

ETS2.A: Interdependence of Science, Engineering, and Technology

Grade/Course	Disciplinary Core Idea Statement with 2021 Performance Expectation Linked
K	<ul style="list-style-type: none"> • There are many types of tools produced by engineering that can be used in science to help answer these questions through observation or measurement. Observations and measurements are also used in engineering to help test and refine design ideas. (K-PS2-2) • There are many types of tools produced by engineering that can be used in science to help answer these questions through observation or measurement. (K-PS3-2) • People encounter questions about the natural world every day. (K-ESS3-2)
1	<ul style="list-style-type: none"> • People encounter questions about the natural world every day. There are many types of tools produced by engineering that can be used in science to help answer these questions through observation or measurement. Observations and measurements are also used in engineering to help test and refine design ideas. (1-ESS1-1)
3	<ul style="list-style-type: none"> • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4) • Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-4)
4	<ul style="list-style-type: none"> • Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3) (4-ESS3-1)
5	<ul style="list-style-type: none"> • Tools and instruments (e.g., scales, thermometers, graduated cylinders) are used in scientific exploration to gather data and help answer questions about the natural world. (5-PS1-2) (5-PS1-3)

K-12 Conceptual Vertical Articulation of ETS2 – Links Among Engineering, Technology, Science, and Society

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6	<ul style="list-style-type: none"> Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (6-LS1-1) Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (6-ESS2-3)
7	<ul style="list-style-type: none"> Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (7-PS1-3)
8	<ul style="list-style-type: none"> Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (8-LS4-5) (8-ESS1-3)
Chemistry	<ul style="list-style-type: none"> Science and engineering complement each other in the cycle known as research and development (R&D). (secondary) (C-PS4-5)
Physics	<ul style="list-style-type: none"> Engineers continuously modify these technological systems by applying scientific knowledge. (secondary) (P-PS2-6) (P-PS3-3) (P-PS4-2) (P-PS4-5)
Earth and Space Science	<ul style="list-style-type: none"> Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (secondary) (E-ESS1-2) (E-ESS1-4) (E-ESS2-3)

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

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1	<ul style="list-style-type: none"> Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (1-PS4-4) (1-LS1-1)
2	<ul style="list-style-type: none"> Developing and using technology has impacts on the natural world. (secondary) (2-ESS2-1) Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. Thus, developing and using technology has impacts on the natural world. (2-ESS3-1)
3	<ul style="list-style-type: none"> Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (3-ESS3-1)
4	<ul style="list-style-type: none"> Engineers improve existing technologies or develop new ones to increase their benefits (e.g., better artificial limbs), decrease known risks (e.g., seatbelts in cars), and meet societal demands (e.g., cell phones). (4-ESS3-2) Engineers improve existing technologies or develop new ones. (secondary) (4-PS3-4) Over time, people’s needs and wants change, as do their demands for new and improved technologies. (secondary) (4-ESS3-1) Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)
5	<ul style="list-style-type: none"> Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (5-ESS3-1)

K-12 Conceptual Vertical Articulation of ETS2 – Links Among Engineering, Technology, Science, and Society

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6	<ul style="list-style-type: none"> The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (6-ESS3-2)
7	<ul style="list-style-type: none"> The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (7-PS1-3) All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (7-ESS3-1) (7-ESS3-3) (7-ESS3-4) (7-ESS3-5)
8	<ul style="list-style-type: none"> The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (8-PS2-1) Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (8-PS4-3)

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<p>Biology</p>	<ul style="list-style-type: none"> The understanding of evolutionary relationships has recently been greatly accelerated by using new molecular tools to study biology. (B-LS4-1) Modern civilization depends on major technological systems, including those related to agriculture, health, water, energy, transportation (e.g., wildlife corridors), manufacturing, construction, and communications. (secondary) Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (secondary) (B-LS4-6)
<p>Chemistry</p>	<ul style="list-style-type: none"> Modern civilization depends on major technological systems. (secondary) (C-PS4-5)
<p>Physics</p>	<ul style="list-style-type: none"> Modern civilization depends on major technological systems which can have deep impacts on society and the environment. (secondary) (P-PS2-6) (P-PS3-3) (P-PS4-2) (P-PS4-5)
<p>Earth and Space Science</p>	<ul style="list-style-type: none"> Modern civilization depends on major technological systems. (secondary) (E-ESS3-1) (E-ESS3-3) (E-ESS3-7) New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (secondary) (E-ESS2-2) (E-ESS3-3) Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. Analysis of costs and benefits is a critical aspect of decisions about technology. (secondary) (E-ESS3-2)

Adapted from *The Framework for K-12 Science Education* and the *Next Generation Science Standards*.

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References:

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.

NGSS Lead States. (2013). *Next Generation Science Standards: For States, By States (Appendix I: Engineering Design in the NGSS)*. Retrieved from <https://www.nextgenscience.org/>