

THE EFFECTS OF USING SCIENCE NOTEBOOKS AND GUIDED NOTES IN
FOURTH GRADE SCIENCE

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ABSTRACT

The purpose of this study was to explore the effects of different strategies in note-taking within the 4th grade science classroom. The use of science notebooks and guided notes was explored to enhance teaching methods, support students' studying, and improve test scores. Results of the study indicate that there was not a significant change in student achievement when differentiating between the use of guided notes and science notebooks.

INTRODUCTION AND BACKGROUND

Project Background

I teach fourth grade at Radley Elementary School in the rural town of East Helena, Montana in an economically disadvantaged community. In our school district we have a Kindergarten through 1st grade elementary school, a 2nd through 5th elementary school, and a middle school. There are approximately 500 students enrolled in our 2nd through 5th grade building and an overall district enrollment of 1150 students. Our district has about 42% of students in the free and reduced lunch program (Radley Office, personal communication, December, 2012). I teach 1 of the 5 fourth grade general education classes and my homeroom class consisted of 27 students. There were 13 boys and 14 girls in the classroom.

During my six years of teaching, I have noticed that I have had a reoccurring question. How am I going to organize my science curriculum so that my instruction is highly effective and as a result, will produce high test scores? Students in fourth grade are starting to learn how to take notes from teacher-led instruction. The key to note-taking is organization. This can be very difficult for younger students to do because it requires complex skills such as listening, short-term memory, processing, and prioritizing. I have found students need a way to record important facts, their thoughts and their observations, and to be able to review this information on a daily basis.

The purpose of my study was to explore the effects of different strategies in note-taking within the fourth grade science classroom. I explored the use of science notebooks and guided notes to enhance my teaching methods, support students' studying, and improve test scores. I had previously used a combination of these methods, which led to

this study. I wanted to know which note-taking strategy students will benefit from and in turn lead to the following sub questions:

- Would it be a single note-taking strategy or a combination of them?
- Which strategy/strategies would help my students perform better and produce high test scores?

CONCEPTUAL FRAMEWORK

When there is a demand for each student to make adequate yearly progress in the general education system, the role of a teacher is to be highly effective with instruction. Adequate Yearly Progress, or AYP, is a measurement defined by the United States federal No Child Left Behind Act that allows the U.S. Department of Education to determine how every public school and school district in the country is performing academically according to results on standardized tests (Wikipedia, 2012). Available evidence indicates that many students struggle to make this level of progress (Adelman & Taylor, 2005). One primary reason that many of these students don't reach this level is the difficulty of taking appropriate notes during class. Effective note taking is often problematic for many students because it requires the application and coordination of several complex skills, including listening, short-term memory, prioritizing, and transcribing for later use (McLeskey, 2010). With the demands of tests and retaining information for later use, it is important for students to know the most effective ways to remember the information needed (DeWitt, 2007).

Research on note-taking has generated debates since C. C. Crawford began his studies in the 1920s. Initially the debates centered on whether note-taking resulted in

improved student performance on tests. Over the years, researchers have tried to verify that note-taking helps student encode the information involved and that notes are valuable as materials for review (Ladas, 1980). In 1925, Crawford published a study which sought to verify his observation that there is a positive correlation between analyses of college students' lecture notes and their grades on subsequent quizzes. He concluded that taking notes was better than not taking notes, reviewing notes was a key to their impact, and that organizing notes effectively contributes to improved performance on tests (Beecher, 1988).

Studies on the impact of note-taking strategies on recall and achievement in exams have shown that students not only learn when they review their notes, but also while they take their notes. The notes constitute an external memory that can be used later for studying and other tasks (Kiewra, 1985a; Kiewra 1985b; Benton, Kim, Risch, & Christensen 1995; Knigh & McKelvie, 1986; Laidlaw, Skok, & McLaughlin, 1993; Peters, 1972). Research has shown that writing-to-learn in science has enhanced students' learning when teachers attend to curricular goals, learners' metacognitive knowledge, and the instructional environment (Hand, Prain, & Yore, 2001; Rivard, 1994). Therefore, if students are encouraged to communicate their understanding of concepts through science writings, these writings can be an effective strategy to help students learn science (Audet, Hickman, & Dobrynina, 1996; Fellows, 1994; Shepardson & Britsch, 1997). As teachers begin to involve students in inquiry-based science investigations, the need for students to communicate their science learning in new ways has become evident. Many of the inquiry based science curricula currently in use in the

elementary grades recommend and provide information for teachers on the use of science notebooks in inquiry science teaching (Morrison, 2008).

A science notebook is defined as a compilation of entries that provide a partial record of a student's instructional experiences over a certain period of time or unit of study (Ruiz-Primo, 2002). Science notebooks are great ways to reflect what students are doing in science class. They are a tool that is generated during instruction and that will show the great diversity of activities in a science class.

Science notebooks can be a valuable tool for both teachers and students to use to determine (1) prior knowledge and existing science ideas, (2) how conceptual understanding is being built, (3) procedural understanding, (4) mastery of curriculum goals, and (5) the ability to apply/transfer ideas to new context (Volkman, 2003, p. 41).

Science notebooks may incorporate diagrams, drawings, graphs, and tables. They contain information about the students' classroom experiences and they imitate the journals that actual scientists use as they explore the world (Hargrove, 2003).

A science notebook enables children to work as scientists and keep a cumulative record of their thoughts and observations about the activities in a unit of study. Within the context of science activities, notebooks promote the use of literacy while clarifying children's emerging ideas and theories about science phenomena. A science notebook also encourages children to make records using words and drawings in age-appropriate ways. Students are able to impose their ways of seeing and thinking about the science phenomena, constructing or reconstructing the phenomena through their own lens of experience. (Science Companion: Inspiring Students to Explore Their World, n.d.).

The student science notebook serves as an important link between science and literacy when it is used in the classroom as a knowledge-transforming form of writing that provides an appropriate opportunity for students to develop voice in the process of constructing meaning from their experiences with the science phenomena (Klentschy, 2004). This coupled with appropriate and timely feedback from the classroom teacher has strong potential to provide the improvement in student achievement across the curriculum that educators are seeking (Klentschy & Molina-De La Torre, 2004). Science literacy focuses on accumulating scientific facts, *scientific* literacy emphasizes scientific ways of knowing and the process of thinking critically and creatively about the natural world.

