

Unplugged lessons and resources complete list

Type	Category	Concept	Grade	Time (mins)	Name	Source	Description
Lesson	Coding	Abstraction	4+	50+	Mad glibs	Abstraction with Mad Glibs	Abstraction is one of the most important skills for a computer scientist to understand. It simplifies problems and prevents unnecessary repetition. A good coder uses abstraction just about every time she creates a program. This activity will have your students analyze stories for differences so that they can abstract them away.
Lesson	Coding	Algorithms	.K+	10-15+	Peanut butter and jelly robot	Peanut Butter and Jelly Robot Howtosmile	This is an activity about robotics programming. Learners will discover how precise programmers have to be as they instruct a friend to make a peanut butter and jelly sandwich. This is a great activity for both the "programmer" and the "robot" to use their creativity to its fullest.
Lesson	Coding	Algorithms	.K+	45+	Happy maps	Happy Maps	At the root of all computer science is something called an algorithm. The word "algorithm" may sound like something complicated, but really it's just a list of instructions that someone can follow to achieve a result.
Lesson	Coding	Algorithms	.K+	50+	Move it, move it	Move It, Move It	This lesson will help students realize that in order to give clear instructions, they need a common language. Students will practice controlling one another using a simple combination of hand gestures.
Lesson	Coding	Algorithms	.K+	50+	Real life algorithms: Plant a seed	Real-Life Algorithms Plant a Seed	In this lesson, students will relate the concept of algorithms back to everyday real-life activities by planting an actual seed. The goal here is to start building the skills to translate real-world situations to online scenarios and vice versa.
Lesson	Coding	Algorithms	.K+	NA	How to train your robot	https://drtechniko.com/2012/04/09/how-to-	The game works as follows: every kid is turned into a "robot master" and their mom or dad becomes their "robot". I give each kid a "Robot Language Dictionary" and explain to them that this is the language their robot understands. The dictionary has symbols for "move left leg forward", "turn left", "grab", "drop" etc.
Lesson	Coding	Algorithms	.K+	NA	Human crane	http://code-it.co.uk/wp-content/uploads/20	A lesson where kids create and test crane algorithms that move blocks from one bowl to another.
Lesson	Coding	Algorithms	2+	10-15+	Sentence checker algorithm	Grammar Algorithms – code-it supported by	An activity to reinforce grammar rules using computing science concepts. This could be used as a homework activity or as an alternative strategy within a literacy lesson. Pupils convert sentence grammar rules into a flowchart algorithm they can use to check their sentences.
Lesson	Coding	Algorithms	2+	30+	The poor cartographer	http://csunplugged.org/graph-colouring/	Coloring a map (which is equivalent to a graph) sounds like a simple task, but in computer science this problem epitomizes a major area of research looking for solutions to problems that are easy to make up, but seem to require an intractable amount of time to solve. This activity introduces graph colouring, and leads on to many variations and extensions that reach the cutting edge of computer science.
Lesson	Coding	Algorithms	2+	45-50+	fuzzFamily Frenzy (Beginner)	https://www.kodable.com/hour-of-code/less	A beginner unplugged lesson on using algorithms to move a "robot" (coder) around a path
Lesson	Coding	Algorithms	2+	NA	Getting up	Getting Up – code-it supported by HIAS, Har	Writing an algorithm (accurate sequence of instructions to achieve a goal) focussed around getting up and getting to school, using Microsoft Publisher as the recording medium. Although this can be done on paper, pupils make so many mistakes that easy editing and rearranging is of real value.
Lesson	Coding	Algorithms	3+	10+	Emotional robot video	3. Programming unplugged: learning program	This activity aims to show that the future of human-computer interaction is not about keyboards and mice. In the future computers will be able to understand the subtleties of human-human interaction. We focus here on the way we react to facial expressions and tone of voice. It also demonstrates that a robot "brain" based on a neural network can learn human-like behaviour in the form of emotions.
Lesson	Coding	Algorithms	3+	45-50+	fuzzFamily Frenzy (Beginner)	https://www.kodable.com/hour-of-code/less	A beginner unplugged lesson on using algorithms to move a "robot" (coder) around a path.
