Teacher Work Sample

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4th Grade

Electricity

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Contextual Factors

District/Community/School Factors: Camden Station Elementary is located in Crestwood, Kentucky. Crestwood is a rural community of about 2,000. The population of Camden Station Elementary is 553, kindergarten through fifth grade. The racial/ethnic makeup is: 4% African American, <1% Asian, <1% Hispanic, 95% White.

Classroom Factors: The classroom is a larger classroom and includes six student tables, two student center areas, desk for the teacher, side table for an aide, and a cubby/mailbox area for the students. Two student computers are in the room for internet access during center time or any free time the students might receive throughout the day. A hookup from one of the computers to a projector/screen allows for the whole class to view Internet websites or presentations the teacher might give during the course of the day.

This class is a fourth grade class. All students remain in the classroom for the entire day. Students are put into ability levels for small group reading. During center rotation, a group of five students rotate each day to five center activities set up around the classroom. The morning activities include: morning work, silent reading, center time, then writer's workshop. There is twenty-five minutes of recess after lunch, which is at 10:51. Then, afternoon activities are always the same: related arts, math, and science.

The teacher created in-class procedures that the students often have to be reminded of. The discipline is to have students sign their card listing the misbehavior. Three times to sign his or her card and the student gets a note to send home to the parent for a signature. There is very little parental involvement in the classroom. The majority help their children with homework, and very few come for field trips, but there are no volunteers to help in the classroom. There is, however, great participation in the PTA.

Student Characteristics: There are 22 students, 10 girls and 12 boys. The students' age range is from 9-10. All students are white. Three of the students are below grade level in math and reading, five are listed as gifted, and the remaining students in the class are on grade level across the content areas. Most of the students have been introduced to electricity, but do not know how to create circuits.

Most of the students in the class are visual and kinesthetic learners. A learning style inventory was administered, and the results showed that half of the students are strongest in the bodily/kinesthetic intelligence and logical/mathematical intelligence. Even though my students are older, they have a shorter attention span. They cannot sit much longer than 35-40 minutes. They are interested in any lessons that include hands-on activities.

One student has an IEP due to mild ADD. However, no instructional modifications are listed on his IEP. There are no ESS students.

Instructional Implications: My students are very kinesthetic learners. I will have to incorporate hands-on lessons in most of my lessons. Many of my students are also visual, so I will provide presentations and pictures as well as concrete examples when necessary. The easy access to classroom viewing of computer applications will allow me to take advantage of PowerPoint and the Internet in order to provide students with more content experiences.

Learning Goals

Learning Goal 1 (LG 1): The student will evaluate (evaluation) a variety of representations or electrical circuits and explain why the circuits work.

Program of Studies Alignment – SC-4-ET-S-3: Students will demonstrate open and closed circuits, and series and parallel circuits using batteries, bulbs and wires; analyze models of a variety of electrical circuits in order to predict changes to the systems.

Core Content Alignment – SC-04-4.6.3: Students will evaluate a variety of models/representations of electrical circuits (open, closed, series and/or parallel) to: make

predictions related to changes in the systems; compare the properties of conducting and non-conducting materials.

(LG 1 aligns with these standards because students will be learning about the many electrical circuits and exploring what happens when changes are made to the circuits.)

Learning Goal 2 (LG 2): The student will make predictions (synthesis) related to the changes in an electrical circuit.

Program of Studies Alignment - SC-4-ET-S-3: Students will demonstrate open and closed circuits, and series and parallel circuits using batteries, bulbs and wires; analyze models of a variety of electrical circuits in order to predict changes to the systems.

Core Content Alignment – SC-04-4.6.3: Students will evaluate a variety of models/representations of electrical circuits (open, closed, series and/or parallel) to: make predictions related to changes in the systems; compare the properties of conducting and non-conducting materials.

(LG 2 aligns with these standards because the students will be learning how changes can affect electrical circuits.)

Learning Goal 3 (LG 3): The student will compare (analysis) the properties of conducting and non-conducting materials.

Program of Studies Alignment – SC-4-ET-S-6: Students will design and conduct experiments/investigations to compare properties of conducting and non-conducting materials, documenting and communicating observations, designs, procedures and results of scientific investigations.

Core Content Alignment – SC-04-4.6.3: Students will evaluate a variety of models/representations of electrical circuits (open, closed, series and/or parallel) to: make

predictions related to changes in the systems; compare the properties of conducting and non-conducting materials.

(LG 3 aligns with these standards because students will be learning about conductors and non-conductors and how these change the electrical circuits.)

Three levels of Bloom's Taxonomy are included in these learning goals. LG 3 requires students to break down information and make conclusions about what is a conductor made of and what is a non-conductor made of; LG 2 requires the student to put what they have learned about electrical circuits together to conclude a pattern about the changes in an electrical circuit; and LG 1 requires the higher level skill of evaluation in order to be able to test and verify various representations of electrical circuits and then tell why they work.

