2020-2021 Science Instructional Guidance for Diverse Learning Settings

Office of Standards and Instructional Support
July 2020

COLORADO
Department of Education

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Significant portions of this document were adopted or adapted from Version 1.1 of "Supporting Science Learning During COVID-19 School Closures" by the Council of State Science Supervisors, which is licensed under CC BY 4.0.

Full Document and Other Support

For the full version of this document that contains all content areas, and for other standards, content, and instructional support, see the website for the Office of Standards and Instructional Support

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Purpose

When CDE describes **best, first instruction**, it is assumed that instruction is occurring in a traditional environment: teachers and students gathered together in a classroom, working in small groups, large groups, and individually, and that there are no safety risks posed by having people in close proximity of each other or touching shared objects. Due to COVID-19, we can no longer assume that this traditional environment is possible or preferable under the current circumstances. Districts and schools have had to consider other options, including hybrid/blended learning, online-only options, or switching to remote learning on an emergency basis when circumstances require it. For most educators, this has created challenging teaching conditions—not only is teaching under these non-traditional settings challenging compared to the classroom environments teachers are accustomed to, but the uncertainty of the moment makes long-term planning and preparation especially difficult.

The purpose of this document is to provide some guidance under these uncertain times for each of the content areas addressed by the Colorado Academic Standards. While some compromises are inevitable when shifting instruction to non-traditional settings, maintaining high-impact instruction (or the highest-impact instruction under the circumstances) requires adherence to certain principles, practices, and strategies. Teaching is a very complex endeavor and while it isn't possible to cover every approach, tool, or practice for every situation, this document aims to inform educators about what teaching should ideally look like given a variety of instructional settings.

Teaching and Learning in Diverse Learning Settings

In March of 2020, schools in Colorado made on-the-fly decisions and took quick action to change the way teaching and learning worked across the state. Several terms emerged to describe the different settings school was happening in, such as *online*, *virtual*, *remote*, and *at home*. To attempt to clarify the language used to describe these settings, this document refers to the following categories:

- **In-person learning:** Face to face instruction within a brick and mortar structure.
- **Hybrid/blended learning**: A combination of in-person learning and remote learning.
- **Online-only learning:** Online learning in Colorado refers to schools that are providing online course offerings on a full or part-time basis. Students who engage in online learning in this context are enrolled in an approved school or program or may be taking an online course to supplement.
- **Remote learning:** Education that occurs away from a school building in response to emergency situations such as COVID-19 or natural disaster. Remote learning seeks to offer continuous educational opportunities that may or may not build upon previously taught content. Remote learning is both a temporary and longer-term option. Remote learning may include digital resources and/or hard copy resources and may include synchronous or asynchronous instruction and/or self-paced independent study work.

Even with these categories and definitions, other variations are possible. For example, in-person learning *with* an enforcement of social/physical distancing will certainly have some constraints that in-person learning *without* social/physical distancing. Similarly, online and remote learning looks very different when it is conducted synchronously rather than asynchronously.

Content-Specific Resources to Support Diverse Learning Settings

CDE's top priority continues to be the health and safety of all students, educators, and communities in Colorado. To help schools plan for educational continuity while the suspension of in-person learning is in effect, we have curated a list of best practices for remote learning and teaching including free web-based resources to help keep students academically engaged. We recognize that the multitude of resources for remote learning can be overwhelming so we have collected and organized material by content area and grade level that may be useful as educators develop plans for their students. While remote learning through the Internet provides a great deal of flexibility in learning opportunities, educators should also consider utilizing hard copy resources (e.g., packet work, textbooks).

There is no requirement for districts to offer remote learning via the Internet, but if educators decide to go this path, they should strive to include equitable access to instruction for all students. Equitable access does not require that all students receive instruction in the same format e.g., online instruction). Districts should consider the individual learning needs of students in determining how to best meet individual needs. Click here for a curated list of resources across content areas.