Lesson	Coding	Algorithms	3+	50+	Graph paper programming	Graph Paper Programming	By "programming" one another to draw pictures, students will begin to understand what programming is really about. The class will begin by having students instruct each other to color squares in on graph paper in an effort to reproduce an existing picture.
Lesson	Coding	Algorithms	3+	50+	Real life algorithms: Paper planes	Real-Life Algorithms Paper Airplanes	In this lesson, students will relate the concept of algorithms back to everyday real-life activities by making paper airplanes. The goal here is to start building the skills to translate real-world situations to online scenarios and vice versa.

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Lesson	Coding	Algorithms	4+	50+	Create-a-face: Programming an emotional robot	3. Programming unplugged: learning program	This is an exploration of affective computing, which relates to moods and emotions. The class make an affective (relating to moods and emotions) robot face out of card, tubes and themselves. It is programmed to react to different kinds of sounds (nasty, nice or sudden) and show different emotions (sad, happy, surprised). The class then think up some other facial expressions and program sets of rules to make the face respond to sounds with new expressions.
Lesson	Coding	Algorithms	4+	50+	Dice race	Dice Race	In this lesson, students will relate the concept of algorithms back to everyday real-life activities by playing the Dice Race game. The goal here is to start building the skills to translate real-world situations to online scenarios and vice versa.
Lesson	Coding	Algorithms	5+	45-50+	fuzzFamily Frenzy (Beginner)	https://www.kodable.com/hour-of-code/less	A beginner unplugged lesson on using algorithms to move a "robot" (coder) around a path.
Lesson	Coding	Algorithms	5+	50+	Tangrams	Algorithms Tangrams	This lesson shows us something important about algorithms. If you keep an algorithm simple there are lots of ways to use it. If you want to make sure everyone ends up with the same thing, then your algorithm needs more detail.
Lesson	Coding	Algorithms	NA	15+	The robots game	On Food and Coding: The Robots Game	This is a race game played by two teams. The winning team is the first to get all their "robots" from the start to the finish and off the board. (Note: the winner is the first team to get all their robots off the board, not just the first one.)
Lesson	Coding	Algorithms	NA	NA	Algorithms	Algorithms	Some activitis for introducing algorithms.
Lesson	Coding	Algorithms	NA	NA	Exchange sort investigation	Exchange Sort Investigation	In this module pupils investigate all the possible ways of comparing two cards in a list such as starting with the end cards and working into the centre or comparing pairs next to each other starting on the right of the list. They then move on to test which patterns can be turned into Exchange sorts.
Lesson	Coding	Algorithms	NA	NA	Jam sandwich algorithm	Jam Sandwich Algorithm	Create an algorithm (a precise set of instructions or rules to achieve an outcome or solve a problem) to instruct a pretend robot (teacher) to make a jam sandwich. One of the steps towards writing a good algorithm, that can be converted into code, is precision. Precision doesn't come naturally to most humans. Another computational thinking skill is evaluation in this case is my algorithm fit for purpose. The robot teacher interpretation of their algorithm helps pupils to evaluate its effectiveness and make changes if needed. Is it an algorithm or is it coding though, who cares its lots of fun!
Lesson	Coding	Algorithms	NA	NA	Obstacle course robot	https://playgroundcomputing.files.wordpress	Using algorithms to navigate a human "robot" through an obstacle course.
Lesson	Coding	Algorithms	NA	NA	Playground games algorithm	Playground Games Flowchart Algorithm	Pupils learn how to use a flow chart by trying to work out what playground game it describes. This is a great introduction to flow charts as pupils need to use them purposefully before they can write their own. Pupils then go on to trying to work out what is wrong with the bugged version of the chart.
Lesson	Coding	Algorithms	NA	NA	Spelling algorithms	Spelling Algorithms – code-it supported by H	Short spelling algorithm activities.
Lesson	Coding	Computaional thinking	5+	45-60+	Computational thinking with monsters	Computational Thinking	With nothing but paper and markers, students will learn the four steps of computational thinking. After a brief introduction, students should be split into groups where they will have to create directions for other students to draw a specific monster (from a catalog of pre-selected monsters).
Lesson	Coding	Computaional thinking	5+	55+	Computational thinking	Computational Thinking	For this activity, no instructions are provided. Instead, students will use examples of what imaginary players have done to figure out how to play the game. This lesson gives students the opportunity to practice the four arts of computational thinking (decomposition, pattern matching, abstraction, and algorithms) in one cohesive activity.