These goals are designed around the contextual factors of my classroom. They are developmentally appropriate for 4th grade students because they are designed to keep going with their prior knowledge about electricity and are implemented as real-life applications. These goals were made to incorporate hands-on activities. They include a great deal into the content, but the students will not have to learn this content in a formal classroom setting. These goals include higher level thinking skills to put into effect the concepts taught and to provide many challenging opportunities for knowledge about the content. The learning goals are also designed to adapt to the primary learning styles of the students: each lesson will include visual displays and hands-on activities for the visual and kinesthetic learners, and will also include higher order thinking for the logical learners.

Assessment Plan

Overview:

Learning Goal	Assessment	Format of Assessment	Adaptations
LG 1	Pre-Assessment	Pencil-Paper (multiple choice, short answer, and open response) Questions: 6, 7, 14	Allow more time for students on test. Proximity to keep students on task.
	Formative Assessment	Questioning and observation; Writing to Learn; Whole group brainstorming with compare and contrast chart on parallel and series circuits	Provide concrete models for student skill practice. Have students use drawings to expand on written answers. Work in groups. Proximity to keep students on task. Review and reinforce throughout unit.
	Post Assessment	Pencil-Paper (multiple choice and open response) Questions: 1, 6, 9, 17	Allow more time for students on test. Proximity to keep students on task.
LG 2	Pre-Assessment	Pencil-Paper (multiple choice, short answer, and open response) Questions: 10, 17	Allow more time for students on test. Proximity to keep students on task.
	Formative Assessment	Questioning and observation; Writing to Learn; Multiple lab hand-outs; review game	Provide concrete models for student skill practice. Have students use drawings to expand on written answers. Proximity to keep students on task. Review and reinforce throughout unit.
	Post Assessment	Pencil-Paper (multiple choice and open response) Questions: 3, 4, 5, 17	Allow more time for students on test. Proximity to keep students on task.

LG 3	Pre-Assessment	Pencil-Paper (multiple choice, short answer, and open response) Questions: 1, 8, 9	Allow more time for students on test. Proximity to keep students on task.
	Formative Assessment	Questioning and observation; Conductors handout; Writing to Learn; Magnets handout; review game	Provide concrete models for student skill practice. Incorporate online activity to increase interest. Show examples of what is expected for each activity. Proximity to keep students on task. Review and reinforce throughout unit.
	Post-Assessment	Pencil-Paper (multiple choice and open response) Questions: 2, 7, 8	Allow more time for students on test.

[See Appendix A for the pre-test with related rubric and Appendix B for the post-test and related rubric.]

My pre-test and post-test are very different. After I had given the pre-test, my fourth grade team said we needed to split this part of the unit into two tests. So, I had to change my learning goals, lessons, and post-test. On the pre-test, questions 6, 7, and 14 align with LG 1. In these questions, the students had to decide between different circuits, then choose the answer, and on question 14 they had to explain their answer. LG 2 deals with making predictions based on information given and how they think they circuit will work. Questions 10 and 17 assessed the students on LG 2. Question 17 was the open response question asking students what would happen if a certain kind of circuit was used. In questions 1, 8, and 9, the students had to know the difference between a conductor and an insulator, which aligns with LG 3.

The pre-test consisted of ten multiple choice questions, four short answer questions, and one open response. There were 3 points related to LG 1, 5 points related to LG 2, and 3 points related to LG 3. The multiple choice and short answer questions were evaluated using a key, and the open response was scored using a rubric. Since there were so little points per learning goal, the mastery criteria were very high. The mastery criteria for LG 1 was 2 out of 3 points (100%); the mastery criteria for LG 2 was 1 out of 2 points (50%); and the mastery criteria for LG 3 was 3 out of 3 points (100%). The mastery criteria for the entire assessment was 6 out of 8 points (75%).

For the post-test, I had to follow the school's criteria for the test. The students could not be tested with short answers, true/false, or matching questions. It was strictly a multiple choice test with one open response. Questions 1, 6, 9 and the open response related to LG 1. In these questions, they had to judge information within the question in order to find the correct answer. Questions 3, 4, 5, and the open response were related to LG 2. In these questions, the student had to use the information in the problem to predict weather the circuit will work. LG 3 has the students comparing conductors and non-conductors, and questions 2, 7, and 8 relates to this goal.

There were 5 points related to LG 1, 5 points related to LG 2, and 3 points related to LG 3. Seven of the questions were review questions, which is also criteria related to the school's policy. All of this makes for a total of 20 points on the post-test. The multiple choice questions were evaluated using a key, and the open response part was scored using a rubric. The mastery criteria for LG 1 was 4 out of 5 points (80%), the mastery criteria for LG 2 was 4 out of 5 points (80%); and the mastery criteria for LG 3

was 3 out of 3 points (100%). The mastery criteria for the entire assessment was 17 out of 20 points (85%).

My formative assessment will be primarily based around questioning and observation during group activities and a collection of independent practice activities. Each lesson will include a class discussion that can assess comprehension of the content being taught. Discussions about earlier taught lessons will also be used as a formative assessment tool. Through this assessment, I can question students so they can explain in their own words and think about how they view the concepts. Also, at the end of most lessons, I will have a writing to learn activity for students to complete as independent practice. This is a more formal assessment that will give me a way to see where students are in the understanding and can provide a great source for the review that will be done at the end of the unit. The review game will also allow me to do any last-minute explanations that need to be addressed before the post-test.

