

## 2020/21 course catalog for online middle school classes.

To see what programs look like, visit

[CaveSim.com/distance-learning](https://cavesim.com/distance-learning). For more info, contact us at [info@cavesim.com](mailto:info@cavesim.com), or 914-330-7824.

How our online courses work: you tell us what topics you're covering. From the list below, we work with you to choose a lesson that fits your syllabus. You choose one or more dates and times for the online class. You send us video conference invites to join your class(es), or we can send you Zoom links. We email you a short list of materials that we suggest that the students try to get (not required, but students get more from the classes if they have the materials). We join your class virtually at the chosen days/times. Students can be in-class, at home, or hybrid. We teach the lessons described below, and engage students with questions and hands-on activities throughout the class period. Typical classes last 1 hour.

In 2020, we did 36 days of online classes. Here's what other teachers and administrators are saying:

*"The class was an excellent mix of technical caving demonstrations and the scientific principles that are involved in exploring caves. Dave did a great job of engaging the students and keeping them connected with hands on labs to explore how rock type, weathering and erosion play a part in cave formation."* Corey Combs, science teacher, Holmes Middle School, Colorado Springs, CO

*"This is the best thing we've done all year! You were SO engaging! You constantly asked the students questions and they never lost focus because of that. Also, there were several hands on demonstrations which were so interesting!"* Anna Bostick, 5<sup>th</sup> grade teacher, Austin ISD, TX

*"That was great. I liked the way you tried to get different students involved, had them providing words, making connections, etc. Great job."* Yann Ulrich, assistant principal, Holmes Middle School, Colorado Springs, CO

### Course offerings:

- Physical science ([CaveSim Distance Learning Lesson 1: Vertical Caving](#))
  - Description: students learn about the physical science of vertical caving with pulley experiments, knots, friction demos (including a rope-slicing demo in which we cut through a piece of webbing with parachute cord and talk about molecular interactions).
  - Student involvement: Students get to actively participate from home or the classroom using simple materials like a metal fork and a shoelace to learn about friction.
  - Science topics covered: mechanical advantage, friction, conservation of work, science terminology (e.g., hypothesis, horizontal, vertical, distributed, concentrated)
  - Math topics covered: inequalities, multiplication and division with whole numbers
  - Other topics covered: logic and reasoning
- Chemistry with carbide lamps: ([CaveSim Distance Learning Lesson 4: Chemistry](#))
  - Description: students learn about chemical reactions with exciting carbide lamp demonstrations, as well as acid/base reaction demos.
  - Student involvement: students participate by doing simple experiments with vinegar and several household powders (can include baking soda, powdered laundry detergent, sugar, flour, baking powder).
  - Science topics covered: experiment safety, conservation of mass, exothermic reactions, science terminology (e.g., flammable, exothermic, exoskeleton), limiting reactants, acid/base reactions, the ideal gas law

- Math topics covered: subtraction of decimal numbers
- Other subjects covered: history of carbide lamp use, reading and writing skills, environmental conservation
- Life science ([CaveSim Distance Learning Lesson 2: Elementary Life Science](#))
  - Description: students learn about the unique macro- and microbiological food web that exists in caves, and about the exciting ways in which cave-dwelling creatures like bats help humans.
  - Student involvement:
    - Minimal-materials activities: echolocation exercise with a blindfold in which students see if they can detect a wall before they bump into it; echolocation exercise with a friend to demonstrate the power of stereo hearing; echolocation tag for students to play with one or more family members.
    - Materials-intensive lab: Slime mold experiments in which participants use living *Physarum Polycephalum* to demonstrate the amazing material transport efficiency of single-celled organisms
  - Science topics covered: microbiology (the role of rock-metabolizing bacteria in cave formation), food webs, adaptation and inheritance, habitats, species classification, the role that single-celled organisms play in helping humans develop efficient computer code.
  - Other topics covered: Civil War history
- Geology ([CaveSim Distance Learning Lesson 3: Geology part 1](#))
  - Description: students learn about the different types of rocks and how we can test rocks to figure out what they are. We do demonstrations with HCl acid, and talk about how different cave formations grow.
  - Student involvement: Students will participate by finding rocks at home and doing some of the simple tests, including Mohs hardness test, sink/float test, magnetism test, and rock solubility test (which students can do using vinegar).
  - Science topics covered: experiment safety, acid/base reactions, precipitation reactions, geology (metamorphosis, rock types, fossils), oil/water interaction, science terminology (e.g., repel).
  - Other subjects covered: logic and reasoning skills, environmental conservation
- Geology part 2 ([CaveSim Distance Learning Lesson 3: Geology part 2](#))
  - Description: in this follow-up lesson about geology and earth science, students will go hands-on using simple household materials like cups, sugar, and baking soda. Students will get to do one or more of the following: (1) grow their own cave formations and/or (2) make their own cave sinkhole in a cup.
  - Student involvement: Students gather household materials like cups, sugar, sand, string, paper, tape, etc. to do one or both of the labs described above
  - Science topics covered: experiment design, chemical reactions, geology (weathering and erosion)
  - Other topics covered: conservation, environmental engineering
- STEM lab ([CaveSim Distance Learning Lesson 5: Energy and Waves](#))
  - Description: students will go hands-on using simple household materials like cups and string to learn about different types of energy, and conversion from one type of energy to another. Students will see demos with home-made waterproof speakers and high-tech engineering equipment to learn that sound is a mechanical wave, and to learn that electrical energy can be converted into mechanical energy. Students will also see a demo of some equipment repair to learn about how engineering really works.
  - Student involvement: Students will use cups and string to make cup phones, and will conduct a series of experiments to learn about wave propagation.
  - Science topics covered: forms of energy, graphing, frequency/pitch/period/amplitude, experiment design, engineering
- Art ([CaveSim Distance Learning Lesson 6: Art](#))

- Description: students will go hands-on with art using simple materials that they have at home. Students will learn about how ancient people made rock art in caves using pigment blown through a bone or reed.
- Student involvement: students will make their own paint using ground-up charcoal and water, and will then spray their paint (using an arrangement of straws in a cup) to make hand-stencil paintings.
- Science topics covered: the Bernoulli principle
- Other topics covered: early hominid art, art preservation, painting techniques
- Maker lab ([CaveSim Distance Learning Lesson 7: Ropes, carabiners, and taking stuff apart](#))
  - Description: We dissect and repair several pieces of vertical caving equipment, including carabiners and dynamic kern mantle rope. This allows us to showcase a variety of different tools, from the hot knife to the Dremel tool.
  - Student involvement: using found materials, students design an impact-absorbing device intended to protect a brittle piece of wood. Students test their device by suspending a heavy object from a string and then cutting the string, causing the object to fall on their device (this simulates an experiment that we do on the vertical caving tower with a cut rope)
  - Science topics covered: potential and kinetic energy, elastic and inelastic collisions, prototyping, material science.
- Maker lab part 2 ([CaveSim Distance Learning Lesson 8: Sparks, heat, and high-tech tools](#))
  - Description: We dissect and repair a piece of high-tech electronic test equipment, and show how this equipment can be used to test cave rescue phones and waterproof speakers.
  - Student involvement (requires adult supervision and safety glasses): Students use capacitors, wire, and resistors to learn about basic electronic components and their uses. Exciting experiments include: making sparks with a capacitor; making heat with a capacitor and resistor; making light with a capacitor, resistor, and LED.
  - Science topics covered: forms of energy (and conversion among electrical, thermal, and mechanical energy), electromagnetics.

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