Lesson	Coding	Conditionals	4+	60+	Conditionals with cards	Conditionals with Cards	We don't always know ahead of time what things will be like when we run our computer programs. Different users have different needs, and sometimes you will want to do something based off of one user's need that you don't want to do with someone else.

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Lesson	Coding	Conditionals	5+	30-40+	The Imp computer	3. Programming unplugged: learning program	You compile simple programs that involve if statements on to a computer made of student ropes tied together. Each student represents an instruction. A baton represents the flow of control. It is passed to the first student who carries out their instruction before passing it on. When it is returned the program has been executed and the appropriate result has appeared on the screen. This makes the program execution both visible and tangible allowing a variety of concepts to be explained and discussed.
Lesson	Coding	Conditionals	NA	NA	If-Then Backyard Coding Game for Kids	If-Then Backyard Coding Game for Kids	Today we're talking coding and I had one goal in mind. Help kids learn to code with no expensive equipment. No computer, no tablet, no apps, just their bodies and their mind. So we're starting with one of the most basic parts of computer programming, the If Then statement and turning it into a fun and active game. It's an If-Then Backyard Coding Game for Kids. This post contains affiliate links.
Lesson	Coding	Conditionals	NA	NA	Robotic board game	Robotic Board game	A board game for reinforcing if/else statements.
Lesson	Coding	Debugging	.K+	55+	Building a foundation (persistence)	Building a Foundation	New and unsolved problems are often pretty hard. If we want to have any chance of making something creative, useful, and clever, then we need to be willing to attack hard problems. This lesson teaches that failure is not the end of a journey, but a hint for how to succeed.
Lesson	Coding	Debugging	3+	55+	Relay programming	Relay Programming	This activity will begin with a short review of Graph Paper Programming, then will quickly move to a race against the clock, as students break into teams and work together to create a program, one instruction at a time.
Lesson	Coding	Debugging	NA	NA	Bugs and debugging	Student Handout: Bugs and Debugging	Intel handout with suggestions and activities.
Lesson	Coding	Events	.K+	45+	The big event	The Big Event	Events are a great way to add variety to a pre-written algorithm. Sometimes you want your program to be able to respond to the user exactly when the user wants it to. That is what events are for.
Lesson	Coding	Functions	3+	50+	Functional suncatchers	Functional Suncatchers	In this lesson, students will make a suncatcher out of string, beads, and a special charm. The students will follow a series of repetitive steps, then be asked to identify certain sets of "skills" that are duplicated several times. Once those skills are defined, they will be called from a main program and the whole beautiful process of creation will be recorded on a single sheet of paper.
Lesson	Coding	Functions	3+	50+	Songwriting	Songwriting	One of the most magnificent structures in the computer science world is the function. Functions (sometimes called procedures) are mini programs that you can use over and over inside of your bigger program. This lesson will help students intuitively understand why combining chunks of code into functions is such a helpful practice.
Lesson	Coding	Functions	3+	55+	Songwriting with parameters	Songwriting with Parameters	One of the most magnificent structures in the computer science world is the function. Functions (sometimes called procedures) are mini programs that you can use over and over inside of your bigger program. This lesson will help students intuitively understand why combining chunks of code into functions is such a helpful practice.
Lesson	Coding	Loops	.K+	50+	Getting loopy	Getting Loopy	Loops are a handy way of describing actions that repeat a certain number of times. In this lesson, students will practice converting sets of actions into a single loop.
Lesson	Coding	Loops	4+	55+	For loop fun	For Loop Fun	We know that loops allow us to do things over and over again, but now we're going to learn how to use loops with extra structure built right in.
Lesson	Coding	Program development	NA	Several classes	Making movie storyboards	http://www.thirteen.org/edonline/lessons/s/	An example lesson on making movie storyboards. This lesson would need to be adapted for coding purposes.
Lesson	Coding	Variables	3+	20-50+	Variable dry run (for Scratch)	3. Programming unplugged: learning program	Set a series of dry run exercises where students have to step through short fragments of code working out what they do on paper. This is an important activity to do after explaining variables and assignment. It reinforces understanding and helps identify faulty mental models so they can be fixed. Being able to do this kind of dry run for any new construct is an important prerequisite to being able to actually write code.