Design for Instruction

Ten students achieved the mastery criteria for LG 1, which average score being only 43%; four students achieved mastery level for LG 2, with an average score being a very low 11%; and nine students achieved mastery criteria for LG 3 which average score was a very high 85%.

From these results, I can see that the some of the concepts I plan to teach are concepts that my students have not mastered yet. However, they have seemed to master one of my concepts, but I will still go over this concept because it is a vital part to the unit. Since most students mastered LG 3, I will not spend as much time on it as I would LG 2 and LG 1. Also, most of the students have seen this content before in previous

grades. So I will need to create lessons that focus on basic comprehension of the material, but the lessons must still create some challenging opportunities to promote higher order thinking. Through class discussions and hands-on activities, those students who do not fully grasp the concept can learn from the other students' experiences. Those who help others are also at an advantage because they will recall and explain their prior knowledge. I will need to make sure LG 2 is covered a great deal since most students scored the lowest in that area.

Overview:

Date	**Lesson Number**	**Instructional Strategy/Activity**	**Learning Outcome(s) Addresses**	**Assessment(s) Related to Outcome(s)**
Day 1	Pre-Assessment	Pre-Test	All Learning Goals	
Day 2	Electricity Introduction	*"Dancing Oatmeal" *Lab Chart	Learning Goal 2	Complete pictures and questions on lab hand-out. Allow time for any questions and sharing.
Day 3	Electricity in a Circuit	*"Magic School Bus Gets Charged" *Build a simple circuit	Learning Goals 1 and 2	Observation and questioning. Provide concrete models for students to see. Writing to Learn
Day 4	Switch in a Circuit	*Circle Circuit *Build a simple circuit with a switch	Learning Goals 1 and 2	Provide a concrete model for students to see. Observation and questioning. Writing to Learn. Review and reinforce throughout the unit.
Day 5	Conductors and Non-Conductors	*Online Activity	Learning Goal 3	Online Quiz at the end Allow time for questions. Review and reinforce throughout the unit.
Day	Finish	*Testing Conductors	All	Hand-out on conductors

6	Conductors and Non-Conductors Series Circuit	and Non-Conductors *Build a series circuit	Learning Goals	and non-conductors. Do one example with the students so they will have a model. Model series circuit. Reinforce throughout the unit.
Day 7	Parallel Circuit Comparing Parallel and Series Circuits	*Build a parallel circuit *Compare/Contrast Chart	Learning Goal 1	Model parallel circuit for a concrete example. Whole group brainstorming with compare and contrast chart. Writing to learn activity.
Day 8	Magnet Review	*"Magnet Muscle" *"Stop Pushing Me" *Online Activity	Learning Goal 3	Go over online quiz after the activity as a class. Complete the magnet and muscle and stop pushing me activities. Writing to Learn.
Day 9	Review	*Jeopardy	All Learning Goals	Questions and answers. Allow students any time to ask any questions before taking the test the following day.
Day 10	Post-Assessment	Post-Test	All Learning Goals	

Three activities included in the lessons are detailed.

Activity One

One activity I am designing for my electricity unit is building a simple circuit. This activity will be part of my day 3 lesson on open and closed circuits. This concept is related to LG 1 and LG 2 because they are building different circuits and will make predictions to see if the circuit will or will not work. Then they are to explain why this happened. Very few students knew what an open and closed circuit was on the pre-test, so I know this is a concept that will need to be given more focus since it is the base of the entire unit. Because my students need more hands-on activities and visual examples, I

decided I would hand groups of students the materials to make a circuit, then tell them experiment and manipulate the materials until the light bulb was lit. All students will have an opportunity to use all of the materials. I will assess their learning by observation and a writing to learn prompt.

Activity Two

Another activity that I plan on using is an online activity testing conductors and non-conductors. Knowing these is part of the skills needed for LG 3. Students scored the best on this learning goal in my pre-test, but since it is such a detrimental skill, conductors and insulators need to be covered. I will first explain and read the directions to the students before beginning. Then, in their science notebooks, they will predict which items are conductors and which are non-conductors. Their predictions will then be tested in the activity. I will let most of the students use the interactive mouse pad to switch out a variety of materials in the electrical circuit. Then, we will go through as a class answering any questions they might have about different items. We will then follow up the lesson with the online quiz at the end of the activity. Students can run to the four corners of the room of the answer they think is correct. This allows them to get up during the period. I will assess this activity by following the students to see which ones can correctly answer the questions or which ones are just following the crowd to the corner of the room.