When reviewing science notebooks, the literature suggests to not only focus on what the “right” answers should be, but how the student arrived at their conclusion. This article states that feedback should focus on the scientific processes used rather than what the scientific facts are. For example, how detailed were student drawings and observations? Were data not changed? If student observations did not match the class’s observations, did the student give reasons for the differences? Only when feedback such as this is given can students continue to grow and develop their scientific literacy skills (Science Companion: Inspiring Students to Explore Their World, n.d.).

Students’ explanations in their science notebooks were studied to determine if there was a connection between the explanations and the scores on summative assessments. The study showed evidence that students performed higher on summative assessments when the explanations in their science notebooks contained a claim, evidence to support that claim, and scientific reasoning to explain the claim than when

the students' explanations were missing one or more of those parts (Ruiz-Primo & Shavelson, 1999).

In note-taking research for students and teachers, it suggests that instructors use a spaced lecture format, insert verbal and nonverbal cues into lectures to highlight structure, write important material on the blackboard, avoid information overload when using transparencies or slides, tell students what type of test to expect, and use handouts that give students room to add notes (McAndrew, 1983). Research has revealed that if students who struggle academically are to be successful, they need support or scaffolding in taking appropriate notes (Anderson, 2004). Scaffolding is a general term describing any extra support to the students during instruction.

Guided notes are a strategy that has been developed to provide support for students during note taking. Guided notes are teacher prepared handouts that are used to support students during note taking by reducing the cognitive demands that are required to successfully accomplish this task. Many teachers use guided notes to support students who struggle to learn academic content in taking notes during lectures. This strategy is simple to use: The teacher provides students with a handout containing a map or outline of the lecture, and he or she leaves some critical information blank requiring a student response. This critical information may consist of key facts, definitions, important concepts, and so forth. The practice of guided note taking involves accurately recording key information from lectures onto a page of fill-in-the-blank spaces. During the lecture, the teacher cues the class to look at a particular sentence and write facts in the corresponding prepared spaces (Haydon, 2011).

Guided notes are designed to increase student listening, active participation and covert verbal behavior (i.e. thinking) during classroom lectures and discussions. This outcome is more likely to occur because students are not preoccupied or distracted by trying to determine which information in a lecture is important, and accurately recording this information (Austin, 2004). Research has demonstrated that guided notes improve outcomes for students with a range of ages, skills, and abilities (Konrad, A metanalytic review of guided notes, 2009). Specifically, guided notes increase active student responding, (Austin, 2004; Blackwell, 2005; Heward, 1994) improve the accuracy of students' notes (Sweeney, 1999), and improve students' quiz and test performance (Patterson, 2005). Additionally, students prefer to use guided notes over taking their own notes (Konrad, A metanalytic review of guided notes, 2009) or using preprinted notes (Neef, 2006). Not only do guided notes help students attend to lectures better, this form of note taking serves as a model for helping students to learn how to take better notes on their own (Konrad, Using Guided Notes to Enhance Instruction for All Students, 2010).

Guided notes can combine and include other effective teaching strategies. Partially completed graphic organizers, such as story or geography maps, word webs, and Venn diagrams may be embedded into guided notes to aid in labeling essential elements and gaining an understanding about relationships among concepts (Dye, 2000). The teacher can also create worksheets that follow a *model-lead-test* teaching sequence and then have the students complete it along with the teacher. Guided notes can serve as a tool to facilitate students' preparing for upcoming assessments, and one advantage of using guided notes is that students are more likely to leave class with a complete and accurate set of notes (Konrad, A metanalytic review of guided notes, 2009) from which to

study from. If teachers collect guided notes on an unpredictable schedule, students know that they should be ready to turn them in at any time. This also makes monitoring student note-taking and delivering contingent reinforcement less cumbersome to manage on a day-to-day basis. Another way to motivate students to complete guided notes is to give in-class, open note quizzes immediately following lectures. Teachers should design these quizzes so that students who complete guided notes will be able to do well (Konrad, *Using Guided Notes to Enhance Instruction for All Students*, 2010). Konrad suggests that teachers should design assessments, quizzes and exams that are direct measures of mastery of material covered within the guided notes. They should use the data from these assessments to evaluate the effectiveness of their lessons and make appropriate instructional adjustments as needed. The use of guided notes is a versatile tool that not only facilitates students' attention to lecture, ease in studying for exams, and improved test performance, it helps teachers organize and pace their delivery of lecture content (Konrad, *Using Guided Notes to Enhance Instruction for All Students*, 2010).

With the demands of tests and retaining information for later use, it is important for students to know the most effective ways to remember the information needed (DeWitt, 2007). The process of note-taking involves a complex set of skills and interactions between instructors and their students. Current concerns and questions about note-taking offer both a challenge and an opportunity to re-examine our assumptions about the efficacy of notes and note-taking. They also offer a chance to re-conceptualize the role of instructors in an educational landscape that may require new approaches to time-honored practices (DeZure, *Research on Student Notetaking: Implications For Faculty And Graduate Student Instructors*, n.d.).

METHODOLOGY

The treatment for my classroom-based research project was the use of science notebooks and guided notes in my fourth grade general education science class. My class consisted of twenty-four students during the ten weeks of treatment. The research methodology for this project received an exemption by Montana State University's Institutional Review Board and compliance for working with human subjects was maintained.

I introduced science notebooks, discussed their purpose and emphasized their importance. I wanted my students to use their notebooks for notes, charts/tables, questions, observations and other scientific processes. My research focused on determining if notebooks became important engagement tools in class and consequently help students perform better on tests. The data collection tools that I used to gather information regarding the impact of science notebooks compared to teacher-made guided notes are as listed: Note-Taking Interview Questions, Student Opinion Survey, and PowerGrade test reports (Table1).

Science notebooks were introduced and used during instruction for four science chapters over the first six weeks of the treatment period. I gave a post-test following each chapter. Scores of the post-tests were collected and recorded in our school's grading system. At the end of the treatment period, these scores along with the Note-Taking Interview Questions (Appendix A) and the Student Opinion Survey (Appendix B) responses were analyzed to determine if the use of the notebooks helped students prepare and feel prepared for summative assessments. In the Student Opinion Survey, each student was able to respond if they agreed, disagreed or sometimes agreed to statements

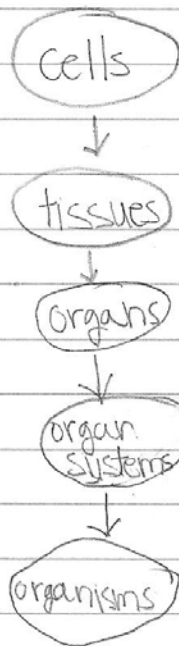
about note-taking. These additional tools of inquiry provided informative information by recording student responses to determine if they felt more confident about the science vocabulary and learning objectives at the end of the treatment than they did at the beginning of treatment. The Note-Taking Interview Questions were analyzed and divided into categories based on common themes, to provide additional feedback to tell if students felt more confident in science because of their note-taking, what they found was difficult about note-taking, and if they felt taking notes helped them earn better grades in science.