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Lesson	Coding	Variables	5+	15-20+	Box variables	3. Programming unplugged: learning program	You dry run simple programs that involve variables and assignment by running them on a computer made of students. Students with boxes act as variables as values are copied between them following the instructions of the program. You physically demonstrate the creation of variables, how accessing a variable involves taking a copy of its value, and how storing values in a variable destroys any previous value stored.
Lesson	Coding	Variables	5+	50+	Variables in envelopes	Variables in Envelopes	Variables allow for a lot of freedom in computer science. This lesson helps to explain what variables are and how we can use them in many different ways. Use this activity before (or in conjunction with) the lesson on abstraction to really hit the idea home.
Lesson	Computer science	Binary	3+	45+	Binary bracelets	Binary Bracelets	Binary is extremely important to the computer world. The majority of computers today store all sorts of information in binary form. This lesson helps to demonstrate how it is possible to take something that we know and translate it into a series of ons and offs.
Lesson	Computer science	Binary	3+	50+	Binary images	Binary Images	Though many people think of binary as strictly zeros and ones, our previous courses taught students that information can be represented in a variety of binary options. This lesson takes that concept one step further as it illustrates how a computer can store even more complex information (such as images and colors) in binary, as well.
Lesson	Computer science	Binary	NA	NA	Binary counter	Student Handout: Binary Counter	Intel handout with suggestions and activities.
Lesson	Computer science	Binary	NA	NA	Binary system	https://sites.google.com/site/childrenandtec	An introductory unplugged lesson on binary.
Lesson	Computer science	Computation	.K+	NA	Concurrency and synchronization	https://sites.google.com/site/childrenandtec	This workshop has kids split into teams and work on tasks that require synchronization between them. It is a great team building and leadership exercise. Thanks to German Nudelman for the idea.
Lesson	Computer science	Computation	.K+	NA	How computers work	How Computers Work	The purpose of this activity is to give the students a basic sense of how computers work by having them act out a simple computer simulation. Each student takes on the role of a different part of a simplified computer and they work in groups to run a simple program. The end result of this program is to draw a picture on a simulated computer display.
Lesson	Computer science	Computation	1+	NA	Simulating an iPad	https://sites.google.com/site/childrenandtec	Understand calculator application on an iPad with kids role playing various components, such as operating system, processor, button controls.
Lesson	Computer science	Computation	NA	NA	Fetch, decode, and execute	Student Handout: Fetch, Decode, and Execut	Intel handout with suggestions and activities.
Lesson	Computer science	Computation	NA	NA	Taking command	https://www.intel.com/content/dam/www/	Intel handout with suggestions and activities.
Lesson	Computer science	Hardware	.K+	NA	Simulate a computer	https://sites.google.com/site/childrenandtec	Draw a computer and look at computer components. Use children to simulate mouse, IO controller and a processor on the example of Calculator program. Before simulating the whole system, let kids get a feel of each individual component.
Lesson	Computer science	Hardware	NA	45-60+	My first computer exercise	Hello Ruby — For educators: Lesson plan for	My First Computer exercise is an introduction to the amazing machine that is the computer. Few things are as exciting as computers. And now kids will get to design their very own one.
Lesson	Computer science	Internet	NA	NA	How the internet works	How the Internet Works	This activity is an interactive demonstration of what happens when you type a URL into a browser. In this activity the students will be guided to act out the various parts of the internet: websites, routers, name servers, ISPs and home computers.
Lesson	Computer science	Networking	2+	NA	Introducing the internet: Telephone and networks	Introducing the Internet: Telephones and Ne	This lesson provides students with an understanding of the basic structure of electronic network communications and how Internet communications are different from telephone conversations. In a hands-on classroom activity, children create and use paper cup telephones and compare this to sending messages over a computer "web" created with photocopies of computers linked by yarn.
Lesson	Computer science	Networking	NA	NA	Did you get the message	Student Handout: Did You Get the Message?	Intel handout with suggestions and activities.
Lesson	Computer science	Networking	NA	NA	Message routing	Children and Technology by Misha Leder - Pr	Internet works this way - computer networks are connected with each other via routers. Have kids sit at several tables, every child being a server. Have representatives for each table to act as routers. Kids write messages to each other and routers help routing this messages
Lesson	Computer science	Networking	NA	NA	Put it in your packet	Student Handout: Put It in Your Packet	Intel handout with suggestions and activities.