Activity Three

A third activity I will use in my unit is a lesson on comparing and contrasting parallel and series circuits. They will start working in groups to build a parallel and a series circuit. This lesson is only focused on LG 1 because the students have to examine

two types of circuits, and then tell why each one works a different way than the other. Students did not do very well on this area on the pre-test. Each group will have enough materials to construct both. Then, they will work as a group to spot the similarities and differences between the two circuits and complete the Venn Diagram that will be given to them. To finish the lesson, they will have to answer a writing to learn on their own. This lesson focuses on Gardner's interpersonal intelligence because the students are working in groups as well as logical/mathematical and bodily/kinesthetic. I will assess students by observation, the completed charts, and the writing to learn entry.

Technology

Technology is used throughout the planning process. I used many resources on the Internet. Most of the information on the Internet is very up to date, that is why I chose to use this instead of the science textbook. My teacher has also suggested that I use the Microsoft Word and the projector to put on the screen their writing to learn prompts so everyone will be able to see it. I will use United Streaming to show a video clip of the *Magic School Bus*. I have also planned to incorporate online activities to project onto the screen, such as the BBC website for science.

Instructional Decision-Making

One of the instructional decisions came during my fourth lesson about switches in a simple circuit. I had begun the lesson by telling them a switch breaks the circuit by opening up the circuit. We related the switch to a drawbridge and cars, and the kids really seemed to understand what was going on. I had them switch out the light bulb with a buzzer. This made a lot of noise, but the kids were experimenting. Then, one student came up to me and asked me, "What did they call it in the old days when people had to

switch a code into words?" Then, the light bulb went off in my head, and we talked about Morse code. All of the students had experimented with the switch long enough, I was not worried about moving on to an enriching project. I asked one of the students to look up Morse code in the Encyclopedia as I quickly found a kid-friendly website. The student read part of the entry in the Encyclopedia, then I shared some of the information that I had found on the Internet. Since I could project the computer screen onto the board, it was fun for the auditory and visual learners. When time had ended for the period, I asked the students if they would want to research Morse code for homework. Surprisingly everyone, except maybe three or four, wanted to do it. I told them to research who invented it, what year, and to relate Morse code to a switch in a circuit. I also added to find an interesting fact about the code. I was very eager to find out what they had found the next day. The students were as excited as I was, so I allowed them to share their reports first thing the next morning. I was glad to find a way to incorporate history into science, and the students seemed to really enjoy this impromptu assignment as well.

A second instructional decision I made came during a lesson on magnets. We were talking about items repelling and attracting to the magnets. We started off by doing an online activity and then taking the quiz as a class. Then, I had them find certain objects in their desks to test on magnets. One student had found a penny in his pocket and tried to pick it up with his magnet. When it did not pick up, he came running up to me. He asked why it was attracting to the magnet, but electricity can run through it. So, then I wondered if everyone was making the same mistake. Turns out, most of the class thought magnetic and conductor were interchangeable words. Then, we made a list of

words to test if they were a conductor, magnetic, or both, then found the similarities and differences in a Venn Diagram. They then said that magnetic items were made of four different materials, but conductors could be any kind of metal. Changing up the lesson was a lot of fun, because I never would have thought before I started the unit that the students would connect the two words. Hopefully using the Venn diagram allowed them to clear up any misconceptions about magnetic materials.

Analysis of Student Learning

After all of my students took the post-test for my electricity unit, I was able to compare how my students performed on each learning goal on the pre and post-test. I was very interested to find out how much they had learned during the course of the unit, and if more students were able to meet the mastery level created for each of my three learning goals.

By looking at the pre-test vs. post-test charts for each learning goal [See Appendices], I can see that all of the students showed significant increases in learning goals one and two. Two students' scores for learning goal three decreased, but the rest of the students' scores either remained the same or increased. The most significant increases were shows in regards to learning goal two, while the least improvement was shown in respect to learning goal three. One reason this could be is because the pre-test scores for this learning goal were already high. I was very pleased to see that the post-test scores went up for all students, and many more students met the mastery criteria for each goal than I had expected.

Nineteen out of twenty-one students met the mastery criteria of 80% on LG 1. Only ten students had met mastery on this goal on the pre-test. Three students who met

mastery made a 100% on this goal. Seventeen students met the mastery criteria of 80% for LG 2. Two students had met mastery on this goal on the pre-test. Seventeen students met the mastery criteria of 100% on the post-test for LG 3; eight students had met mastery on this goal on the pre-test. On the post-test as a whole, only three students did not meet mastery out of twenty-one. [See Appendix for results in table format.]

I decided to analyze learning goal two in terms of gifted students versus the lower students. I wanted to analyze this group of students because I wanted to know if there was a significant difference of students learning between these two groups. I decided to compare using LG 2 because it was the goal which was the had the lowest percentage points right on the pre-test, and both groups only answered 10% of the questions correctly. It was also a learning goal that showed a vast improvement in scores. I created a graph showing the pre and post-test average for learning goal two for my high and low groups. As noted earlier, the average score for the pre-test was the same at 10%. However, the high group's score was much more significantly increased to 94%, whereas the low group's score did increase a great deal, but increased to only 71%. This shows that my lessons were able to reach the high group's learning, but not so much the low group. [See Appendix for the comparison chart and Appendix for the results in table format.]

