

## Society and Technology Tips

The section in the Graded Course of Study for Science on **Society and Technology** is new to us with this revision. It is based on the Ohio state standards for science, and includes items dealing with scientific inquiry (the scientific method), scientific ways of knowing, and the interconnection of science and technology. **Following are some ideas to help teachers “flesh out” the society and technology objectives at the various grade levels.**

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### Kindergarten:

#27 Examples of “What would happen if” questions:

- Dogs and cats didn't have fur?
- Fish had legs?
- Snakes had feet?
- The sun shown all the time (no night)?
- It only rained four times a year?
- It rained every day?
- Ice never melted?
- Nothing would float?
- Everything would float?
- Nothing was magnetic?
- Everything was magnetic?

#29 Why some materials are better suited to a purpose than others:

- Would you make a real boat out of cloth? Cardboard? Plastic? Rubber? Why or why not?
- Would you make a cooking pot out of paper? plastic? Rubber? China (like a cup)? Why or why not?
- Would you make a car tire out of plastic? Metal? China? Why or why not?
- Ask students to pose similar questions

### Grade 1

#37 Ways people use science:

- Predict weather, temperature, (know what to wear), prepare for emergencies - tornadoes, hurricanes, floods
- Cooking (baking, boiling, microwaving -- heat transference)
- Heating, cooling homes
- Cleaning products
- Entertainment - computers, DVDs, radios, iPods, etc.

### Grade 2

#45 Examples of “How do you know” questions to generate reasoned answers:

- When it's time to eat? Go to bed?
- When to bring an umbrella to school?
- When to wear a jacket (boots, gloves, etc.)?
- What to put juice in to bring to school?
- What makes a good cage for an animal? (consider size, ease of cleaning, type of pet)

- Who to ask for help with homework?
- Who to talk to if you get lost?
- What to do if you have a toothache? A cut?

#47 Why people invent new things - make work easier, more convenient, more mobile, cheaper.

#48 How new inventions might affect other people or the environment - eliminate some businesses, establish new ones; create more jobs/lose some jobs; create more waste (old computers and electronic gadgets, batteries), save resources; make work easier or faster.

### Grade 3:

#46 Re-design a common object -- design (draw) a different kind of doghouse, telephone, car, chair, bed, clothes hanger, etc. How might your design be better?

#47 Observe, record, interpret data - can be fulfilled by #21, or use in connection with #46. Tell why you thought of the new design, what you wanted it to do/work, how you decided to make it the way you did. Keep notes on what you did or how things changed as you worked on your design.

#48 Read, interpret data from others - have students share their notes from #46/47 or form an earlier activity/experiment. Would they draw the same conclusions? Is there another way to interpret the data? Was something not accounted for that might have affected the outcome?

#49 Analyze a series of events - to predict future occurrence. #22 would serve well for this one. Series of events - signs of fall leading to winter, spring coming, winter fading; clouds forming before rainfall; seeds sprouting, trees budding; robins returning, squirrels gathering nuts, etc.

#50 How technology has improved life - generally made communication faster, more convenient; transportation faster, more comfortable (AC in cars), safer; food labels more informative; medicines to counter various illnesses; computer games, videos, DVDs, etc. in entertainment area.

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### Grade 4:

#35 Positive and negative effects of human activity - this could easily be incorporated in discussion of various ecosystems. Basically, any disturbance of the ecosystem by human action will have some effect, ex: introducing non-native plants, animals could endanger native ones; taking large numbers/amounts of natural resources from an area can deplete it and harm the inhabitants/environment.

#36 Technology extends human abilities through enhancing vision (magnifiers of many sorts, including Hubble); laser surgeries, able to get into delicate areas like eyes and heart; machinery for building roads, bridges, structures of any sort replace limited people-power; hearing aids, amplifiers extend ability to hear, etc.

#37 Purpose here is to give students experience in either design or conducting an investigation.

