

Physical Science, Properties of Matter

Place-Based Project Ideas:

Place-based education involves students with local culture, ecology, landscapes, opportunities, and experiences so they can connect science concepts they are learning to something they know already, and to something that matters to them. Research shows that place based education helps students learn, invites students to become active citizens, transforms school culture, and connects schools with the community*. These project ideas are included to get teachers and students thinking about ways to make science education relevant to the place in which they live. This is only a starting place; the list is certainly not exhaustive, and teachers are invited to continue adding, sharing and building the list.

These ideas were developed with the Yukon Flats School District in mind. Other districts using the Yukon Flats curriculum resource should adapt the list of ideas to fit their own district and region.

*Place-based Education Evaluation Collaborative. 2010. The Benefits of Place-based Education: A Report from the Place-based Education Evaluation Collaborative (Second Edition). Retrieved 5/16/11 from <http://tinyurl.com/PEECBrochure>.

Project Idea:

Fires in Your Community

What are some examples of questions students can investigate, and projects students can do, related to the concepts of properties of matter?

Which common materials (e.g., paper, foam, cloth, vinyl) produce the worst smoke/air pollution when burned?

Examine the effects of ash on soil composition.

What chemicals can react to cause fire?

Which weight is greater, that of the product of combustion or that of the starting material?

Which substances will burn the fastest?

Determine which flame-retardant chemical would best prevent combustion of various species of local trees (or various types of construction materials).

Which fire retarding treatment would best protect a structure from wildfires?

Find a soap that can be combined with water to create an inexpensive fire retardant.

Test the effectiveness of fire-fighting gels.

What type of wood burns fastest?

What type of wood burns hottest?

How fast will objects burn with different levels of oxygen?

Test the flammability of different fabrics.

What are some traditional ways of extinguishing fires?

What common materials can be used to make homemade fire extinguishers?

Possible Resources:

Local firefighters or Public Safety Officers

BLM Alaska Fire Service <http://fire.ak.blm.gov/afs/>

AK Department of Public Safety – Office of Rural Fire Protection <http://www.dps.state.ak.us/fire/teb/ruralfireprotection.aspx>

Alaska Department of Health and Social Services Fire Safety Program

http://www.hss.state.ak.us/dph/chronic/injury_prevention/fire/program.htm

Raven Island – A fire safety video game developed for rural Alaska students <http://g.whyville.net/smmk/spark/gates>

Alaska Native Tribal Health Consortium Focus on Safety Curriculum <http://www.anthc.org/chs/wp/injprev/focus-on-safety.cfm>

National Fire Protection Association <http://www.nfpa.org/index.asp>

Alaska State Fire Marshal's Office Jodie Hettrick, Public Ed. Director 5700 E. Tudor Road Anchorage, AK 99507 907-269-5052

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USFWS Role of Fire in Alaska Curriculum Guide <http://alaska.fws.gov/nwr/visitor/fire/curriculum.htm>

Connections to other units and concepts:
and Fire

Year 2 Life Science: Ecosystems and Role of Fire

Year 3 Physical Science: Energy

Project Idea:

Water, Rivers and Ice

What are some examples of questions students can investigate, and projects students can do, related to the concepts of properties of matter?

Does frozen water take up more space than liquid water?

Does ice melt at a rate proportional to its surface area?

Why don't oceans freeze completely in the winter, but some rivers do?

How does the freezing point of pure water compare to that of water

With salt or other additives?

What causes overflow?

When is river ice safe for walking? Skating? Snow-machining? Driving?

Observations of break-up and freeze-up on the river

Do currents affect the rate of freezing?

How can you predict break-up?

Why is some ice clear and some ice cloudy?

What are some of the gasses that are trapped in ice?

How can we keep things cold in the summer?