For my individual comparison, I used one male student, Christopher, and one female student, Meghan. I picked these two students for a couple reasons. One is because Meghan scored the highest on the pre-test and Christopher had one of the lowest in the class. Another reason is because Meghan is one of the gifted students in the classroom, and Christopher has begun the process of testing for attention deficit disorder.

On the post-test, Meghan scored the only 100% in the class, and Christopher received a 75%, which was not the lowest in the class, but very close. In this case, I do not think gender is an additional possible variable because the males in females in the class were very spread out in scores and I do not think it would be a significant comparison to do so.

On the pre-test, Meghan made an 80%, being the only student in the classroom to reach mastery on the pre-test. She also reached the mastery goal level for learning goals one and three. Christopher made a 40%, which was the second lowest score in the class. He did not reach mastery on any of the learning goals. On the post-test, Meghan scored a 100%, therefore, reaching mastery in all three learning goals, showing a significant increase in her score and student learning. Christopher scored a 75% on the post-test and only mastered learning goal one. His score did increase a great amount, but may not have affected student learning. However, Christopher did make a more significant increase than Meghan from the pre to post-test.

In terms of formative assessment, Christopher regularly got off task. He found it hard to focus on the concepts being taught. He did not take any notes in his science notebook, nor finished half of the assignments that I gave for in-class work. However, when I asked him questions orally, he could answer them correctly. Meghan, on the other hand, could stay on task and focus throughout the lesson at its entirety. She could answer all of the questions correctly, and finished all of the in class homework. She was even able to make connections to her life when talking out loud about electricity circuits.

On the whole, Meghan is a great example of the type of learning I wanted to see with all of my students. She started off with some prior learning, and came out of the unit mastering all of the learning goals. Christopher, however, did not show much

improvement over the course of the unit, which is not something I wanted to see out of any of my students. I will need to make further reflection on the reasons why Christopher did not make more of an improvement and how I can adjust my lessons to reach all students to be as successful as Meghan was. [See Appendix for Meghan's example work, Appendix for Christopher's example work, and Appendix for results in table format.]

Reflection and Self-Evaluation

The learning goal where my students showed the most success was LG 3, which states: the student will compare the properties of conducting and non-conducting materials. I think one reason for this was the students came into the unit having more prior knowledge and experience with these concepts than any others, as shown in the pre-test results. Even if students did not begin the electricity unit understanding what conductors and insulators were, they received enough hands-on experience to be able to identify and compare different materials. Additionally, LG 3 was based solely on conductors and contained fewer concepts than the other two learning goals.

The learning goal where my students showed the least success was LG 1, which states: the student will evaluate a variety of representations or electrical circuits and explain why the circuits work. I think the students had a more difficult time with this learning goal because it was a complex goal. It was based more around knowing several electrical circuits, and how each circuit was constructed. Another reason I think this goal was the most difficult was because the students had to learn four different terms for electrical circuits, and each circuit was very different than the others. Most of them did get these circuits confused, therefore missing questions on the post-test. In the future, I

could possibly spend less time comparing and contrasting the different circuits and spend more time having them assess the situation and see what kind of circuit it is for themselves. If it was a perfect classroom, all of the students would have the materials they needed to make their own circuits and no one would have to share with other people. This would be much help for teaching a unit like this.

I have learned many things while teaching in a fourth grade classroom as a whole. One professional learning goal that came from this experience for myself is to incorporate many learning styles in one lesson. When I was in elementary school, we did not have near as much technology and resources that the schools do today. There is no reason not to reach all of my kids in their learning styles. Another professional learning goal I have for myself is to create a positive learning environment for all students. Some of the students got off task when I gave them independent time to do work. I now know I need to have specific adaptations for these students to work with a partner or have multiple assignments to give out on different levels. To me, science is one of those hard subjects to reach the ability levels of all students. However, if one student gets off task, more are sure to follow. When I have my own classroom, it would cancel out a lot of stress to nip this problem in the bud first thing.

One step I will take to improve my performance is to observe a teacher whose main teaching is in science. For this I might have to go to a higher age level, but I can always learn to adapt what I find to the elementary level. Doing this will help me find ways to keep all students on task, and also how to reach all students' learning styles. Another step I have already taken is observing a teacher who has great classroom management. I learned a lot of ideas to bring into my own classroom during transitions,

teaching, homework procedures, and center time. This was time well spent for myself because I could not have learned all I did from her in any book.

During the course of my teaching career, I will not have to be afraid of failure. I now know many of the concepts I try with my students will work with some classes, but not with others. My teacher told me she learns something different every year and that is what makes teaching an exciting profession. I look forward to the failures I can learn a great deal from in the future.

Appendix A

Electricity Pre-Test

Multiple Choice

1. A material that transfers heat well is called _____.
    a. Radiation
    b. Conductor
    c. Insulator
    d. Refraction

2. Friction is _____.
    a. the transfer of heat through space.
    b. the distance an object moves in a certain amount of time.
    c. a material that transfers heat well.
    d. the force that works against motion between surfaces that touch.