The remaining four science chapters, at the same level of difficulty, were spent collecting data in the same manner with the students using guided notes pre-made by the teacher. The students were given chapter post-tests and data was collected in the same way as the first four chapters and took place during the last six weeks of treatment. Students were given the same Student Opinion Survey and Note-Taking Interview Questions so that the data could be compared to determine which method of note-taking the students preferred. The scores were collected, determining which methods of note-taking helped students perform better on tests.

1. Cell-is the smallest unit of a living thing that can perform all life processes.

2. Nucleus- is the control center for the cell.

3. Cytoplasm- contains the things that the cell needs to carry out it's life processes.



4. Chloroplasts- special parts in plant cells that trap the sun's energy

Figure 1. Student example in science notebook.

Lesson 2: How is matter measured?

Your weight is _____ times as much on Earth as it is on the Moon.

Your MASS is always the _____.

Mass is the measure of the amount of _____ in an object.

The _____ of an object does NOT change unless matter is _____ to or _____ from it.

A _____ is a tool to measure mass.

_____ is the amount of space that matter takes up.

- multiply length x width x height

A **graduated cylinder** is used to measure the volume of _____.

- milliliter (mL) and liters (L)

An object's _____ determines whether it floats or sinks in a liquid.

Liquids and objects have _____ densities.

When placed in a graduated cylinder, objects and substances with _____ densities will sink to the _____ of the cylinder. The substances with the _____ densities are near the top.

An ice cube is less/more dense than water.

Figure 2. Example of guided note page.

Table 1.
Data Collection Methods

	Science Notebooks	Guided Notes	Student Report Cards (test scores)	Student Artifacts (teacher made post tests, student interviews, opinion surveys)
Does note-taking improve test scores?	x	x	x	x
Does the use of note-taking in science notebooks increase student engagement and result in higher test scores?	x		x	x
Does the use of guided notes increase student engagement and result in higher test scores?		x	x	x
Does the combination of science notebooks and guided notes improve test scores?	x	x	x	x

DATA AND ANALYSIS

The data collected during the study was divided into two themes: student interest in science and achievement, and student preference and preparation.

Student Interest in Science and Achievement

This fourth grade class showed a high percentage, 83% of students, agreeing that they were interested in science at the beginning of the year ($N = 24$) (Figure 6). With

those same students, 88% of them believed that their teacher made learning about science fun and enjoyable. At the beginning of treatment, 88% of this class declared that their favorite thing about science was participating in labs. This statement showed growth post-treatment by increasing to 92% of students showing preference of science labs (Figure 7).

While using the note-taking method of science notebooks, student scores of chapter post-tests that were recorded using PowerGrade, indicated that the average test score of chapter one was 81%, chapter two was 91%, chapter three was 88%, and chapter four was 93% ($N = 24$) (Figure 3). The overall mean with this method of treatment was 88.25%. During the second part of the treatment period, and same level of difficulty, guided notes were used. Scores of the student post-tests indicated that the average test score of chapter five was 91%, chapter six was 84%, chapter seven was 93%, and chapter eight was 86% (Figure 4). The overall mean of this method of treatment was 88.50%.

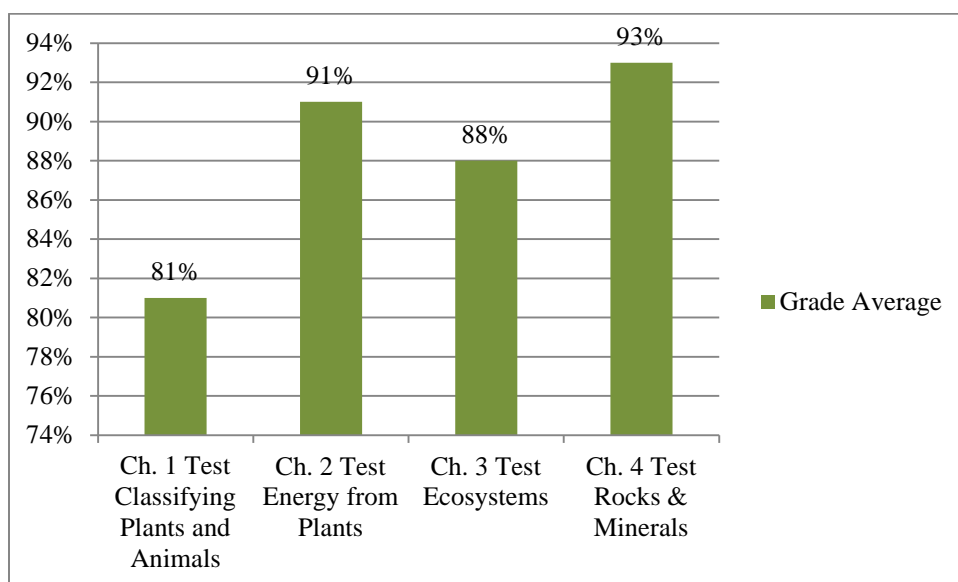


Figure 3. Grade averages on chapter post-tests using Science Notebooks, ($N = 24$).

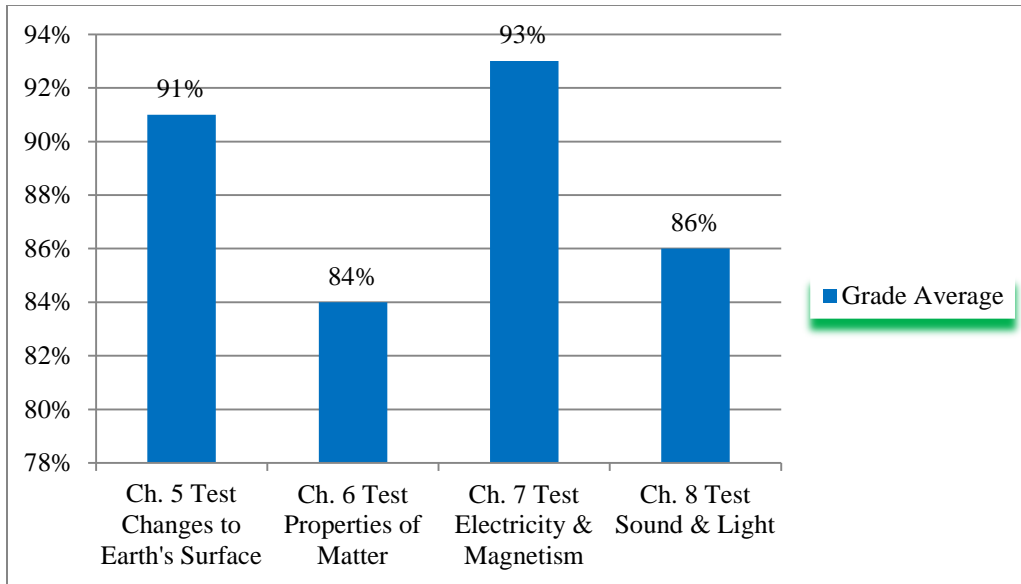


Figure 4. Grade averages on chapter post-tests using Guided Notes, ($N = 24$).

