

SEPjr / CS4All

SEPjr Program Overview

Essential Question: What is Elementary School Computer Science?

Name:

Date:



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SEPjr Program Overview

In September 2015, Mayor Bill de Blasio announced the [Computer Science for All \(CS4All\)](#) Initiative, an initiative that will provide computer science (CS) education to every public school student by 2025. In an effort to support this goal in elementary schools, the CS4All team is proud to offer the [Software Engineering Program Jr.](#) (SEPjr), a comprehensive CS program for kindergarten through fifth-grade students that includes high-quality curriculum, training, and ongoing teacher and school leader support.

The goals of SEPjr are to **(1)** increase the number of elementary students, particularly from traditionally underrepresented groups who learn computer science, **(2)** develop students' computational thinking and problem-solving skills in real-world contexts, and **(3)** enable students to engage in computer science instruction in each year of elementary school. The SEPjr curriculum is designed to provide *all* students in the school with deep exposure to CS concepts and practices through a “sequence” of CS experiences that build on each other from year to year, thus offering a truly rich elementary school CS experience that exceeds the CS4All goal of a single meaningful unit.

How would you help your school reach the SEPjr goals?

What other goal(s) might you set for your school?

Requirements for Participation

Offer the Curriculum

- Provide on-going instruction of the Software Engineering Program Jr. (SEPjr) curriculum throughout the year at each grade level.
- Plan towards ensuring SEPjr participation by *all students* within 2 to 4 years, as described in detail below in 4.

Staff SEPjr (Year One)

- Provide at least five licensed teachers, including two at each grade band and one coverage teacher, to attend professional development sessions.
- Please note: Schools are encouraged to provide up to seven teachers, one at each grade level K-5 and a technology teacher.
- Dedicate an administrator as a point of contact for the program.

Implement CS Curriculum to Reach Student Outcomes

- SEPjr schools will be provided content and curriculum, as well as professional development materials, to help reach [student outcomes for Explorer and Creator Perspectives](#).
- SEPjr Teachers will learn how the content and curriculum aligns with the [New York State Computer Science and Digital Fluency Standards](#).
- SEPjr teachers are expected to attend all mandatory professional development (PD) sessions.

Commit to Providing SEPjr to *All* students

- SEPjr is designed for schools that are committed to planning towards ensuring *all* students - not just a select group - engage in the CS experiences made possible through the SEPjr curriculum.
- Each SEPjr school should reach “*full implementation*” of the program after 2 to 4 years, at which point *one or more units* of CS instruction is being provided to *all students* at *each grade level* (i.e. all new

students entering in grade K will receive one or more units of CS instruction *each year*). The curriculum is designed to support flexibility for schools in regards to which (and how many) units are taught in each grade.

- SEPjr schools are not expected to *initially* offer CS to every student or at every grade level (as outlined in the previous bullet), but *are* expected to acknowledge this expectation upfront and to plan and work towards “full implementation” within 2 to 4 years.
- Designate and support a team of teachers to serve as the “CS Team” for their school who help with:
 - Strengthening the culture around CS teaching and learning in the school
 - Recruiting and supporting any *additional* teachers who are necessary to provide SEPjr to all students

Support the Goals of SEPjr

- As outlined at the start of this document in the SEPjr Program Overview

How can you help your school meet the SEPjr requirements?

SEPjr Curriculum

The SEPjr Program identifies six different content areas for teaching computer science. Each content area offers a variety of units that allow teachers to create and implement a computer science curriculum that is tied directly to the student outcomes they have selected as well as meets their students' needs. Lessons include unplugged and online activities rooted in effective approaches to computer science education that engages all students.

Computer Science Content Areas

Introduction to Computer Science

The Introduction to Computer Science Units are designed to introduce elementary school students to academic concepts and practices of computer science as well as begin developing their computational thinking. In addition, students will have opportunities to communicate their ideas, collaborate and problem solve as they develop a better understanding of what it means to be a successful computer science student. **You Try Unplugged:** [Computers All Around Us](#)

Fundamentals of Computer Science

The Fundamentals of Computer Science units provide the opportunity for practical application of computational thinking and computer science practices and concepts. Computer science practices and concepts will include but are not limited to abstraction, algorithms, programming, data, debugging, prototyping, analyzing and communication. Addressing student developmental stages, there is greater emphasis on unplugged activities for early elementary and more open ended projects and problem solving for upper elementary. The units will work to develop additional skills important to computer science practices including creativity, collaboration, and persistence. **You Try Online:** [Programming w/ Angry Birds](#)

Robots & Robotics

Programmable robots provide students an opportunity to demonstrate understanding of computer science practices and concepts. Beginning with unplugged and app based activities students will move to programming physical robots. The unit activities include programming robots to complete mazes, obstacle courses, tell stories and navigate maps. students will demonstrate how to transfer what is learned through unplugged and app based puzzles to new programming environments while developing a greater understanding of the design process and prototyping. **You Try Unplugged:** [Have You Ever Seen A Robot?](#)