3. The distance an object moves in a certain amount of time is _____.
    a. Speed
    b. Work
    c. Energy
    d. Friction

4. A push or pull that makes an object start moving, stop moving, speed up, slow down, or change direction is a(n) _____.
    a. Speed
    b. Force
    c. Energy
    d. Work

5. Words such as above and below, left and right, and north and south give clues about _____.
    a. Work
    b. Force
    c. Friction
    d. Position

6. Two objects connected to a cell in a single path make up a(n) _____.
    a. Series circuit
    b. Circuit
    c. Parallel circuit
    d. Open circuit

7. A complete path that electricity can move through is a(n) _____.
   a. Series Circuit
   b. Circuit
   c. Parallel Circuit
   d. Open Circuit

8. A material through which electricity does not flow is a(n) _____.
   a. Conductor
   b. Circuit
   c. Electricity field
   d. Insulator

9. Which material is a good conductor?
   a. Cotton
   b. Metal
   c. Wood
   d. Plastic

10. Electrical devices in homes are connected in _____.
   a. Short circuits
   b. Series Circuits
   c. Parallel Circuits
   d. Open Circuits

Short Answer

11. How can forces change the way objects move?

   They can change the direction of an object, speed it up, slow it down…

12. What causes an object to move positions?

   Forces

13. Is it usually easier to move a smooth object across a smooth surface or a rough object across a rough surface? Explain.

   Smooth across smooth – less friction

14. Which bulb will light up? How do you know?
   [insert picture]

   3 will light up because it is metal touching metal touching metal touching metal.

15. If a car is going 10 miles per hour, how long does it take the car to travel 50 miles?
    5 hours

Open Response

Daniel is helping his dad put up holiday lights around the house. The first strand of lights he plugs in runs on a series circuit. When he plugs them in they all light up. However, when he removes one bulb, every light goes out. Daniel thinks of what he learned during an experiment using series circuits and parallel circuits. He uses what he learned to tell his dad to go buy lights that operate on a parallel circuit.

a. What will happen to the rest of the lights on a parallel circuit if one light is removed from the strand?
b. Why did Daniel want his dad to buy lights that operated on a parallel circuit?

4 – Both sections are answered. A parallel circuit will keep all lights on if one light is removed. Daniel wanted his dad to buy parallel lights because it would be less of a hassle and if one light went off, then the rest of the lights would stay on.

3 – Both parts are answered. One part is wrong, one part is right.

2 – Both parts are answered. Both parts are wrong.

1 – Only one part is answered wrong.

0 – Neither part is answered.

Appendix B

Post-test Electricity

Multiple Choice

1. The buildup of electric charge on a neutral object is called _____.
   Static electricity

2. Electrons flow freely through copper wire. Copper is an example of a good _____.
   Conductor

3. In which type of electrical current are there many paths for electrons to flow?
   Parallel

4. If one light in a string of holiday lights is taken out, all the lights go out. The string of holiday lights is an example of what type of electric circuit?
   Series

5. An electric circuit provides a path for electrons to travel. A switch in a circuit provides _____.
   A break in the path that stops the flow of electrons

6. The sudden discharge of static electricity can produce _____.
   All of the above

7. When both wires are touching the penny, the light bulb lights. This is because the penny is a _____.
   A good conductor of electricity

8. Charlene made a circuit with a switch. She made the posts for the switch out of copper. Which could she use to connect the posts so the bulb will light?
   A nail

9. Which statement about the circuits shown below is true?
   Circuit number 3 is a closed circuit because there is a complete flow of electricity.

10. The lines of magnetic force are
    greatest at the poles of a magnet

11. Which of the following diagrams shows a magnet being attracted to another magnet?
    C

12. Which of the following items is NOT magnetic?

A plastic spoon

13. A magnet would be _____ when held close to a concrete wall.
Unaffected

14. William yells to Nancy across a soccer field. His voice is heard by nearly everyone around him because sound travels _____.
Outward in all directions away from its source.

15. Why is it better to wear a white tee-shirt than a dark blue tee-shirt in the summer?
Light colors reflect more light than dark colors.

Open Response

Jack's teacher provided the variety of materials shown in the picture below and asked him to use any of the material to build a circuit that would light a bulb.

Battery, Popsicle stick, straw, wire, light bulb, yarn

a. Identify the items from the materials provided that Jack needs to build a complete circuit.
b. Draw a picture of the circuit Jack should build with the materials you identified in part A.
c. Explain how the materials you identified in part A can be placed or hooked together to construct a complete circuit.

4 – identified battery, wire, and light bulb. Picture drawn showed the wire running from both sides of the battery to the metal part of the light bulb. Student explained the wire is a conductor for electrons to flow freely and it is metal touching metal touching metal.