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Lesson	Digital citizenship	Crowdsourcing	3+	45+	Crowdsourcing	Crowdsourcing	In computer science, we face some big, daunting problems. Challenges like finding large prime numbers or sequencing DNA are almost impossible to do alone. Adding the power of others makes these tasks manageable. This lesson will show your students how helpful teamwork can really be.
Lesson	Digital citizenship	Internet	3+	55+	Internet	The Internet	In this lesson, students will pretend to flow through the Internet, all the while learning about Internet connections, URLs, IP Addresses, and the DNS.
Lesson	Digital citizenship	Safety	.K+	65+	Going places online	Going Places Online	In collaboration with Common Sense Media This lesson helps students learn that many websites ask for information that is private and discusses how to responsibly handle such requests.
Lesson	Digital citizenship	Safety	.K+	65+	Your digital footprint	Your Digital Footprint	In collaboration with Common Sense Media, this lesson helps students learn about the similarities of staying safe in the real world and when visiting websites. Students will also learn that the information they put online leaves a digital footprint or “trail.”
Lesson	Digital citizenship	Safety	3+	60+	Digital citizenship	Digital Citizenship	In collaboration with Common Sense Media, this lesson helps students learn to think critically about the user information that some websites request or require. Students learn the difference between private information and personal information, distinguishing what is safe and unsafe to share online.
Lessons	Coding	Algorithms, debugging, conditionals	.K+	Varies	Getting started with code 1	https://itunes.apple.com/us/book/get-starte	In this interactive book developed by Apple, there are several unplugged lessons related to algorithms, debugging, and conditionals.
Lessons	Coding	Algorithms, debugging, conditionals	3+	Varies	Getting started with code 2	https://itunes.apple.com/us/book/get-starte	In this interactive book developed by Apple, there are several unplugged lessons related to algorithms, debugging, and conditionals.
Lesson	Coding	Mathematics	4+	NA	UCL ScratchMaths Curriculum	UCL ScratchMaths Curriculum IOE - Faculty	ScratchMaths is a two-year computing and mathematics-based curriculum for grades four and five. Its aim is to enable pupils to engage with and explore important mathematical ideas through learning to program. These resources focus on learning mathematics through Scratch.
Resource	Computer science	Computing systems, data and analysis, networks and the internet, and impacts of computing	K-5	NA	K-5 CS: NOT Just Coding	https://sites.google.com/view/k5csnotjustcodi	The purpose of the K-5 CS is NOT Just Coding: Teaching Non-Algorithms & Programming Standards Workshop and this companion website is to help K-5 teachers of CS: ~Understand that Computer Science is more than just coding and why it is important to teach standards beyond Algorithms and Programming ~Understand what students need to know and be able to do to meet each standard ~Explore activities, websites, lessons to understand how the non-Algorithms and Programming standards might be taught ~Understand ways in which the Impacts of Computing Standards can be integrated into the other concept areas of CS and other curricular areas
Resource	Coding	Algorithms	NA	NA	How do computer games work?	What are computer games? - BBC Bitesize	A short video on how computer gams work (access may be geographic region).
Resource	Coding	Algorithms	NA	NA	How do you program a robot?	How do you program a robot? - BBC Bitesize	A short video on programming robots (access may be geographic region).
Resource	Coding	Algorithms	NA	NA	How to explain algorithms to kids	How to Explain Algorithms to Kids - Tynker B	A short article on how to explain algorithms to kids.
Resource	Coding	Algorithms	NA	NA	What is an algorithm?	What is an algorithm? - BBC Bitesize	A short video on algorithms (access may be geographic region).
Resource	Coding	Algorithms	NA	NA	What is coding?	What is a computer program? - BBC Bitesize	A short video explaining coding (access may be geographic region).
Resource	Coding	Debugging	NA	NA	What are computer bugs?	http://www.bbc.co.uk/guides/ztgiq6f	A short video on computer bugs (access may be geographic region).
Resource	Coding	Demonstration	NA	NA	Computer Science Class Clips	http://www.bbc.co.uk/education/topics/z3tt	Short videos demonstrating computer science classes.