-22
K	Design	Implement		
1st		Design	Implement	
2nd			Design	Implement
3rd	Design	Implement		
4th		Design	Implement	
5th			Design	Implement

- Design teams of 8 teachers per grade level will create and pilot modules
- Special education and ESOL teachers will consult on meeting all students' needs
- 5 teachers hired as Coordinators

Lesson Plan Template

Authors: _____

Grade: _____ Content Area: _____

Lesson: _____ of _____

DLCS Standards: ▪	**Pacing:** *(Include content areas, units, and specific times of year) Which content area? What unit? What month would you see this in?* ▪
Content Standards: ▪	
Objectives/Goals: ▪	
Knowledge: *(Students should know…)* *Can be pulled from the UPGs, should connect the objectives and standards of the lesson* ▪	**Skills:** *(Students should be able to…)* *Can be pulled from the UPGs, should connect the objectives and standards of the lesson* ▪
Essential Questions: *(Can be specific to the lesson or overarching the entire module (can be found in the content area UPGS).)* ▪	
Vocabulary	**Resources Needed**

Lesson Piloting

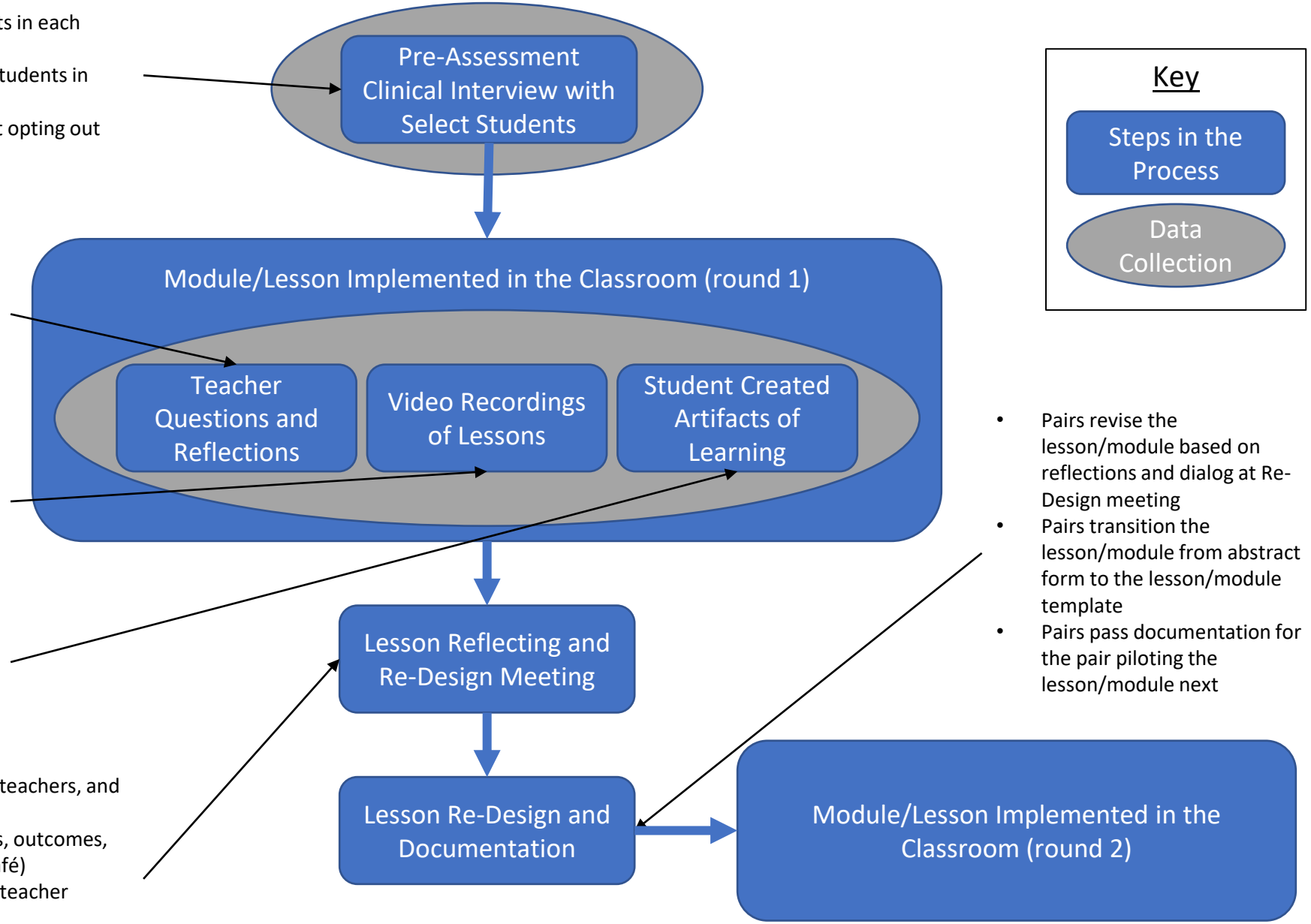
Module Progression – Kindergarten

Pair	Cycle 1 *December/January* *Create Modules, Pilot Modules, Feedback, Edit Modules*	Cycle 2 *February/March* *Pilot Modules, Feedback, Edit Modules*	Cycle 3 *April/May* *Pilot Modules, Feedback, Edit Modules*	Final Drafts *June*
Jaime Thomas & Victoria Long	Quarter 1	Quarter 2	Quarter 3	A *Jaime Thomas- Sumner* *Victoria Long*
Cheryl Elias-Ells School *Melissa Stenwick*	Quarter 2	Quarter 3	Quarter 4	B *Cheryl Elias* *Melissa Stenwick*
Aimee Baron- *Rebecca Johnson* *Jacklyn Stockhamer*	Quarter 3	Quarter 4	Quarter 1	C *Aimee Baron-Rebecca Johnson* *Jacklyn Stockhamer*
Jennifer Ross - Washington *Anne Marie Glasser*	Quarter 4	Quarter 1	Quarter2	D *Jennifer Ross -Washington* *Anne Marie Glasser*