Students scores showed that when preparing for science summative tests, guided notes produced a higher grade average than science notebooks. When students prepare with guided notes they produce a grade average of 0.25% higher scores than preparing for tests using science notebooks.

Student Preference and Preparation

When preparing for their summative tests in science, 67% of students preferred the use of guided notes made by the teacher, 29% preferred using science notebooks, and 4% stated that they preferred either method of note-taking ($N = 24$) (Figure 5). Students were asked Student Interview Questions (Appendix A). When students were asked if they would rather take notes in their science notebooks or fill-in-the-blank guided notes that the teacher makes for them, multiple students responded with “fill-in-the-blank notes because it is easier, takes less time, and is less writing.” Although the majority of students favored guided notes, one student that preferred using science notebooks stated, “Writing in science notebooks helps me pay attention and when I write it, I remember it.”

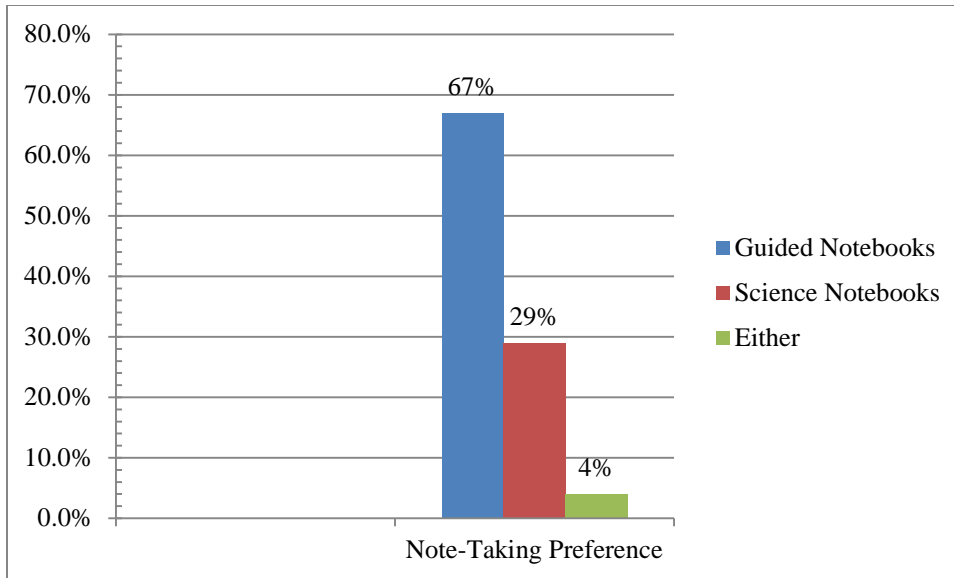


Figure 5. Student opinion on note-taking preference, ($N = 24$).

When students were given the Student Opinion Survey (Appendix B) at the beginning of treatment, 79% of students felt that taking notes in science helped them learn (Figure 6). When asked again at the end of treatment, only 54% of students felt that the notes helped them in their learning (Figure 7). Students were asked if they thought taking notes in science helped them on their tests and 67% agreed at the beginning of treatment (Figure 6). At the end of treatment, 63% agreed that taking notes in science helped them on their tests (Figure 7). Students were also given chapter study guides at the beginning of each chapter to take home and study in addition to their chapter notes. At the time of pre-treatment, 88% of students thought that the study guides were helpful.

By the end of treatment, this decreased to 83% of the class believing they were helpful.

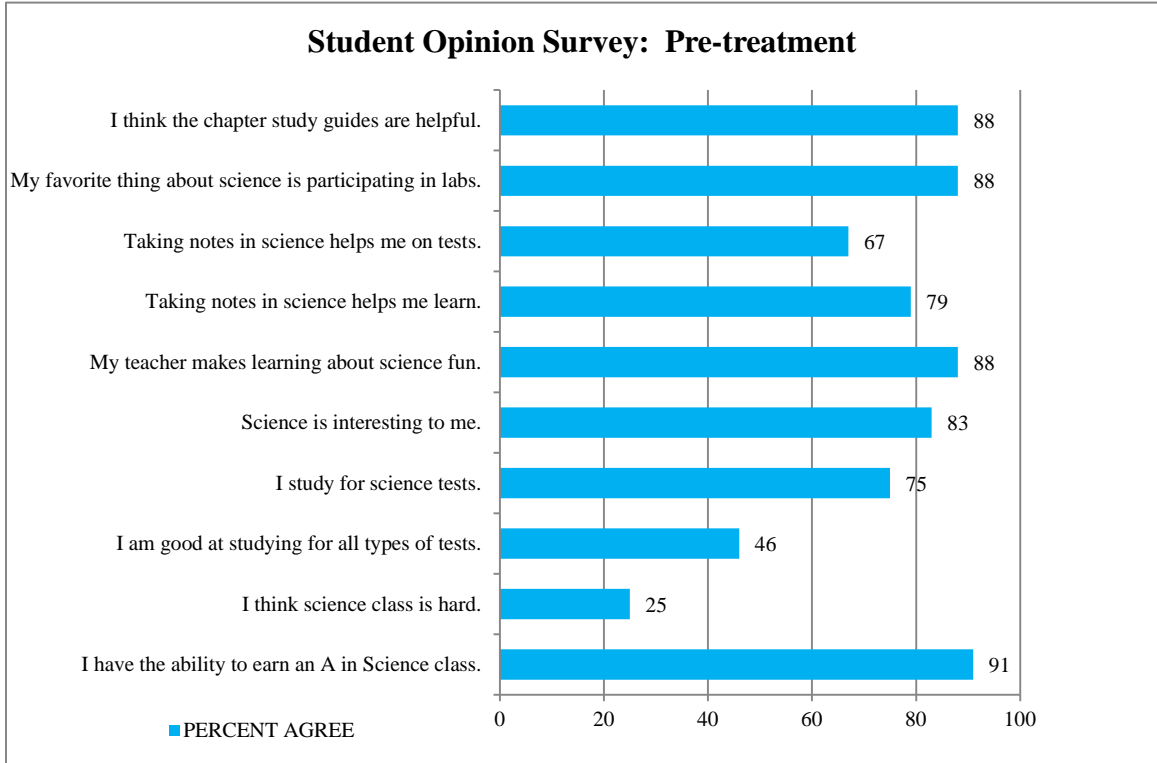


Figure 6. Student Opinion Survey: pre-treatment, ($N = 24$).