Project Based Learning

Beginning with a challenge, problem, or task, the Project Based Learning units will provide students an opportunity to integrate computational thinking and computer science practices into other content areas through digital storytelling, animation and game design. students will be given the opportunity to investigate, collaborate and create solutions while having an authentic experience of the design process. Through developing prototypes, students learn to test, debug, iterate and remix. Content connections can allow for integration of specific themes that are relevant and meaningful to the student. students will have an opportunity to present projects while building a better understanding and ability to communicate their ideas. **You Try Online:** [Tell A Story w/ Scratch](#)

Physical Computing

Physical computing provides students an opportunity to design, create and build physical devices such as game controllers, sensors and simple machines with micro-controllers, which they can then program specific applications as a solution to specific challenges. Students will be able to connect computer literacy skills to computer science while developing valuable practices such as creative, collaborative, communication and problem solving. **You Try Online:** [Flashing Heart](#)

Future Content Areas

In addition to the previously mentioned content areas The SEPjr Schools will have the opportunity to explore future topics related to the Internet, Networks, Cyber Security, Machine Learning and Artificial Intelligence (AI).

Approaches to Computer Science Education

Puzzle Based Activities and Tutorials

students learn to explore the concepts and practices through **a series of puzzle based activities and/or tutorials**. As they increase their skills students create artifacts and begin to build projects to demonstrate understanding. The units also work to develop additional skills important to computer science such as creativity, collaboration, and persistence. Activities may include but are not limited to, **Kodables, codeSpark Academy, Code.org CS Fundamentals, Tynker, Google's CS First, Pencil Code, and Code Monkey**.

Computational Media

Computational Media is computer science instruction that engages students in remixing and creating visual media using procedures on and off the computer. students learn the basics of how computers function using data, problem solving strategies, and how to use a visual programming language to create interactive, expressive projects. Every activity gives students time to work hands-on, personalize their work, and be creative while applying CS practices and concepts. Activities may include but are not limited to, **Hello Ruby, codeSpark Academy, Code.org CS Fundamentals, Scratch Jr., Creative Computing Guide, Google's CS First, Codesters, Pencil Code, Code Monkey and Kano**.

Physical Computing

Physical computing investigates computer-human interaction design that starts by considering how humans express themselves physically. students learn to explore communicating with and through computers using



microcontrollers & sensors, such as touch, motion, distance, light, and temperature. students will take a hands-on approach to demonstrate an understanding of computer systems, input-->processing-->output, through creating models, writing programs and prototyping how they relate to human expression. Activities may include but are not limited to, **Craft Computing**, **Hello Ruby: Journey Inside the Computer**, **The MaKey! MaKey!** and **Micro:Bit**.

What computer science curriculum is your school already using?

What instructional approaches are used in your school?

Student Outcomes

The [Student Outcomes](#) take into account the different perspectives students have as they deepen their understanding of the CS practices and concepts. For elementary schools, the Explorer and Creator Outcomes help to set clear expectations for students engaged in computer science. In addition, it provides concrete representation of what skills the students will have by the end of 2nd and 5th Grade. Based on a schools implementation plan, some students may begin to achieve Innovator and Citizen Outcomes. Through the student outcomes, and identifying what specific skills and sub-concepts are needed to reach them, SEPjr is working on kindergarten to 5th grade scope and sequence.

As an Explorer, I can...

Practices	Abstraction	Algorithms	Programming	Data	Networks
Analyze	give examples of specific patterns in something I can see, do or touch. 2 - Examining	describe more than one set of instructions that might complete a task. 2 - Examining	experiment with the commands of a programming language. 2 - Examining	provide examples of how sensors are used. 2 - Examining	identify the hardware used for computers to connect to the Internet. 2 - Examining
Prototype	describe different things I tried in order to achieve a goal. 2 - Imagining	explain why I used specific instructions to complete a task. 3 - Planning	explain why I chose specific commands to communicate my instructions. 3 - Planning	select a sensor among many to achieve a goal and explain why I chose that sensor. 2 - Imagining	explain the components of an Internet model that I made. 3 - Planning
Communicate	explain how I might help others identify patterns. 3 - Presenting	compare and contrast my instructions with other instructions that complete the same task. 4 - Discussing	discuss what can and cannot be done with a specific set of commands. 4 - Discussing	present potential uses of a sensor to others. 3 - Presenting	explain how information might travel over the hardware that connects us to the Internet. 2 - Explaining

As a Creator, I can...