Module Progression – Third Grade

Pair	Cycle 1 *December/January* *Create Modules, Pilot Modules, Feedback, Edit Modules*	Cycle 2 *February/March* *Pilot Modules, Feedback, Edit Modules*	Cycle 3 *April/May* *Pilot Modules, Feedback, Edit Modules*	**Final Drafts** *June*
Sarah Inskeep-Mueller *Stephanie Parent*	Quarter 1	Quarter 2	Quarter 3	A *Sarah Inskeep-Mueller* *Stephanie Parent*
Liam Bevan *Jillian Cook*	Quarter 2	Quarter 3	Quarter 4	B *Liam Bevan* *Jillian Cook*
Danalyn Haynes *Emma Bartlett*	Quarter 3	Quarter 4	Quarter 1	C *Danalyn Haynes* *Emma Bartlett*
David Casali *Sheena Morris*	Quarter 4	Quarter 1	Quarter2	D *David Casali* *Sheena Morris*

- Interviews, up to 10-15 minutes, with 8-12 students in each participating grade level (K and 3)
- Opt-out forms (passive consent) sent home to all students in class
- Students selected randomly from among those not opting out



- Teacher identifies one or two key questions about delivering the lesson prior to implementation
- Teacher reflects and takes notes on questions and process/outcomes of lesson shortly after implementation

- Researchers (from Umass) record lesson pilots, if the teacher is willing
- Students without signed media releases participate in lesson, but are not recorded
- Teacher has the opportunity to review and identify key segments of videos for sharing

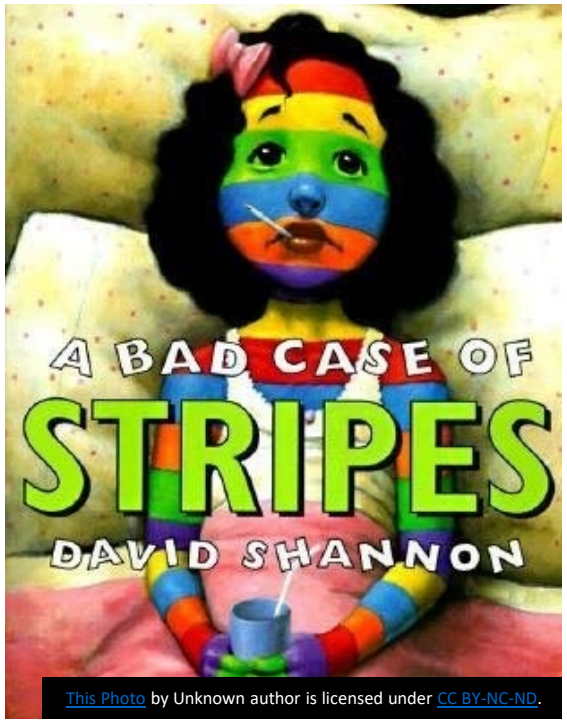
- Physical or digital artifacts or products (assignments, assessments, projects, etc.) or student work, that demonstrate learning, are collected

- Coordinators, 8 member design teams, consulting teachers, and researchers participate together
- Each pair (dyad) shares reflections on pilot process, outcomes, and lessons learned via protocol (such as World Café)
- Reflections can draw on clips of classroom videos, teacher reflections, and student artifacts
- Reflections are discussed along side options and ideas for refining and enhancing lessons/modules

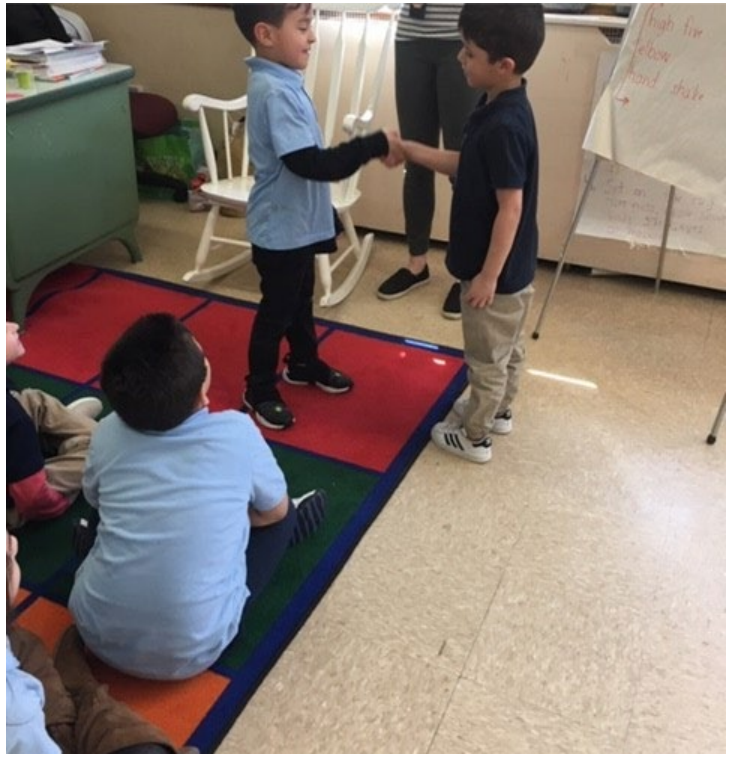
- Pairs revise the lesson/module based on reflections and dialog at Re-Design meeting
- Pairs transition the lesson/module from abstract form to the lesson/module template
- Pairs pass documentation for the pair piloting the lesson/module next