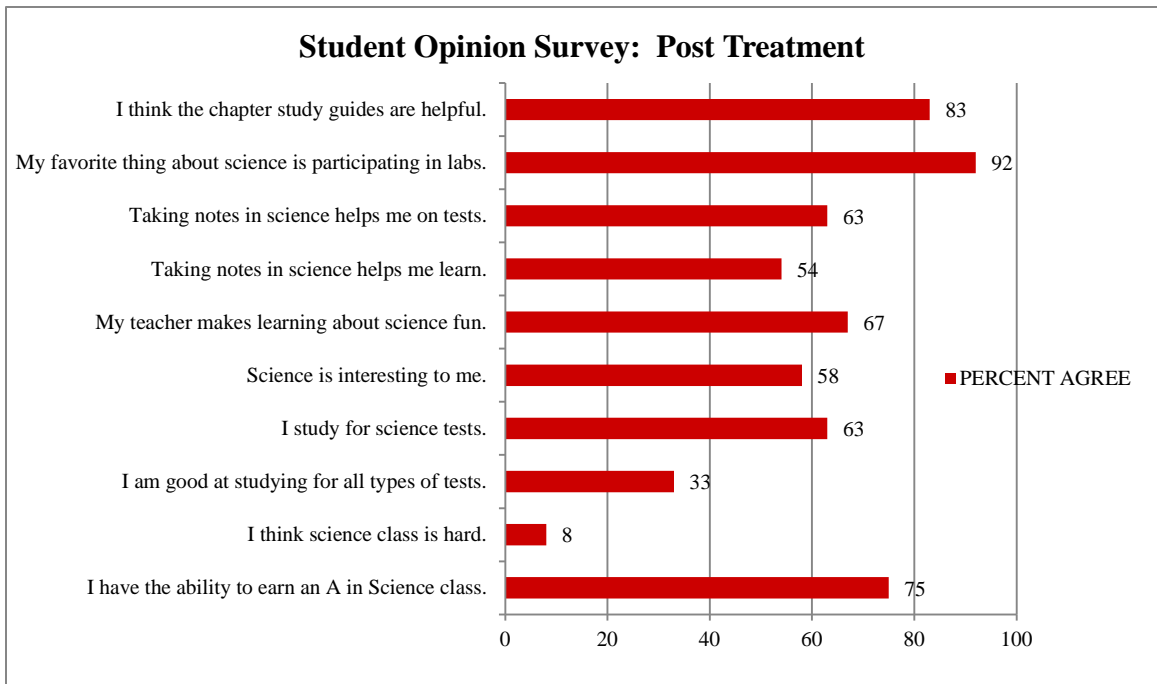


Figure 7. Student Opinion Survey: Post-treatment, ($N = 24$).

A strong majority of the class felt confident in earning a high grade in science class during the beginning of treatment. At that time, 91% of students believed that they had the ability to earn an A in science (Figure 6). At the end of treatment, this percent dropped to 75%. Even though the overall student confidence showed a decrease, only 8% of students felt that science class was hard. During the beginning of the year, pre-treatment, 46% of students stated that they were good at studying for all types of tests. This showed a decrease at the end of treatment to 33%. In the beginning of treatment, 75% of the class stated that they studied for science tests. This also showed a decrease at the end of treatment to 63% (Figure 7).

INTERPRETATION AND CONCLUSION

Based on the collection of data, I conclude that there was not a significant change in student achievement when differentiating between the use of guided notes and science notebooks. However, by using either method of note-taking, students' average test scores were at 88%. This is a high B on our school's grading scale. Therefore, I believe that either note-taking strategy produces successful test scores.

The majority of my fourth grade class enjoys science and finds the subject interesting. This supports the claim that a high majority of this class feels they have the ability to earn an A in science class. Some students stated that they enjoyed taking notes in class because they can take them home to study for their tests. A strong majority of students said their reason of disliking notes was that it was a lot of writing, takes too much time and it was hard to keep up with the teacher. This is important to me as an

educator because I want to make sure that the students are taking effective notes, being engaged in their learning, while enjoying what they are learning.

In the Student Interview Questions, the students were asked if they knew they would be able to use their notes on their tests, would they take better notes. When students were asked if they would put more effort into their notes, 79% stated that they would. This observation has led me to a future inquiry I would like to investigate. Given that there was no significant change in student achievement between the uses of these two note-taking methods, then I would like to determine if my students would produce higher scores when allowing them to use their notes that were taken exclusively in their science notebooks. I predict that this would result in higher interest and engagement levels in class as well.

Through the course of this study my understanding of the ability in note-taking strategies at the fourth grade level has improved. A lot of students at this grade level feel that recording notes and observations help them learn, be more attentive, and remember better. Studies on the impact of note-taking strategies on recall and achievement in exams have shown that students not only learn when they review their notes, but also while they take their notes (Kiewra, 1985a; Kiewra 1985b; Benton, Kim, Risch, & Christensen 1995; Knigh & McKelvie, 1986; Laidlaw, Skok, & McLaughlin, 1993; Peters, 1972). I have found that the notes for this age of students need to be short and concise. Through observations over the past few years I can also conclude that taking notes is better than not taking notes. This was proven to me through the collection of data in this action research project. When students are averaging an 88% on their

summative science tests, I believe there is a high positive correlation between taking notes in science class and high test scores.

VALUE

This research greatly affected me as an educator. This study helped me discover how my students are learning and how to help them learn in a more effective and beneficial way. By testing these note-taking strategies, it has opened up my eyes to additional action research topics that I plan on exploring in my classroom. Learning about action research has given me the confidence to make changes in my instruction to further my students' learning, help my colleagues use it as well, and play a leadership role in our school's curriculum.