Possible Resources:

Water and Ice Molecular Information http://www.edinformatics.com/math_science/info_water.htm and http://www.edinformatics.com/math_science/ice_java.htm

Water for Kids <http://www.sciencekids.co.nz/water.html>

Ice Thickness Safety Guidelines <http://www.dnr.state.mn.us/safety/ice/thickness.html>

NASA visualization sites (Sam)

Connections to other units and concepts: Year 1 Earth Science: Water Cycle, Weather Year 2 Earth Science, Forces that Shape the Earth (permafrost, erosion by river ice) Year 3: Physical Science: Energy (Hydropower)

Project Idea: Environmental Pollution
What are some examples of questions students can investigate, and projects students can do, related to the concepts of properties of matter?
<p>Does boiling remove all the contaminants from water?</p> <p>Invent and test methods of filtering water.</p> <p>Test the pH levels of water from different sources (bottled, tap, river, rain etc).</p> <p>Which method of water purification is most effective for chemicals? Heavy metals? Bacteria?</p> <p>What is the effect of certain chemicals on algae growth?</p> <p>How closely does the pH of soil relate to the pH of the water around the soil? Which types of soils resist pH changes from pollution the best?</p> <p>What are some natural herbicides, pesticides, or algicides? How effective are they? How safe are they for the environment?</p> <p>What might you do to detoxify run-off?</p> <p>Do the chemical preservatives used in packaging break down or do they remain in soil after the packaging has been composted?</p> <p>Types and sources of water pollution in the village.</p> <p>Water quality monitoring projects.</p> <p>Contaminants introduced by migrating animals (salmon, caribou).</p> <p>Bio-magnification of contaminants</p>
<p>Possible Resources:</p> <p>Water Quality Testing resources http://www.eeweek.org/resources/water_quality.htm</p> <p>Interview with Native scientist LaOna DeWilde, includes a short discussion of water sampling and monitoring, http://www.teachersdomain.org/resource/ean08.sci.life.eco.dewilde/</p> <p>GLOBE Hydrology Chapter http://classic.globe.gov/tctg/tgchapter.jsp?sectionId=143&lang=EN</p>
Connections to other units and concepts: Year 1 Earth Science: Water Cycle, Weather Year 2 Life Science Ecosystems

<p>Project Idea: Dealing With Trash</p>
<p>What are some examples of questions students can investigate, and projects students can do, related to the concepts of properties of matter?</p>
<p>How much trash does the school generate in one week? How can it be categorized? How can trash be reduced?</p> <p>Composting projects</p> <p>Manufacturing a useful product from discarded materials.</p> <p>Research a product's history and future - material sources, manufacturing, transportation, use, potential reuse or recycling, decomposition properties - example products: piece of paper, plastic bag, toothbrush, can of coke, loaf of bread, compact disc, water bottle</p> <p>Compare decomposition processes required to break down organics, plastics, metals, chemicals</p> <p>Create practical biodegradable packaging materials with varying concentrations of glycerin and different types of starch.</p> <p>What kinds of garbage breakdown fastest, the most, and the easiest?</p> <p>Investigate what happens to the community's trash</p> <p>Does recycled paper break down faster than new paper?</p> <p>Test how biodegradable different materials are.</p> <p>Evaluate burning of trash as an alternative to landfills.</p> <p>Compare paper bags and plastic bags: speed of decomposition, cost and impact of manufacturing, re-use and recycling.</p> <p>Which kind of trash, when burned, creates the most heat?</p> <p>From trash to gas: Compare the amount of biogas that is produced from different types of biomass.</p> <p>Human waste solutions</p> <p>Designing landfills to minimize contamination and other problems</p>
<p>Possible Resources:</p> <p>Science Fair Fun: Designing Environmental Science Projects www.epa.gov/osw/education/pdfs/sciencefair.pdf</p> <p>Kids Recycling Page http://www.ecy.wa.gov/programs/swfa/kidspage/</p> <p>National Institute of Environmental Health Kid's Page http://kids.niehs.nih.gov/recycle.htm</p> <p>EPA Environmental Kids Club – Garbage and Recycling http://www.epa.gov/kids/garbage.htm</p>
<p>Connections to other units and concepts: Year 3 Physical Science, Energy (energy to produce and transport materials), Year 2 Life Science Ecosystems – effects of trash on ecosystem</p>