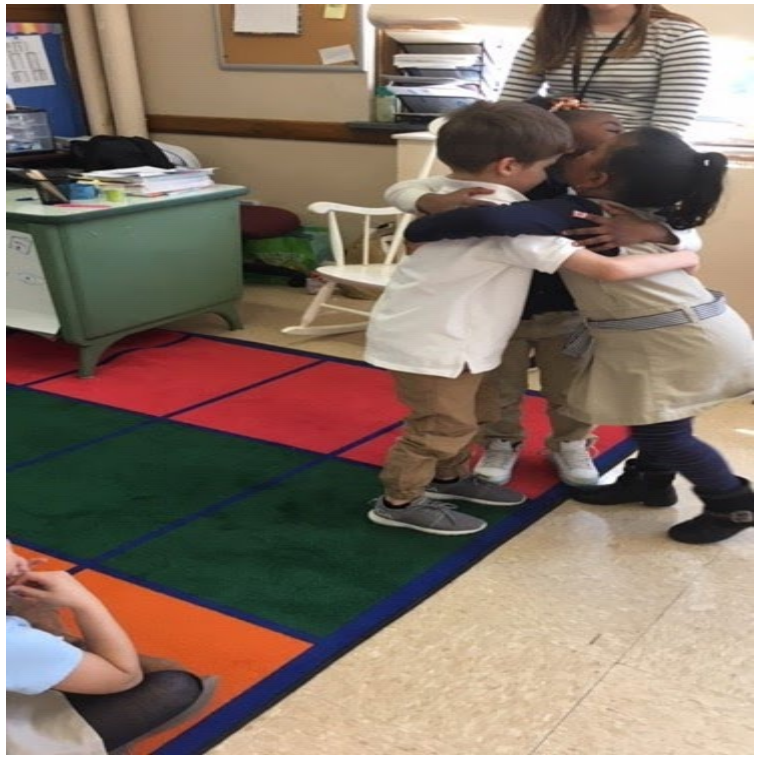
Reflections on Lessons

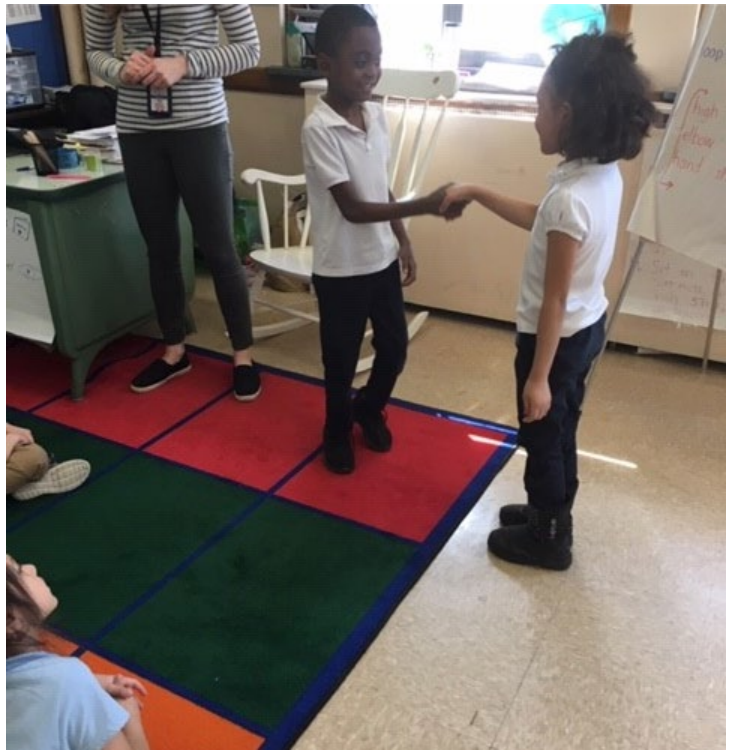
- Dyads
- Researchers
- Coordinators
- Administrators



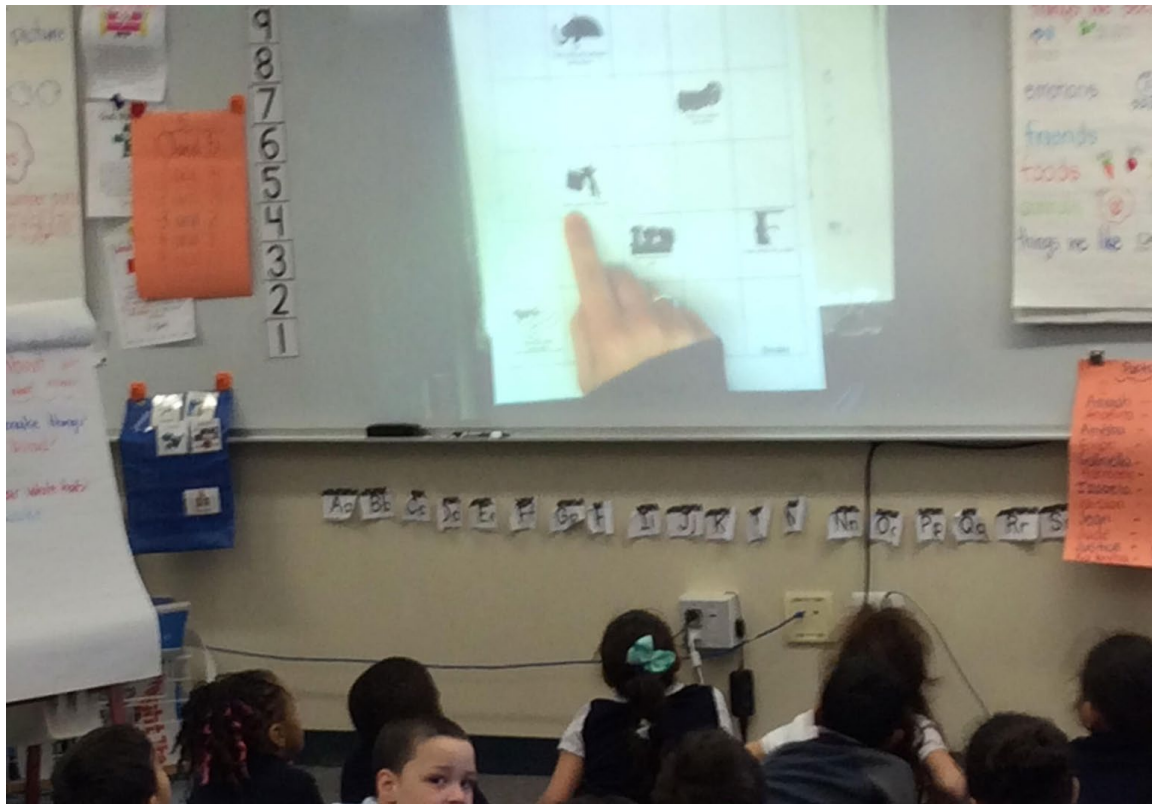
K and 3 Computer Science Integrated Lessons