Equity Considerations for Learning Across Settings

Regardless of the instructional setting, or how it changes in 2020-2021, we suggest you consider the following do support students and their families:

- Support **flexible scheduling and limited technology access when shifting to hybrid/blended or remote** learning settings. Student learning should not be solely dependent on access to devices and the internet. Encourage approaches that can be pursued without technology and/or asynchronously to set students up for success.
- Engage students in **meaningful** explorations, investigations, inquiries, analysis, and/or sense-making. Equitable learning experiences should be both responsive to the current need as well as meaningful to learners.
- When in remote or hybrid settings, encourage students to engage in **activities that already happen in their homes with materials that families already have** (especially so families do not need to purchase additional supplies). Families in poverty may be experiencing several of the considerations described above, along with additional concerns including regular access to meals, utilities, health services, or shelter. Undocumented students and students receiving special education services may face challenges in accessing resources that they need. Encourage educators to prioritize the physical, mental, and emotional well-being of all students.
- Help students make **explicit connections to their interests and identities**.
- **Invite family members to be a partner** in students' learning. Students and families may need to juggle home, caretaking, school, and work responsibilities. Consider a menu of options for learning experiences that allow for different types and levels of engagement during remote learning.
- Provide students with **choices for how they engage, what they investigate/research, or how they demonstrate learning.**
- Support students in **self-reflection** related to content and process to support their learning.
- **Exercise sensitivity** when referencing the current pandemic as a topic for instruction.

- Encourage, support, and facilitate **first-language family participation** in the learning across multiple settings. Take steps to bridge the gap in access to bilingual and native language resources that support learning for students and their families.

General Considerations for Standards-Aligned Instruction

The guidance provided below gives educators insights into "traditional" teaching practices and how shifts in those teaching practices can lead to student learning experiences that are more authentic and engaging in diverse learning settings. These shifts support instructional alignment with the 2020 Colorado Academic Standards.

Learning experiences should look less like…	Learning experiences should look more like…
An attempt to recreate school at home during learning: • assuming a **strict "school day" schedule** • **requiring special materials** (e.g. materials not commonly found at home) • pacing with the **planned scope and sequence in remote learning environment** • assigning **readings** to stay "caught up" • packet of **worksheets and busy-work** • all learning experiences happen **virtually**	**Flexible goals and structures for learning** • **extended time** for learning and reflection • use of **commonly available materials** • **purposeful selection of learning targets** • allowing students to **explore their interests** • **meaningful, manageable tasks and projects** • **opportunities to learn without the use of devices or the internet**
Teacher-centered instruction • virtual lectures/classes that all students **synchronously** attend • teachers **delivering information and assignments** • teacher instruction and feedback as the **primary mode** of facilitating learning	**Purposeful teacher-student interactions** • **optional** opportunities to connect with teachers and peers **virtually and at a variety of times** • teachers providing **coaching, feedback, and encouragement** • encouraging **students to engage in learning and reflection with their families and communities** • encouraging **self-reflection** on what students learn and how they learn it
Assignments to "get through" content • **emphasizing memorizing content** or "checking off" tasks on lists • asking students to **complete tasks that are irrelevant, lack authenticity, or are redundant in nature** (e.g., "busy work") • trying to cover content through a volume of activities or skipping from topic to topic	**Assignments that promote authentic learning** • **connecting experiences to household activities,** like cooking, fixing things, or gardening, community interactions • asking students to **identify relevant problems** in their lives and **leverage content knowledge** to address them • allowing students to **deeply explore concepts, topics, phenomena (science), and/or problems of interest** through investigation, analysis, research, and other sense-making strategies to build understanding and practice over time

Instructional Guidance by Content Area

CDE's Office of Standards and Instructional Support stands behind the saying, "All Students, All Standards." The Colorado Academic Standards define learning goals in each content area. By providing a high-quality, standards-based educational experience for students in each of the content areas, schools open doors of opportunity to students' futures. By experiencing high-quality teaching and learning in a variety of content areas, upon graduation students should be prepared to seek out and find success in multiple career fields, college majors, or other future endeavors connecting to any one or more of the content areas for which Colorado has academic standards.

Unlike other sources of guidance for the 2020-2021 school year, the guidance below gives equal preference to each content area. **This is not a guide for narrowing the curriculum down to mathematics and English language arts**. Instead, it is our goal that schools consider the guidance provided and strive to offer well-rounded, enriching, opportunity-creating educational experiences for all students, regardless of the instructional setting.

