Obtaining, Evaluating & Communicating Information

Science

Science cannot advance if scientists are unable to communicate their findings clearly and persuasively or to learn about the findings of others. A major practice of science is thus the communication of ideas and the results of inquiry—orally, in writing, with the use of tables, diagrams, graphs, and equations, and by engaging in extended discussions with scientific peers. Science requires the ability to derive meaning from scientific texts (such as papers, the Internet, symposia, and lectures), to evaluate the scientific validity of the information thus acquired, and to integrate that information.

Engineering

Engineers cannot produce new or improved technologies if the advantages of their designs are not communicated clearly and persuasively. Engineers need to be able to express their ideas, orally and in writing, with the use of tables, graphs, drawings, or models and by engaging in extended discussions with peers. Moreover, as with scientists, they need to be able to derive meaning from colleagues' texts, evaluate the information, and apply it usefully. In engineering and science alike, new technologies are now routinely available that extend the possibilities for collaboration and communication. (Framework, p. 53)

See A Framework for K-12 Science Education, 2012, p. 74 for the entire text for Practice 8: Obtaining, evaluating and communicating information.

In the video below from BozemanScience.com, Paul Andersen explains how scientists and engineers spend over half of their working day reading, evaluating and producing text. Therefore it is important that we produce students that have a high level of scientific literacy.

For more information, refer to the Science Notebooks Podcast (requires Adobe Flash); the Science Notebooks Presentation on prezi.com created by MPRES Faculty Member John Graves (included below); and the Literacy in Physics: Reading a Primary Source video from TeachingChannel.org (also included below).

Obtaining, Evaluating & Communicating Information Progression through Gradebands:

Grades K-2	Grades 3-5	Grades 6-8	Grades 9-12
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s). • Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea. • Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim. • Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. • Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. • Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. • Communicate scientific and/or technical information orally and/or in written formats, including various forms of media and may include tables, diagrams, and charts.	Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. • Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). • Integrate qualitative and/or quantitative scientific and/or technical information in written text with that contained in media and visual displays to clarify claims and findings. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. • Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. • Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. • Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem. • Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. • Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).

Progression from NGSS Appendix F p. 15.

Activities

Four Conceptual Change Activities are included to help teachers and students Confront Beliefs:

- Obtaining, Evaluating & Communicating Information Activity #1: Using Primary Source Material
- Obtaining, Evaluating & Communicating Information Activity #2: Using Graphics as a Source
- Obtaining, Evaluating & Communicating Information Activity #3: Evaluating Resources
- Obtaining, Evaluating & Communicating Information Activity #4: Communicate Observations of an Object
- Additional Resources, including lesson plans, online resources and videos, are also available for this

Practice

Also refer to Student Work in the Practice for real-life examples of how MPRES teachers have applied this Practice.

The purpose of the activities is to engage teachers in the Practice of Obtaining, Evaluating & Communicating Information. The emphasis in NOT on the activity itself, but rather the conceptual change related to the Practice. Consumers of the Toolkit are reminded to not get wrapped up in the activity, but rather continually reflect on the conceptual nature of the practice to gain deeper understanding.

Now is the time to engage in a phenomenon that focuses on the practice. Professional Development facilitators provide an opportunity for learners to obtain, evaluate, and communicate.

To facilitate conceptual change throughout each activity, you should consider the following questions. These questions are also repeated at key points in each activity to assist you.

Awareness Questions:

1. From the background information, what new awareness do you have about obtaining, evaluating & communicating information?
2. In a 3-Dimensional classroom, who do you think needs to be obtaining, evaluating & communicating?
3. What questions did the background raise for you?

Expose Belief Questions:

1. What are your current beliefs about this practice?
2. In what ways do you think you are using this practice?
3. What challenges do you see to using this practice?

Debrief activities by focusing on the conceptual understanding of the practice using the following prompts.

Resolve Belief Questions:

1. In what ways did this activity change your beliefs about obtaining, evaluating and communicating?
2. How can you foster the understanding of obtaining, evaluating and communicating information for your students?
3. What can you do to make this practice a part of every learner's repertoire?

Extend the Concept Questions:

1. How do you currently help students apply this practice in your classroom?
2. Review a recent lesson you taught and evaluate the effectiveness of obtaining, evaluating and communicating.

Go Beyond Questions:

1. Ask a colleague to observe one of your lessons OR video yourself teaching and provide feedback on how you implement obtaining, evaluating and communicating information in your classroom.
2. Use the EQuiP Rubric for Lessons & Units: Science (PDF format) to evaluate a recent science lesson you taught.