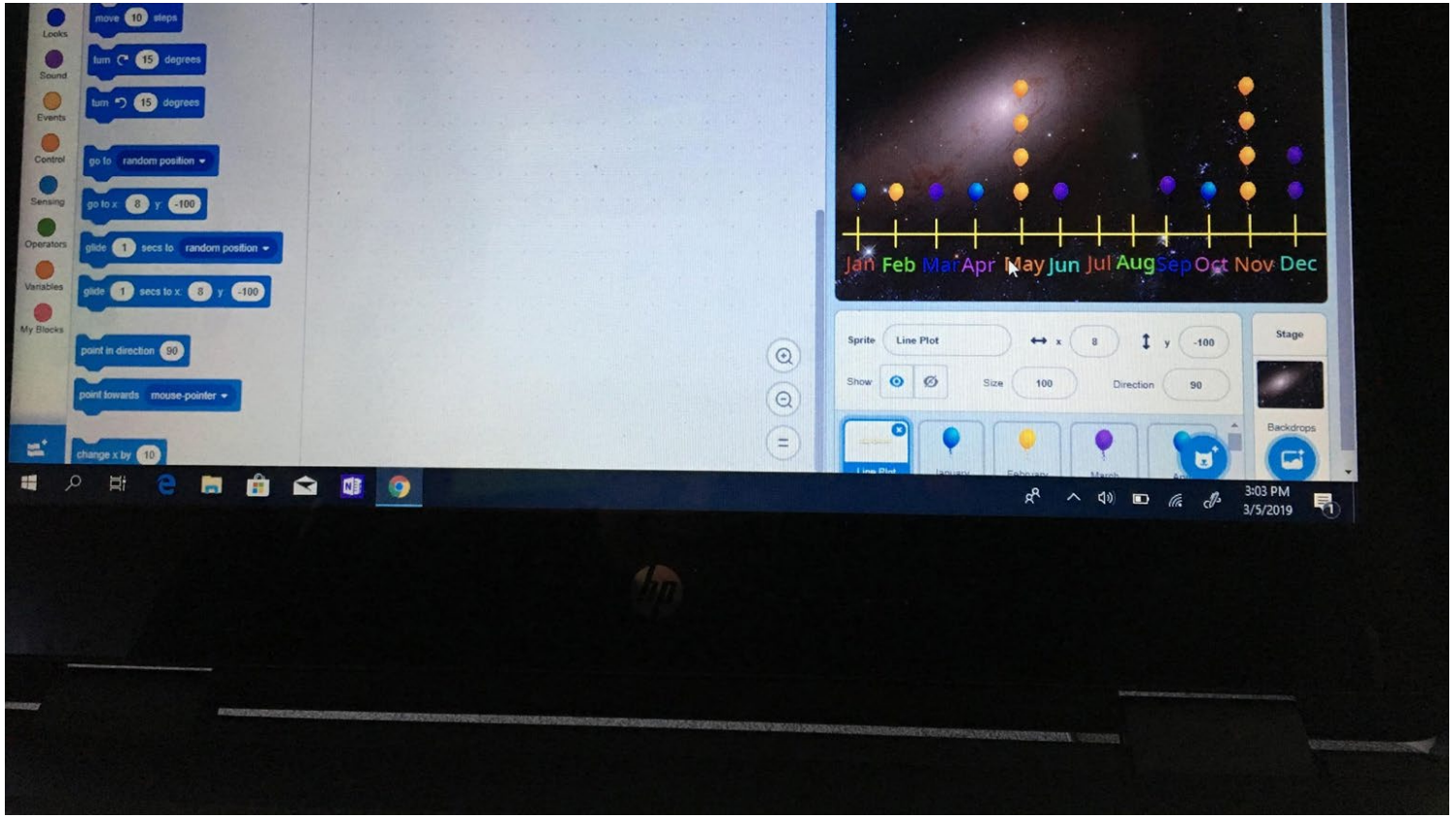
Algorithms and Loops in Kindergarten



Kindergarten

Third Grade Quarter 4 Module Sample

Coding in Scratch.mit.edu https://scratch.mit.edu/studios/5861114/



Lessons Learned

Changes throughout the year

- Calendar that maps out the year
- Weekly newsletter
- In-House Professional Development for future Dyads
- Equity Training

Feedback on Pilot

Who gives the feedback?

- Department Chairs
- Coordinators
- Other Dyad Teams
- Video Observation
- RPP

Feedback Protocol for Dyad Feedback

Instructions:

- *Take 5 minutes to read through the questions below and think about their answers for your module and the module you piloted. (This should be done independently and silently.)*
- *Take 2 minutes to assign roles in your small group. (time keeper, notetaker, and 2 reporters).*

In the next 20 minutes discuss the answers to the following questions.
The notetaker will type notes into the shared document that was emailed to Design Team Members.
All participants have access to the shared document and are welcome to contribute to the document.
Please take detailed notes. These notes will help Design Team Teachers complete the third iteration of the module template.
The remaining 8 minutes will allow for teams to share out to the group.