Practices	Abstraction	Algorithms	Programming	Data	Networks
Analyze	describe how I might use patterns to express an idea. 2 - Examining	describe how instructions can have different outputs depending on inputs. 3 - Interpreting	describe three ways a development environment helps me create a project. 3 - Interpreting	explain how a sensor can allow the user to interact with my project. 2 - Examining	explain what markup languages are and the role they play in creating websites. 3 - Interpreting
Prototype	explain why I chose to include the specific components of my prototype over others. 3 - Planning	demonstrate the benefit of using an event, conditional or loop in my prototype. 3 - Planning	describe the changes I made after testing at least three parts of my program. 3 - Planning	describe at least three reasons I chose a specific sensor or dataset for my prototype. 3 - Planning	explain how I used at least three different markup tags to build a website. 3 - Planning
Communicate	explain why using patterns is necessary when creating with a computer. 3 - Presenting	compare and contrast how conditionals or loops were used in classmates' prototypes. 4 - Discussing	teach another person how to use a development environment and the basics of programming. 3 - Presenting	compare and contrast how sensors or datasets were used in classmates' projects. 2 - Explaining	present my thoughts, ideas, or interests through a website built using markup. 3 - Presenting

Implementation Plan

School Assessment

Before implementing the SEPjr Program schools should assess their current capacity to implement computer science education. Schools should take into account what teachers, resources, and hardware are available for teaching computer science. This will influence what units will be most successful and what additional resources may be needed.

Student Outcomes

Once a school has determined capacity for computer science education, schools should begin to map out what student outcomes will be taught during which grade level. The expectation being that Explorer Outcomes are reached by the end of 2nd Grade and Creator Outcomes by the end of 5th Grade.

Content Areas & Units

The school will select units aligned with the student outcomes selected for each grade level. Content areas may vary based on access to materials and resources. In addition, a combination of different content area units can be used to reach student outcomes.

Scheduling Options for CS Units

When scheduling class time for computer science it is important to be flexible and build off of the school's capacity to implement meaningful content. Schools implementing a sequence model can:

- Scheduled CS into the weekly schedule of a class. (minimum of twice a week)
- A combination of classroom and coverage/cluster teacher instruction.
- Supplement a CS unit or units in other content areas that allow for connections to CS concepts and practices.
- Integrated into other subject areas that offer connections between the CS concepts/practices and other subject areas.

Computer science is often taught in clubs or after school programs, however they are limited in the number of student participation and depth of understanding. Similar to events, such as CS Ed Week, clubs and after school programs should be seen as a way to support a computer science class and build school culture.

Year One Plan

- Initial Teacher Team (5 to 7 teachers)
- Attend all mandator PD sessions (40 to 60 hours)
- Teaches a minimum of two CS units within their own classrooms
- Teacher Team & Admin Identify one to two CS Leads
- Optional PD opportunities for interested teachers

Year Two Plan

- CS Leads and Initial Teacher Team provide in-house professional development to begin building school wide implementation
- Identifying where to start: grade band or level
- Teacher Team begins to plan & implement the school's sequence of CS Content
- Additional teachers attend PD opportunities provided by CS4All and partners

Year Three/Four Plan

- CS Leads and Teacher Team provide in-house professional development to continue building school wide implementation
- Identifying where to expand: grade band or level
- All classroom teachers are teaching content that aligns with the school's sequence of CS Content
- Additional teachers attend PD opportunities provided by CS4All and partners

What would be some first steps in your school implementation?

Professional Development

SEPjr Professional Development

SEPjr provides a number of professional development opportunities for schools participating in SEPjr. New cohort schools participate in a weeklong Summer Institute and five Saturdays sessions throughout the school year. In addition, all cohorts are invited to send additional teachers to four Saturday All Cohort sessions.

Other Opportunities

SEPjr schools are encouraged to send additional teachers, not part of the original teacher team, to attend other professional development opportunities provided by the CS4All Office and partners. These sessions may include but are not limited to CS First w/ Mouse, Code.org's CS Fundamentals, Creative Computing w/ BrainPop and Wonder Workshop. Schools are also asked to designate one to two teachers as PD Leads to help run and support professional development within the schools.

Online Learning

Teachers will also have an opportunity to participate in self-paced learning opportunities online offered through the [CS4All Blueprint](#) or from partners such as MIT Media Lab's Learning Creative Learning, Google's Computational Thinking for teachers, codeSpark w/ Launch CS, Wonder Workshop and Code.org's Teaching Computer Science Fundamentals.

School Visits

Schools will be visited at least once during the first year with the SEPjr Program. These visits are designed to help improve the SEPjr Program and identify how CS4All can better support the schools implementation plan. Additional visits will be scheduled based on a school's needs and special events.

Who would coordinate your school's professional development?

Additional Resources

CS4All Blueprint

Schools and teachers can access additional resources around New York City's Computer Science for All Initiative, including a breakdown of the perspectives, practices and concepts, the citywide curriculum catalog, and educator resources. The educator resources include strategies, recommendations and video tutorials.

SEPjr Google Site

Schools and teachers can access all SEPjr materials and resources needed to implement an elementary school computer science program. In addition, the Google Site will provide important dates, announcements, and resources for school events.

School Communications

Teachers and Administrators will receive bi-weekly emails providing information, updates, and opportunities for SEPjr Schools. In addition, teachers are encouraged to participate in social media and the CS4All Slack Community.

What other resources would be useful for your school?

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