Science

High-Impact Instructional Strategies for Diverse Learning Settings for Science

Research has identified that **science instruction** needs to engage all students with a broad array of natural phenomena, support rigorous intellectual work, and facilitate full immersion in scientific and engineering practices over long periods of time. Such practices include a broad range of intellectual habits—asking questions, developing, and using models, analyzing data, and constructing explanations from data. Thus, science practices are not synonymous simply with "hands-on" activity. High-impact instruction in science classrooms prioritizes phenomena-based instruction with strong emphasis on student sense-making. The table below lists the instructional shifts associated with the 2020 Colorado Academic Standards for Science and high-impact instructional strategies to support inclusive science learning across diverse learning settings. COVID-19 has created a "new" normal in our field. One that challenges us to weave strategies and tools together in a way that maximizes learning for students across a variety of settings. Below are instructional strategies linked to tools to support inclusive, phenomena-driven, student-centered learning, along with tools to support implementation whether instruction is happening in school or online. Consider leveraging a tool like education researcher Ruben Puentedura's SAMR model when considering what technology tool might help you maximize student engagement in the content. Feel free to brainstorm your own strategies and tools here as well.

Moving from less like…	Moving to more like…	Instructional Strategies	Tools to Try
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based reasoning and arguments.	Developing Conceptual Meaning First in Science Develop and Ask Disciplinary Specific Questions 5E Instructional Model Eliciting Student Thinking Tools- Ambitious Science Teaching Supporting Ongoing Changes in Student Thinking- Ambitious Science Teaching Think Aloud Pressing for Evidence Based Explanations- Ambitious Science Teaching	Science Word Catcher MURAL Case Studies GLAD Pictorial Input Chart
Learning ideas disconnected from questions	Systems thinking and modeling to give context for the ideas to be learned	STEM Teaching Tools: Authentic Phenomenon Engaging Youth in Scientific Modeling Question Formulation Technique Phenomena Protocol Eliciting Student Thinking Tools	MURAL Padlet Google Draw Phenomena Protocol Simulations and Virtual Labs

Moving from less like…	Moving to more like…	Instructional Strategies	Tools to Try
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance	5E Instructional Model CER Framework Learning Through Citizen Science Project Based/Problem Based Learning Student Media Projects Place-based Science Education	Case Studies Virtual Field Trips Citizen Science Projects Media Making Toolkit
Teachers posing questions with only one answer	Students discussing open-ended questions that focus on the strength of evidence used to generate claims	Science Talk/Discourse Socratic Seminar Question Formulation Technique Classroom Discussion Collaborative Grouping Strategies Develop and Ask Discipline Specific Questions Thinking Routines	Voice Thread for the Classroom FlipGrid SeeSaw Case Studies
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including content-related magazine and journal articles and web-based resources; students developing summaries of information	Thinking Routines Case Studies in the Classroom Claim Evidence Reasoning and Classroom Discourse Supporting Ongoing Changes in Student Thinking- Ambitious Science Teaching Student Media Projects and Media Liteacy	MindMapping Primary Sources and Science Education Media Making Toolkit
Pre-planned outcomes for "cookbook" activities	Multiple investigations driven by student's questions/interests with a range of possible outcomes that collectively lead to a deep understanding of established core ideas * Student Investigation Article	Eliciting Student Thinking Scaffold Science and Engineering Practices Science Investigations Learning Through Citizen Science Project Based/Problem Based Learning Place-based Science Education	Case Studies Virtual Field Trips Citizen Science Projects Remote Learning with pHET SIMS Simulations and Virtual Lab

Moving from less like…	Moving to more like…	Instructional Strategies	Tools to Try
Worksheets	Student writing in journals, reports, posters, and media presentations that explain and argue	Science Notebooking/Journals - Video Claim Evidence Reasoning and Classroom Discourse Socratic Seminar Nature Journaling Inquiry-based Research with Nonfiction Text	Virtual Science Notebooks Digital Portfolio's Query Books via Padlet NowComment or Kialo Science Journal App- Google
Oversimplification of activities for students who are perceived to be less able than their peers	Provisions for support so that all students can engage in sophisticated lessons and practices.	Equity in Science Education Universal Design for Learning in Science Creating science learning experiences that support learners receiving special education services Collaborative Grouping Strategies Engaging English Learners in Science and Engineering Practices Investigating Contemporary Topics in Science	Concord Consortium Virtual Tasks Science Talk/Discourse Digital Portfolio's Note-taking with Technology Making Labs Accessible for Students Receiving Special Education Services

Resources to Support Diverse Learning Settings in Science

- Parent and Family Engagement in Science: Phenomena, Science Notebooks, and Science Talk
- How can science instruction leverage and develop student interests? Short answer: In so many different ways - STEM Teaching Tool 58
- Technology Integration Considerations
- Improving Distance Learning for Student's with IEP's
- Leveraging Multiple Means of Representation in the Science Classroom
- Distance Learning Problems FAQ - Edutopia
- Colorado Science Education Network - Response to COVID-19 Resources