Through this action research-based classroom study I have become a more effective educator. I have observed my students and listened to their questions and opinions. I have made changes to our note-taking methods to make them more engaging and valuable for my students. I have had more parent involvement in this subject area than I have had in my previous years of teaching. I attribute this to the involvement and participation at home when the students bring their notes home to prepare for tests.

Finally, through reflection and participation in this specific action research project, I believe that my students have learned successful note-taking strategies to enhance their learning and provide them with valuable tools to start on the stepping stones to lifelong success.

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APPENDICES

APPENDIX A

NOTE-TAKING INTERVIEW QUESTIONS

APPENDIX A

Note-Taking Interview Questions

1. How does taking notes in science class help you?
2. Would you rather take notes in your science notebook or fill-in-the-blank notes that I make for you? Why?
3. Do you think note-taking will help you get better grades on your science tests?

How?

4. If you took notes in your own science notebook, do you think you would remember them better than the fill-in-the-blank notes? Why?
5. What do you like and dislike about taking notes?
6. If you knew you were able to use your notes on your test, would you take better notes? Put more effort into them?
7. What do you like and dislike about science study guides?
8. Do you study for science tests? If so, how?
9. What would make it easier to study for your science tests?
10. Is there anything else you would like to add or would like me to know?

APPENDIX B

STUDENT OPINION SURVEY

APPENDIX B

Student Opinion Survey

Directions: Please answer the following questions as honestly as possible. Your responses will not affect your grade in science class.

QUESTION	AGREE	SOMETIMES	DISAGREE
1. I have the ability to earn an <u>A</u> in science class.			
2. I think science class is hard.			
3. I am good at studying for all types of tests.			
4. I study for science tests.			
5. Science is interesting to me.			
6. My teacher makes learning about science fun.			
7. Taking notes in science helps me learn.			
8. Taking notes in science helps me on my tests.			
9. My favorite thing about science is participating in labs.			
10. I think the chapter study guides are helpful.			

APPENDIX C

INFORMED CONSENT

Exemption Regarding Informed Consent

I, Joe McMahon, Principal of Radley Elementary School, verify that the classroom research conducted by Carrie Clement is in accordance with established or commonly accepted educational settings involving normal educational practices. To maintain the established culture of our school and not cause disruption to our school climate, I have granted an exemption to Carrie Clement regarding informed consent.

Joe McMahon
(Signed Name)

Joe McMahon
(Printed Name)

11-1-2012
(Date)

APPENDIX D

CHAPTER POST-TESTS

Chapter 1
Science
Test
pg. 1

Match the following vocabulary words with their definitions. Each word will be used one time.

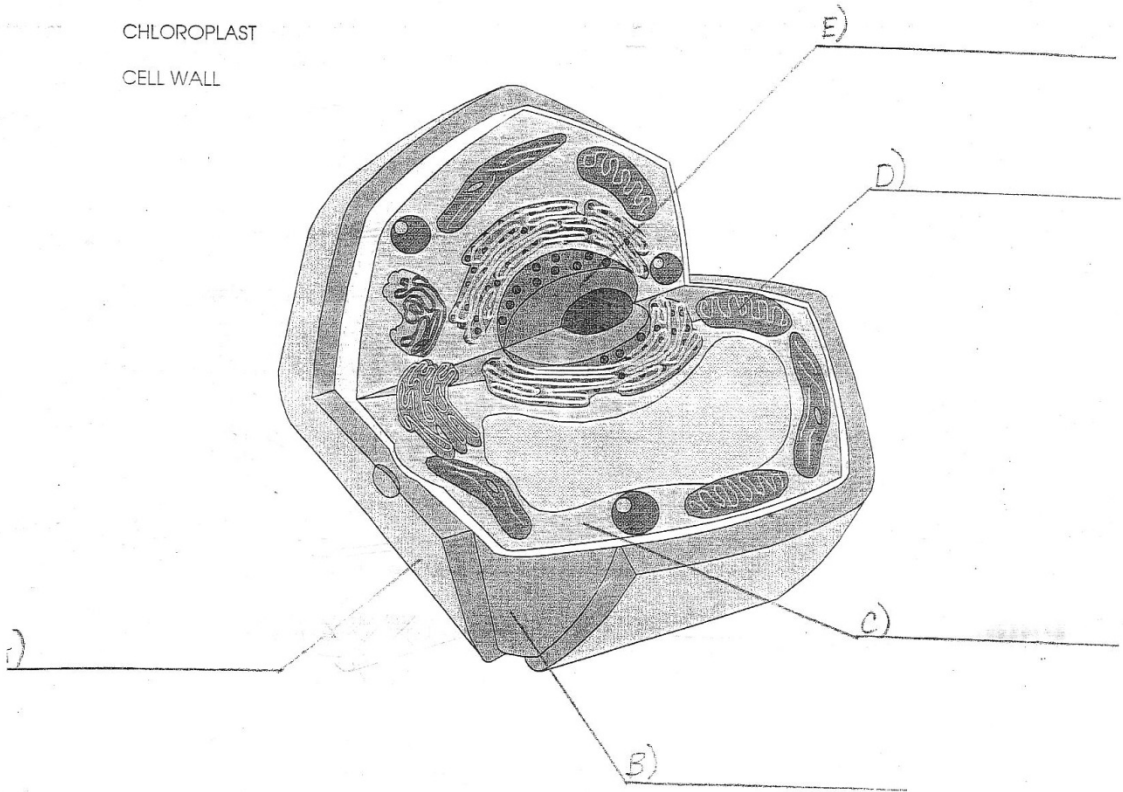
- | | |
|------------------------|--|
| 1. ____ genus | a. Animals <u>without</u> backbones |
| 2. ____ species | b. The smallest unit or part
of a living thing |
| 3. ____ cytoplasm | c. Control center of the cell |
| 4. ____ chloroplast | d. Animals <u>with</u> backbones |
| 5. ____ vertebrates | e. Special part of a plant cell that
traps the energy from the sun |
| 6. ____ nucleus | f. Gel-like liquid inside the cell that
contains the things the cell
needs |
| 7. ____ cell | g. A group of similar organisms that
can mate and produce offspring |
| 8. ____ invertebrates | h. A group that contains similar,
closely related animals (lion and
cat) |
| 9. ____ photosynthesis | i. The process by which plants
make their own food using light |

Ch. 1
Science
test
pg. 2

PLANT CELL

DIRECTIONS: MATCH THE CORRECT PARTS WITH THE DIAGRAM OF THE PLANT CELL.

