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| **Asking questions (for science) and defining problems (for engineering)** A basic practice of the *scientist* is the ability toformulate empirically answerable questions aboutphenomena to establish what is already know, andto determine what questions have yet to besatisfactorily answered. *Engineering* begins with a problem that needs to besolved, such as “How can we reduce the nation’sdependence on fossil fuels?” or “What can be doneto reduce a particular disease?” or “How can weimprove the fuel efficiency of automobiles?” | **Developing and using models***Science* often involves the construction and use ofmodels and simulations to help developexplanations about natural phenomena.*Engineering* makes use of models and simulationsto analyze systems to identify flaws that might occuror to test possible solutions to a new problem. |
| **Planning and carrying out investigations**A major practice of *scientists* is planning andcarrying out systematic scientific investigations that require identifying variables and clarifying what counts as data.*Engineering* investigations are conducted to gaindata essential for specifying criteria or parametersand to test proposed designs. | **Analyzing and interpreting data**Scientific investigations produce data that must beanalyzed to derive meaning. *Scientists* use a rangeof tools to identify significant features and patterns in the data.*Engineering* investigations include analyses of datacollected in the tests of designs. This allowscomparison of different solutions and determineshow well each meets specific design criteria. |
| **Using mathematics and computational thinking**In *science*, mathematics and computation arefundamental tools for representing physical variables and their relationships.In *engineering*, mathematical and computationalrepresentations of established relationships andprinciples are an integral part of the designprocess. | **Constructing explanations (for science) and designing solutions (for engineering)**The goal of *science* is the construction of theoriesthat provide explanatory accounts of the materialworld.The goal of *engineering* design is a systematicapproach to solving engineering problems that isbased on scientific knowledge and models of thematerial world. |
| **Engaging in argument from evidence**In *science*, reasoning and argument are essential forclarifying strengths and weaknesses of a line ofevidence and for identifying the best explanation for a natural phenomenon.In *engineering*, reasoning and arguments areessential for finding the best solution to a problem.Engineers collaborate with their peers throughoutthe design process. | **Obtaining, evaluating, and communicating information***Science* cannot advance if scientists are unstable tocommunicate their findings clearly and persuasively or learn about the findings of others.*Engineering* cannot produce new or improvedtechnologies if the advantages of their designs arenot communicated clearly and persuasively. |