#38 Potential hazards include anything that would harm or injure the investigator or people or material around it. Safety procedures for care of eyes (wearing protective goggles), washing hands, avoiding contact with caustic materials, handling and disposing of chemicals properly; see Appendix A of Graded Course of Study.

#41 Why records are important - for analyzing results, replicating study, verifying outcome.

#42 Why ability to replicate? To verify outcome as result of actual procedure or material tested rather than investigator's prejudice or interference.

#### Grade 5:

#53 Use a design process for solving a problem: possible "problems" - keep bees out of a soft drink can or glass; keep sun out of car driver's eyes; help for someone who is unsteady on his feet; clothes for a person who must climb trees in cold weather; Keeping warm at a winter football game, etc.

#57 Differentiate fact/opinion in scientific claims - is the claim based on clear evidence? Could the "evidence" be manipulated by the investigator? Is the investigator assuming something to start with (that a plant won't grow, or that there will be so much sunlight or water available)? Does the investigation really address the problem and solve it? Could the results be attributed to another factor? Has the investigator given enough evidence to support his conclusion - has he checked out all the possible explanations?

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#### Grade 6:

#39 Helpful and harmful results of technology -- besides pesticides, increasing the speed of cars can be helpful and harmful; cell phones depending on where/how one uses them; computers - carpal tunnel syndrome, obesity, etc.

#42 Basically, automation has eliminated manual jobs, but may have made work safer, possibly faster, more uniformly correct (fewer human errors). Fewer people produce more product.

#43 Depending on the resources the investigation involves (plants, animals, chemicals, DNA, etc) and what the researcher is trying to investigate; how fast a plant grows, how much it produces, or how resistant it might be to disease would entail a different process of investigation.

#45 Students often think the only good experiment is the one that proves their point. Help them to see that outcomes that do NOT support the hypothesis actually tell them a lot, and these are not "failures" but contribute to the knowledge to finding "the answer." Thomas Edison's repeated "failures" inventing the light bulb are particularly pertinent.

## Grade 7:

- #52 Other examples include higher costs for environmentally friendly buildings, landscapes, but more benefit to the environment in the long run; higher cost of hybrid cars, energy saving light bulbs, etc. Generally, the environmentally friendly options cost more initially, but will benefit earth, and often will be more economical in the long run.
- #53 How variables and controls affect an investigation: if variables are not identified and controlled, the researcher can never be sure the results occurred because of the factor he/she might have identified, or were due to unidentified and uncontrolled factors.
- #54 Identify variables and how to control for them: the investigation itself need not be carried out, but the discussion should clarify that if the variables are left uncontrolled, the investigation may well be invalid.
- #55 Ask students for examples of what someone might conclude from an investigation that might not be substantiated by the evidence (attributing growth to one factor if all factors are not controlled; applying the result of an experiment on plants to animals as well; .
- #56 Why ability to replicate? To verify outcome as result of actual procedure or material tested rather than investigator's prejudice, incompetence or interference.

## Grade 8:

- #61 How various factors influence technology: if natural resources are not available or too costly, they will limit the use of technology; the infrastructure of an area may make transportation, communication or dissemination of the technology problematic; the government might prohibit or overly tax the technology, keep it hidden from the public, or develop it for its own use exclusively. The internet and GPS technologies were originally developed for military use and later opened to the public.
- #62 Students could refer to any forms of data. What data is represented, what is not? What questions might be answered using this data? What conclusions might one draw from it? What questions does it raise?
- #64 A small or unrepresentative sample may greatly skew the results of an investigation, esp. if the sample involves human beings. If one class of eighth graders uses a new math book and another class uses a different book, could one conclude that if the first group gets higher scores on a test, it is because of the new book? What other factors might be involved?
- #65 Trying something new often involves a risk (it may or may not work, might have bad side effects, might harm the subject), but the benefit (the good that might come from it) could make the risk worth taking. If someone developed a vaccination for the common cold, but it might make you more susceptible to pneumonia, would you get vaccinated?

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