- CYTOPLASM
- CELL MEMBRANE
- NUCLEUS
- CHLOROPLAST
- CELL WALL



Name: _____ Class: _____ Date: _____

ID: A

chapter 2 test

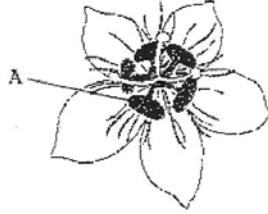
Multiple Choice*Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. Which do all plants have?
 - a. cells
 - b. cones
 - c. needles
 - d. flowers
- ___ 2. What do plants need to live?
 - a. water, sugars, sunlight
 - b. sunlight, oxygen, minerals
 - c. water, oxygen, chloroplasts
 - d. sunlight, water, carbon dioxide
- ___ 3. How is a pine needle like a tulip leaf?
 - a. Both store food.
 - b. Both are kinds of leaves.
 - c. Both also work as stems.
 - d. Both support the plants on which they grow.
- ___ 4. What two main things do stems of plants do?
 - a. store and make food
 - b. support the plant and store food
 - c. carry materials and support the plant
 - d. protect the plant and carry out photosynthesis
- ___ 5. Why does a daisy have a flexible stem instead of a woody stem?
 - a. Daisies have stems that act as leaves.
 - b. Daisies need flexible stems to carry more water.
 - c. Daisies do not need the support of a woody stem.
 - d. Daisies do not live long enough to need a woody stem.
- ___ 6. What kind of root is a carrot?
 - a. taproot
 - b. anchor root
 - c. fibrous root
 - d. chlorophyll root

Name: _____

ID: A

___ 7. Look carefully at the illustration of the flower below.



What is the function of the stamen, labeled A?

- a. makes pollen
 - b. makes petals
 - c. makes egg cells
 - d. protects flower buds
- ___ 8. Why does making nectar help flowers become pollinated?
- a. Nectar easily carries pollen in the wind.
 - b. Animals looking for nectar spread pollen.
 - c. Nectar flows easily between flowers, pollinating them.
 - d. People pick flowers to smell the nectar, pollinating them.
- ___ 9. How are sunlight and plant reproduction linked?
- a. Plants use sunlight for plant pollination.
 - b. Plants turn sunlight into energy for reproduction.
 - c. Plants depend on sunlight to attract bees for reproduction.
 - d. Plants need sunlight to release their scent and attract pollinators.
- ___ 10. Which of these plants grows from spores, not seeds?
- a. fern
 - b. carrot
 - c. pine tree
 - d. tumbleweed
- ___ 11. Which of these describes a spore?
- a. a single tiny cell
 - b. the pistil of a plant
 - c. a small, young plant
 - d. a complex group of cells

Name: _____

ID: A

- ___ 12. How could you grow apples without starting from apple seeds?
- a. planting apple spores
 - b. grafting branches to another tree
 - c. putting a section of root in water
 - d. growing apples on runner stems
- ___ 13. What substance makes plants green?
- a. chlorophyll
 - b. chloroplasts
 - c. stomata
 - d. leaves
- ___ 14. When a seed is in a state of rest, it is
- a. germinate
 - b. sprout
 - c. dormant
 - d. pistil
- ___ 15. What is the part of the flower that covers and protects the flower bud?
- a. pistil
 - b. sepal
 - c. stamen
 - d. petals
- ___ 16. What is the one way in which seeds are NOT scattered?
- a. animals
 - b. wind
 - c. water
 - d. sunlight

Short Answer

17. Describe the process of photosynthesis in detail. (2 points)
18. How are taproots and fibrous roots different and how are they alike? (2 points)

Name: _____ Class: _____ Date: _____

ID: A

ch. 3 test

Multiple Choice*Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. Why is a desert a system?
- People do not live there.
 - It consists mostly of plants.
 - Each part of the desert is independent.
 - It has parts that work together for a purpose.
- ___ 2. Which **best** describes an ecosystem?
- a system where populations stay the same
 - anywhere there is only one kind of organism
 - a system where living and nonliving things interact
 - a place where there is always rain, soil, sunlight, and air
- ___ 3. What is the **best** explanation for a decrease in a population of birds in a community?
- the amount of food decreases
 - the amount of space increases
 - the amount of water increases
 - the amount of air stays the same
- ___ 4. Look carefully at the illustration of the prairie dog below.



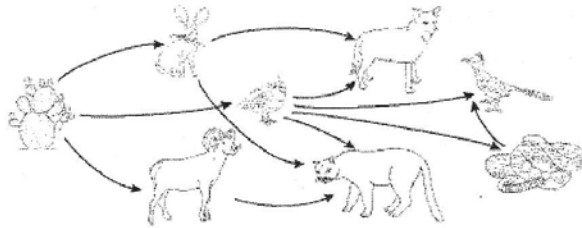
What does this illustration best show?

- the prairie dog's niche
- the prairie dog's habitat
- the prairie dog's ecosystem
- the prairie dog's community

Name: _____

ID: A

- ___ 5. Which adaptation would be most useful to an animal whose niche is eating nectar from plants?
- fins
 - wings
 - fast legs
 - short beak
- ___ 6. What is the main energy source for life on Earth?
- water
 - sunlight
 - chemicals
 - green plants
- ___ 7. Which of these is a producer?
- deer
 - grass
 - hawk
 - worm
- ___ 8. Look carefully at the illustration below.

Which **best** describes this illustration?

- food web
 - producers
 - consumers
 - food chain
- ___ 9. What is a decomposer?
- a dead animal or plant
 - the waste of dead animals and plants
 - a consumer that gets energy by eating only plants
 - an organism like an insect that eats the remains of animals

Name: _____

ID: A

- ___ 10. What is most likely to happen if most of a population of animals dies of disease?
- The food web will stop.
 - The decomposers will die.
 - The food web will change.
 - The producers will also get the disease.
- ___ 11. What is an omnivore?
- an animal that is a producer
 - an animal that eats only plants
 - an animal that eats only consumers
 - an animal that eats plants and animals
- ___ 12. How do decaying organisms in a swamp help create the next generation of organisms?
- The decaying organisms create a new habitat.
 - The decaying organisms create bacteria and fungi.
 - The decaying organisms release oxygen into the air.
 - The decaying organisms put minerals back into the soil.
- ___ 13. Which **best** describes the role of zooplankton in a food web?
- protist
 - producer
 - consumer
 - decomposer
- ___ 14. What is a herbivore?
- | | |
|---|--|
| a. an animal that eats only plants | c. an animal that eats both plants and animals |
| b. an animal that eats only other animals | d. a decomposer |
- ___ 15. What is a carnivore?
- | | |
|---|--|
| a. an animal that eats only plants | c. an animal that eats both plants and animals |
| b. an animal that eats only other animals | d. a decomposer |

Short Answer

16. What is the difference between *a* niche and *a*-habitat *of an animal?* (2 points)

Name: _____

ID: A

17. Make a four part food chain starting with a producer.

Name: _____

Class: _____

Date: _____

ID: A

Chapter 8--Minerals and Rocks**Multiple Choice***Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. Which of these is true of rocks?
 - a. They are made of one or more minerals.
 - b. They can be made of living solid crystals.
 - c. They contain at least two kinds of minerals.
 - d. They have a hardness of at least 7 on the Mohs scale.