Questions:

For whom did the lesson not work?

Which students found the module difficult?

What parts of the module were the most difficult?

What changes did you make (if any) to help your students over these hurdles?

For whom did it work?

Which students were successful in completing the work?

What parts of the module were students most successful?

Did you make any changes for students who were successful in order to challenge them?

What did you do to differentiate for different learners or context?

Crafting

Composing Meaning

Processing

What other feedback can you provide to help the authors complete the third iteration of the lesson plan template?

What questions came up during piloting?

Did the pacing match appropriately?

Did you feel prepared to pilot the lessons as written?

Any other feedback.

Showcase of all Modules Written in Year 1

Attendees

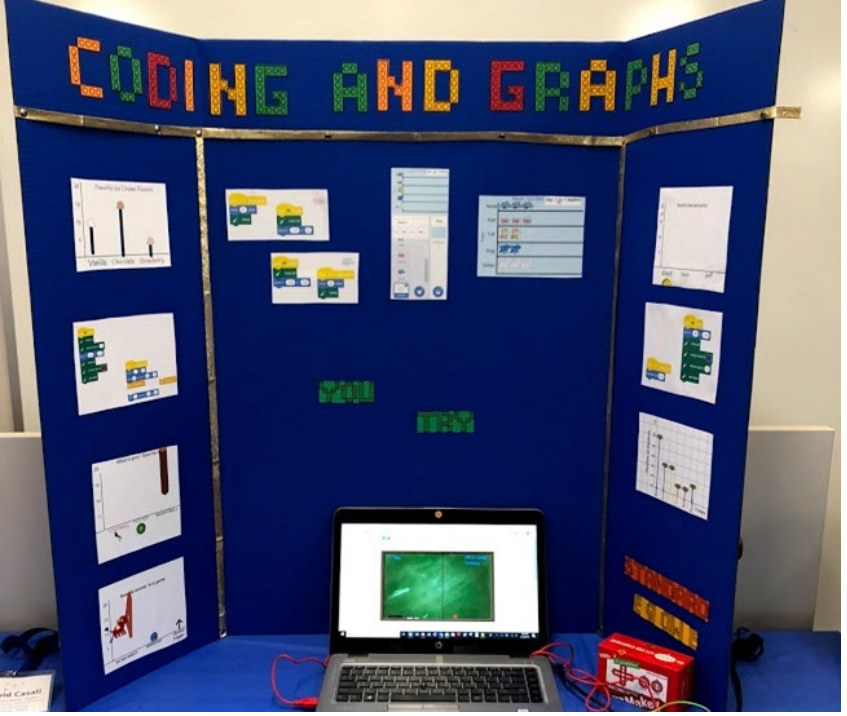
District Leaders

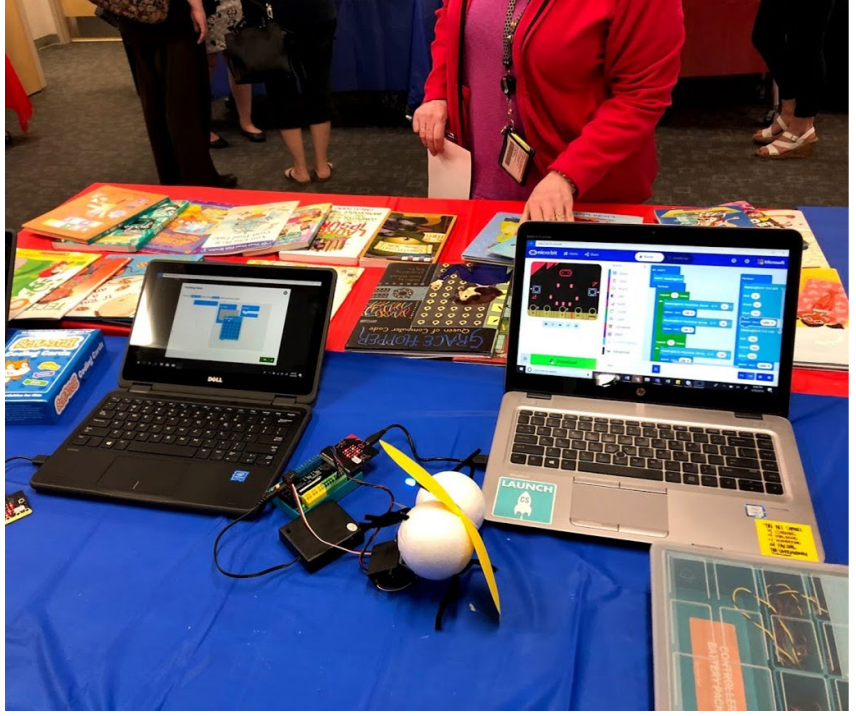
Principals

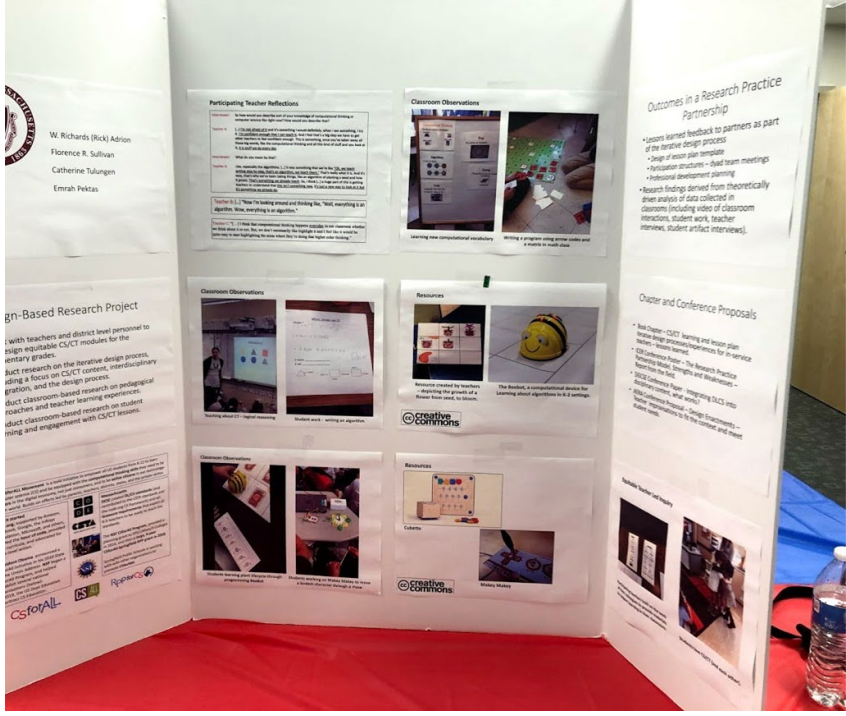
Teachers

Advertisement for Showcase

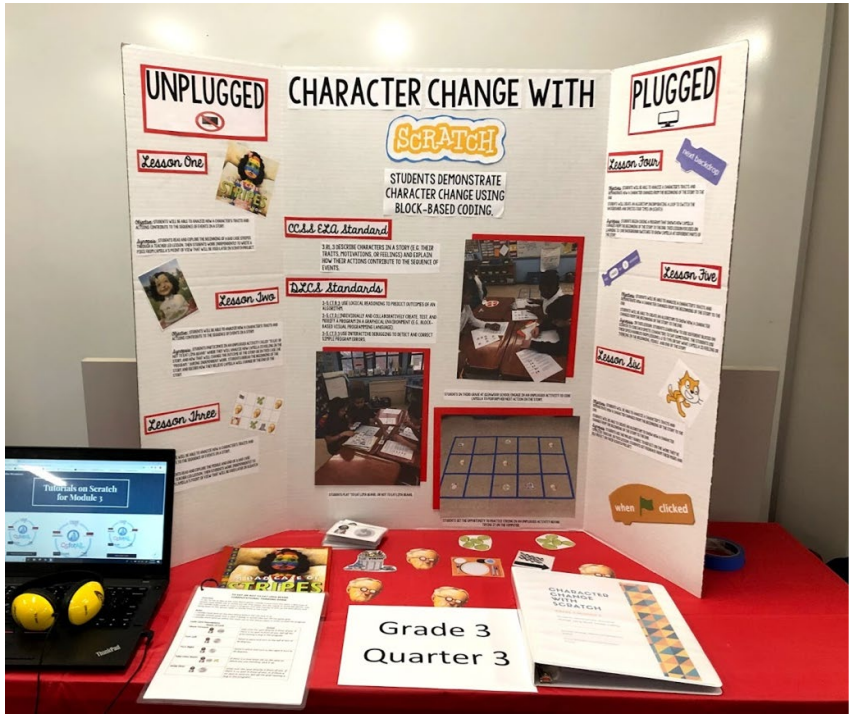
- Yammer
- Podcast
- Flyers to the entire district
- Personal Letters to Principals
- Social Media