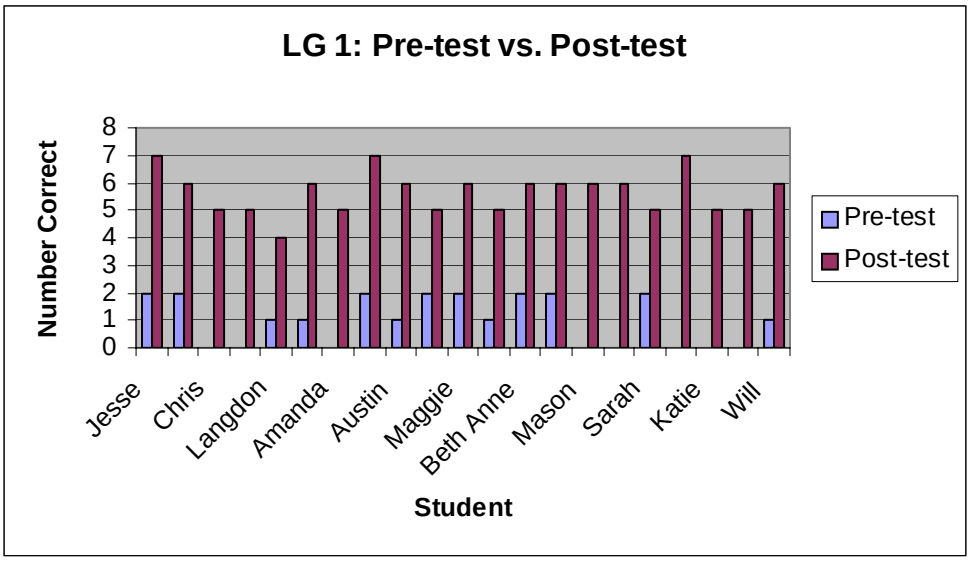
3 – identified battery, wire, and light bulb. Picture drawn showed the wire running from both sides of the battery to the metal part of the light bulb. Student explained how the wire runs from the battery to the light bulb.

2 – identified battery, wire, and light bulb. Picture drawn showed the wire running from both sides of the battery to the metal part of the light bulb. No explanation.

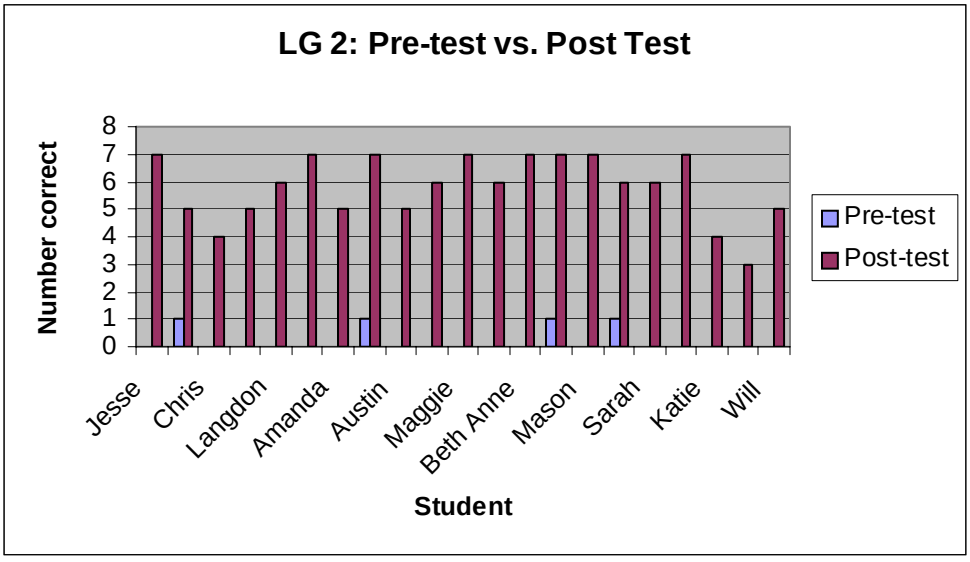
1 – identified battery, wire, and light bulb. No picture, no explanation.

0 – no answer written

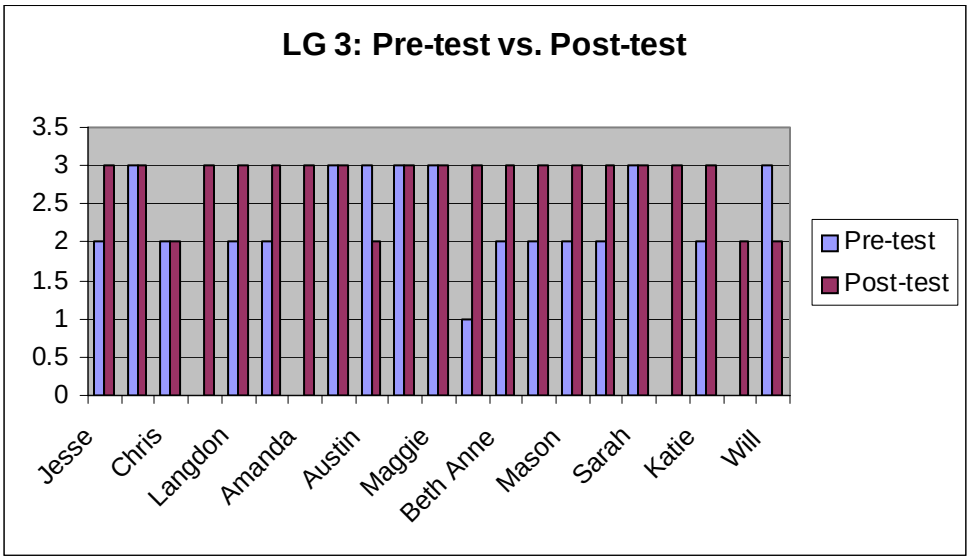
Appendix C:



