**Wilmette Public Schools, District 39**
**Science Curriculum, Grade 4**
***Essential Question:*** Are changes predictable?

**Unit:** Electricity and Magnetism
**Time Frame (in weeks):** 12 weeks

**VOCABULARY**: electricity, magnetism, parallel, series, circuit (closed/open), conductor, insulator, energy, transfer, heat, light, battery, magnetic field, diode, filament, short circuit, Fahnestock clip, switch, ampere, semiconductor

**National Standards or Core Standards**
Transfer of energy within and between systems never changes the total amount of energy, but energy tends to become more dispersed, energy availability regulates what can occur in a process.
Electricity can produce motion, sound, heat or light.
Electric current can transport energy from place to place through wires.
Electricity, sound, heat and light are all forms of energy.
We need electricity to make heat and light in our homes, and to run small machines. We get it from power lines or from batteries.
Magnets are accompanied by magnetic fields that can exert forces on other magnets or transfer energy from one to another.

| | Guiding Questions | Big Ideas of Science | Assessments of Knowledge and Skills | Teaching Resources & Technology |
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| **Core Ideas** | What happens to the parts of a system when the system changes?<br><br>What is the role of a circuit?<br><br>Where can you find evidence of parallel and series circuits in your world?<br><br>How can we apply our understanding of circuits to technological design problems?<br><br>What do electricity and magnetism have in common?<br><br>How can we conserve energy? | **Systems**<br>A system can appear to be unchanging when flows or processes we cannot see are going on in opposite but equal rates.<br>Systems can change in many patterns over time. A process may move in one direction, shift back and forth, or repeat in cyclical pattern (e.g., day and night or weight on a spring).<br><br>**Electricity and Magnetism**<br>Electricity can produce motion, sound, heat or light. Electricity, sound, heat and light are all forms of energy.<br>Electric current can transport energy from place to place through wires.<br>Magnets are accompanied by magnetic fields that can exert forces on other magnets and transfer energy from one to the other<br>Electrically charged materials can pull or push other material even without touching them.<br>Batteries are transportable energy storage devices. Electrical energy is distributed via the power grid.<br>Food, fuel and electric power can be moved from place to place to provide energy where needed.<br>Machines can convert energy from one form to another or can help transfer energy to produce motion, heat, or light.<br>Conductors and insulators play an important part in electrical systems<br>Parallel and series circuits have similarities and differences<br>Electricity and magnetism are both forces<br>Humans can impact the consumption of energy by turning off lights, turning down the thermostat, turning down the water heater, installing new windows, purchasing energy-efficient appliances, etc. systems can have positive and negative effects. | **Summative Assessment**<br>Create a schematic drawing to plan electrical wiring for lighting for a multiple room house. Construct a working model based on your schematic drawing. (*Lessons 15 and 16)*<br>**Formative Assessments**<br>Explain how changes in a system affects its parts.<br>Build series and parallel circuits using insulators and conductors<br>Compare and contrast parallel and series circuits<br>Classify materials as conductors and insulators<br>**Utilize the STC Planner, Teacher Guide, and Assessment Handbook to choose assessments appropriate for your students*<br><br>**Summative Assessment**<br>Complete an energy assessment of your home. Explain, using specific examples, how your family can reduce energy consumption.<br>**Formative Assessments**<br>Complete energy assessment organizer | **CORE MATERIALS**<br><br>*STC Electric Circuit Unit Kit<br>STC BOOK: Electric Circuits,<br>STC Planner Electric Circuits<br>Literacy Enhancement: Thomas Edison<br><br>National Gepgraphic Understanding Electricity 6-Pack<br>The Mystery of Magnets 6-Pack<br>Introduction to Energy 6-Pack |

| | Guiding Questions | Big Ideas of Science | CONNECTED/21st Century Learning |
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| Scientific and Engineering Practices | What is the nature of scientific inquiry?<br><br>How to scientists go about their work?<br><br>What is technology and how does technological development shape our world?<br><br>How is technology created?<br><br>How are technological problems defined and researched?<br><br>How can a problem be stated so that it can be solved?<br><br>How have others solved similar problems?<br><br>What are technological systems and how can they best be modeled and improved?<br><br>How can drawings be used to show the way things fit together?<br><br>How can creative solutions be developed, clearly expressed, and evaluated?<br><br>How can the best possible solution be developed to solve a technological problem?<br><br>Why are controls needed?<br><br>How do theories become accepted or refuted?<br><br>What is the relationship of scientific claims to evidence? | Scientific inquiry is a dynamic process that is not limited to one scientific method.<br><br>Inquiry engages learners in asking scientifically oriented questions, gathering and prioritizing evidence, formulating explanations, making connections to scientific knowledge and communicating and justifying explanations.<br><br>Inquiry leads to new questions.<br>Technology is a class of designed systems, products, or processes. The designed world is constantly changing as new technologies, tools, and materials are developed.<br>Anyone can modify a technology, invent a new application of technology or make a new product (e.g. invent a new toy, make a dollhouse, or paper airplane) by thinking about what they want to do, gathering the right knowledge and skills, and trying different ways of working until they succeed.<br>The first step to solving technological problems is to define the problem in terms of criteria and constraints or limits. It is important to find out how others have solved similar problems and to learn more about the nature of the problem itself.<br>Systems analysis and modeling are key tools in designing, troubleshooting and maintaining technological systems.<br>The more clearly a technological problem is stated in this way the easier it is to design and compare possible solutions.<br>Working together and expressing ideas in words, sketches, and models are helpful in coming up with different solutions to technological problems.<br>After developing several solutions, the best solution can be chosen by comparing each of the solutions with the criteria and constraints developed to define the problem to see which meets them best.<br>Solutions to design problems need to be tested and redesigned several times to arrive at the best available solution.<br>Many products have built in components with feedback control systems (e.g. airbag in car triggered by collision).<br>Science is an imaginative endeavor that is subject to modification as new information challenges current theories. It involves the collection of data, the use of logical reasoning, argumentation and the devising of hypotheses and explanations informed by evidence.<br>Scientists keep honest/unbiased, clear and accurate records, value hypotheses and understand that more than one explanation can be given for the same evidence.<br>Scientists use a variety of tools to inform their observations.<br>Scientists organize information using tables, graphs, diagrams and symbols.<br>Scientists question claims based on vague attributions and are skeptical of arguments based on small data samples.<br>Scientists embrace unexpected results. | Nourishing a sense of **social responsibility**<br>-flexible grouping<br>-responding to real world problems<br><br>Empowering **communication** skills<br>-writing experiences<br>- science notebooks<br><br>Cultivating **collaboration**<br>-small group work<br>-problem solving |