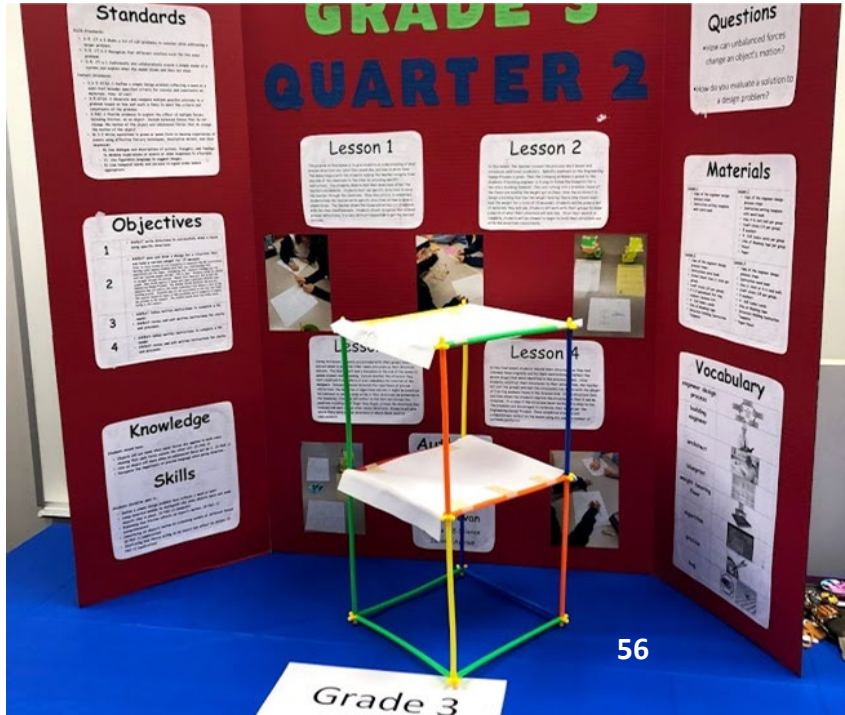

CODING AND GRAPHS


LAUNCH

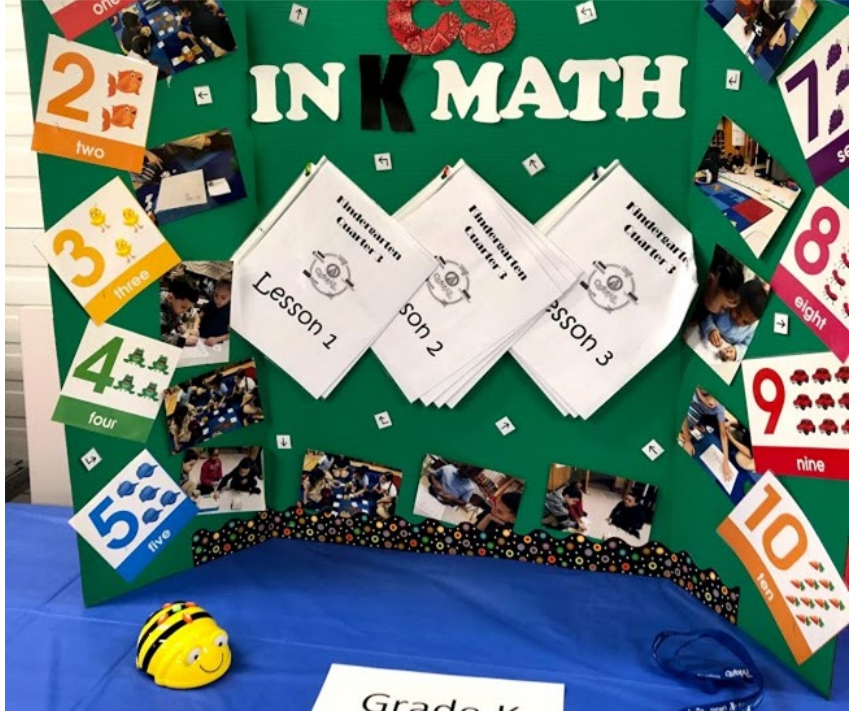

W. Richards (Rick) Adrion
Florence R. Sullivan
Catherine Tulungen
Emrah Pektas
Participating Teacher Reflections
Classroom Observations
Outcomes in a Research Practice Partnership
Chapter and Conference Proposals
creative commons


If I were a Wizard


UNPLUGGED
CHARACTER CHANGE WITH
SCRATCH
PLUGGED
STUDENTS DEMONSTRATE CHARACTER CHANGE USING BLOCK-BASED CODING.
Lesson One
Lesson Two
Lesson Three
Lesson Four
Lesson Five
Lesson Six
CCSS ELA Standard
DTCS Standards
Tutorials on Scratch for Module 3