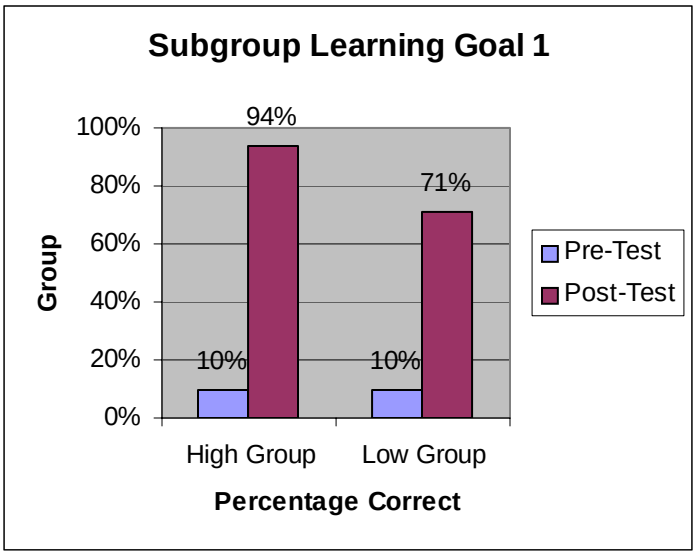
Appendix D:



Appendix E:



Appendix F:



Appendix G: Pre-Test

Langdon	1	1	1	0	1	0	1	0	1	0	0	1	1	0	1	0	0	9
Beth Anne	1	1	1	1	1	0	1	0	1	0	1	1	1	1	1	0	0	12
William																		
Isaac	1	1	1	1	1	0	1	1	1	0	0	1	0	1	1	0	1	11
Holden	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	0	0	11
Mason	1	1	1	1	1	0	0	0	1	0	1	1	1	0	0	0	0	10
Meghan	1	1	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	13
Parker	0	1	0	1	1	0	0	1	1	1	1	1	0	0	1	0	0	9
Ally																		
Anthony	1	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	0	10
Noah	1	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	7
Georgia	1	1	0	1	1	0	1	1	1	0	1	1	1	1	0	0	1	11
Jesse	1	1	1	1	1	1	0	0	1	0	1	1	1	1	0	0	0	11
Maggie	1	1	1	1	1	1	0	1	1	0	1	1	0	1	0	0	0	11
Amanda																		
Austin	1	1	1	1	1	0	0	1	1	0	0	1	0	1	0	0	0	10
Katie	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	5
Sarah	1	1	1	1	1	1	1	1	1	0	0	1	1	0	0	0	0	11
Angie	1	0	0	1	1	0	1	1	1	0	0	1	0	0	0	0	1	9
Jackson	1	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	9
Lillie																		
Will	1	1	1	1	1	0	1	1	1	0	0	1	1	0	0	0	0	10
Chris	1	1	1	1	1	0	0	0	1	0	0	1	0	0	0	0	0	8
	18	17	14	18	19	6	7	11	17	2	11	17	11	10	6	1	5	
Type	S	S	S	S	S	S	S	S	S	S	C	C	C	C	C	C	C	
LG #	3					1	1	3	3	2				1			2	

Appendix G: Post-test

	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Question 11	Question 12	Question 13	Ques 14
Name														
Jesse	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Isaac	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Chris	1	1	0	1	0	0	0	1	1	1	1	1	1	1
William	1	1	1	1	0	0	1	1	1	1	1	1	1	0
Langdon	0	1	1	1	1	0	1	1	1	1	1	1	1	1
Anthony	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Amanda	0	1	0	1	1	1	1	1	1	1	1	1	1	0
Meghan	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Austin	1	1	1	1	0	1	1	0	1	1	1	1	0	0
Holden	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Maggie	1	1	1	1	1	1	1	1	0	1	1	1	1	0
Noah	1	1	1	1	1	0	1	1	1	1	1	1	1	0
Beth Anne	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Jackson	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Mason	1	1	1	1	1	1	1	1	0	1	1	1	1	1
Parker	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sarah	1	1	1	1	1	0	1	1	1	1	1	1	1	1
Ally	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Katie	1	1	0	1	0	0	1	1	1	1	1	1	1	1
Lillie	1	1	0	0	0	0	1	0	0	1	1	1	0	1
Will	1	1	0	0	1	0	1	0	1	0	1	1	0	1
	2	0	5	2	7	12	1	3	3	1	0	0	3	7
Type	S	S	S	S	S	S	S	S	S	S	S	S	S	S
LG #	1	3	2	2	2	1	3	3	1	Rev	Rev	Rev	Rev	Re