Grade 3
Quarter 3

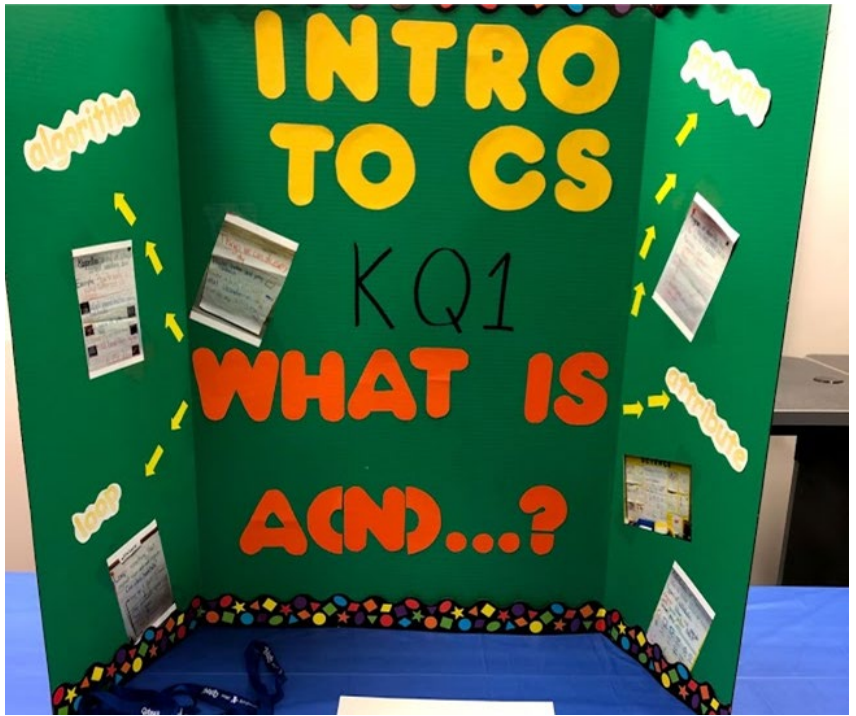

GRADE 3
QUARTER 2
Standards
Questions
Lesson 1
Lesson 2
Lesson 4
Materials
Objectives
Vocabulary
Knowledge
Skills
Grade 3

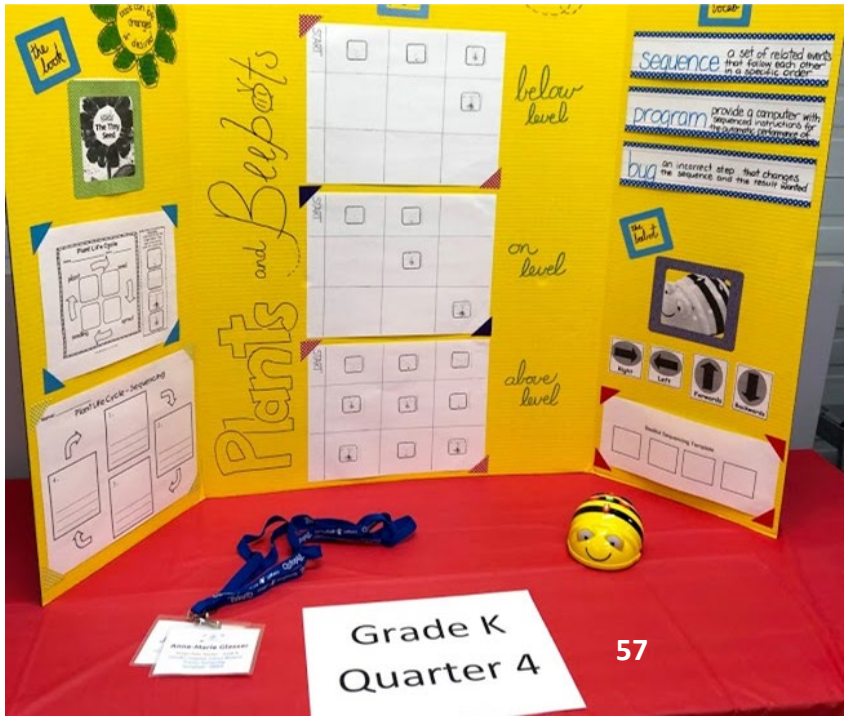

Design
Feedbac
Lesson
Module Hand off
Piloting


IN K MATH
Lesson 1
2 two
3 three
4 four
5 five
9 nine
10 ten


snow pants
boots
coat
scarf
hat
mittens
Grade K
Quarter 2


Grade 3
Quarter 1


INTRO
TO CS
KQ1
WHAT IS
A(N)...?
algorithm
loop
conditional


Plants and Beebots
sequence
program
bug
below level
on level
above level
Grade K
Quarter 4

Recruitment

How did we recruit teachers?

- Personalized email to Principals and Chief Schools Officers
- Visits to the schools to speak with principals and teachers
- Showcase Fair
- Recruitment letter emailed to the entire district
- Recruitment announcements at leadership meetings, Zone meetings

Next Four Years

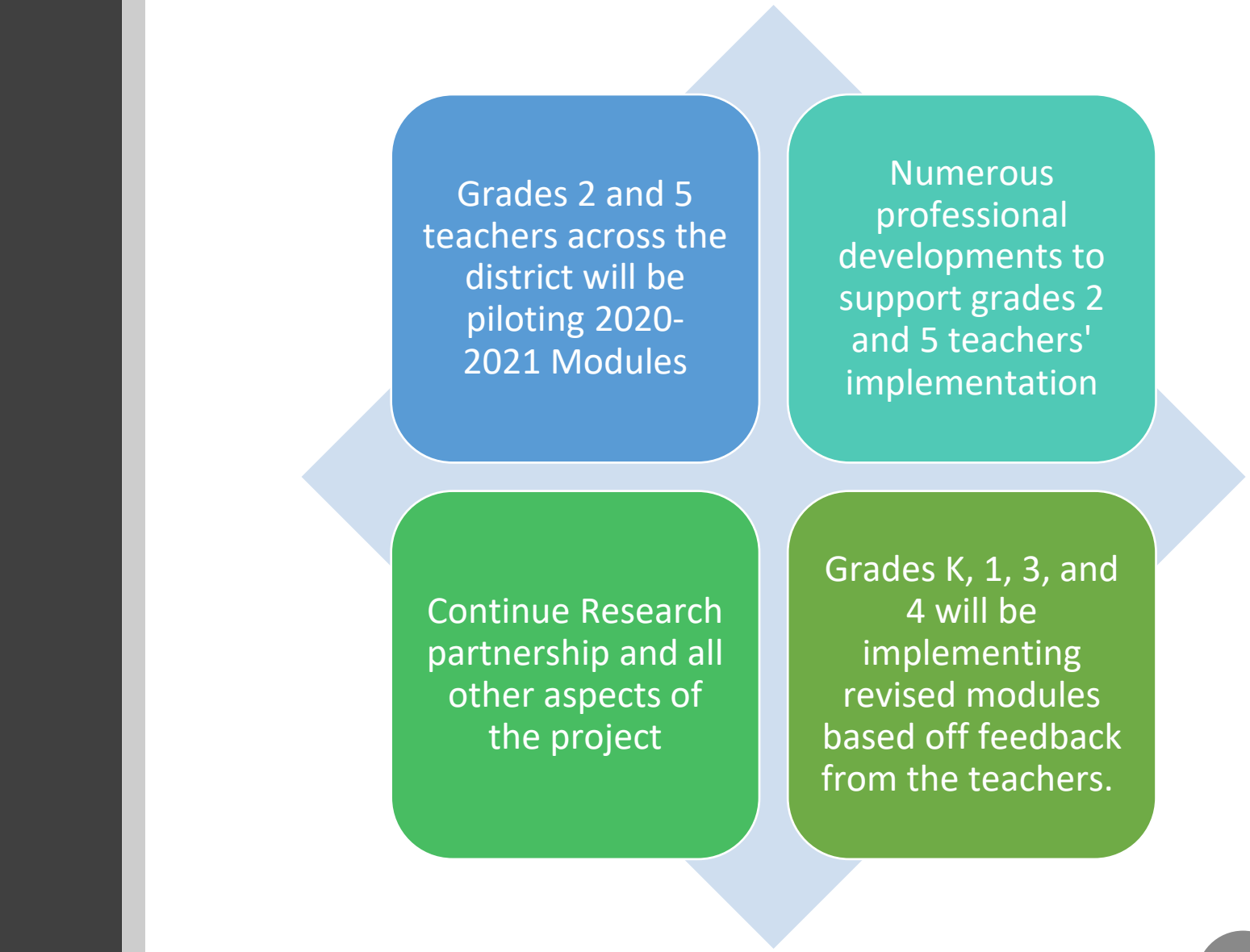
Next Steps for 2019-2020

- Grades 1 and 4 will begin writing lessons 2019-2020
- Grades 1 and 4 will go through a similar process that last years dyads went through.
- Grades K and 3 teachers across the district will be piloting 2018-2019 Draft Modules
- Numerous professional developments to support K and 3 teachers' implementation
- Continue Research partnership and all other aspects of the project
- Leadership training for all coordinators

Next Steps for 2020-2021

- Grades 2 and 5 will begin writing lessons 2020-2021
- Grades 2 and 5 will go through a similar process that last year's dyads went through.
- Grades 1 and 4 teachers across the district will be piloting 2019-2020 Modules
- Numerous professional developments to support 1 and 4 teachers' implementation
- Continue Research partnership and all other aspects of the project
- Grades K and 3 teachers will continue implementing revised modules.

Next Steps for 2021-2022



Next Steps for 2022-2023

Computer Science will be in all Elementary Schools integrated into the academic curriculum and taught by general education elementary teachers.