- ___ 2. What are minerals?
 - a. types of salt
 - b. different kinds of crystals that make up rocks
 - c. rocks formed by two or more kinds of crystals
 - d. rocks with a hardness of 1 or more on the Mohs scale

- ___ 3. What is mica?
 - a. another word for crystal
 - b. a type of the mineral quartz
 - c. a common mineral that forms rocks
 - d. a chemical minerals need to form rocks

- ___ 4. Which describes talc?
 - a. a very soft mineral
 - b. a very hard mineral
 - c. a mineral also known as pyrite
 - d. a rock made of calcite and salt

- ___ 5. What is weathering?
 - a. high pressure systems that cause storms
 - b. weather that forms around high mountains
 - c. a natural process that breaks rocks into smaller pieces
 - d. the process by which animals form caves in rock for shelter

- ___ 6. Which **best** tells what makes up soil?
 - a. pebbles, water, and crushed shells
 - b. pieces of rock combined with water
 - c. small bits of rock, plant and animal remains, and live animals
 - d. layers of big rocks on the bottom and layers of smaller rocks on top

Name: _____

ID: A

7. Look carefully at the illustration below.



What kind of rock is shown?

- a. igneous
 - b. sedimentary
 - c. metamorphic
 - d. conglomerate
8. Which is a property of sedimentary rock?
- a. It is made of layers.
 - b. It is made of one mineral.
 - c. It is made from melting igneous rock.
 - d. It is made of bacteria and other live and dead animals.
9. Which of these can form fossils?
- a. bones and leaves
 - b. skin, hair, and muscles
 - c. composite rocks and plants
 - d. igneous and sedimentary rocks

Name: _____

ID: A

10. Look carefully at the illustrations below.



obsidian



granite



gabbro



pegmatite

Which is an example of an igneous rock that cooled very quickly?

- obsidian
 - granite
 - gabbro
 - pegmatite
11. Which is a property of igneous rock?
- It is always very soft.
 - You can see the layers that form it.
 - It is made of crushed sea animal shells.
 - It is always made of melted rock that cooled.
12. At very high temperatures and pressures, granite can become gneiss. What kind of rock is gneiss?
- igneous
 - composite
 - sedimentary
 - metamorphic
13. How can sedimentary rock form into metamorphic rock?
- by melting the sedimentary rock
 - by splitting an igneous rock
 - by applying heat and pressure
 - by dissolving the sedimentary rock in water or chemicals
14. A sedimentary rock melts. What kind of rock forms?
- igneous
 - composite
 - sedimentary
 - metamorphic
15. Which mineral has a hardness of 10 on the Mohs scale?
- | | |
|------------|------------|
| a. talc | c. quartz |
| b. calcite | d. diamond |

Name: _____

ID: A

Short Answer

16. Explain how soil forms and what soil contains. (2 points)
17. What two things can scientists tell from a fossil? (2 points)

Matching

- | | |
|---------------------|----------------------------|
| a. minerals | e. igneous rock |
| b. luster | f. metamorphic rock |
| c. sediment | g. Mohs Scale for Hardness |
| d. sedimentary rock | h. Streak |

- ___ 18. Rocks that form from molten rock.
- ___ 19. The eroded material that settles on land or on the bottoms for lakes, rivers, and oceans.
- ___ 20. Natural, nonliving solid crystals that make up rocks.
- ___ 21. Rocks that change as a result of heat and pressure.
- ___ 22. The weight of the layers and sticky clay minerals in sediment that hold particles together harden and form this type of rock.
- ___ 23. The way a mineral's surface reflects light.
- ___ 24. The scale that scientists use to rank the hardness of minerals.
- ___ 25. The color of the powder that a mineral leaves when it is scratched on a special plate.

Name: _____

Changes to Earth's Surface
Science - Chapter 9
Chapter Test

1. There are many different types of **Landforms** please list three different landforms.
 - a. _____
 - b. _____
 - c. _____
 2. Name the two types of **Weathering**.
 - a. _____
 - b. _____
 3. Can animals and plants give off chemicals that cause weathering?
YES NO
 4. In _____ weathering, only the size of rocks is changed.
 5. Water, ice, gravity, and wind often work together to move weathered pieces of rock.
This process is called _____.
 - A. Weathering
 - B. Erosion
 - C. Flooding
 - D. Snow Boarding
 6. In colder parts of earth, moving _____ erodes landforms.
 - A. Rain
 - B. Sand
 - C. Ice
 - D. Grass
 7. **True or False** Deposition is the laying down of pieces of Earth's surface.
-

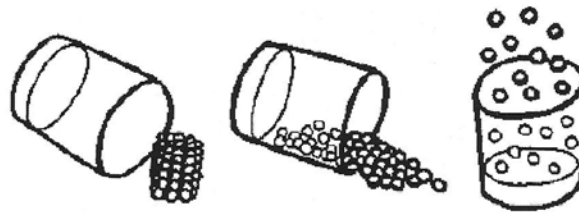
8. The rapid downhill movement of a large amount of rock and soil is called _____.
- A. Flood
 - B. Glacier
 - C. Gravity
 - D. Landslide
9. Describe an **Avalanche**. Give one reason how an avalanche could be triggered.
10. How is a **Landslide** different from other kinds of erosion?
11. A _____ forms at a weak spot in Earth's crust where magma is forced upward and reaches the surface.
12. _____ is hot molten rock that pushes up through vents in Earth's crust.
- A. Dormant
 - B. Weathering
 - C. Magma
 - D. Crust
13. The sudden movement that causes Earth's crust to shake is called an _____.
14. Suppose you are in Hawaii and you are watching a volcano erupt. Write what causes the eruption and describe what you see, hear, and feel.
-

Name: _____ Class: _____ Date: _____

ID: A

Chapter 11 Test**Multiple Choice***Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. Which of these is true of an ice cube?
- It is made of moving, closely-packed, tiny particles.
 - It is made of clumps of particles loosely held together.
 - It is made of tiny particles that are far apart from each other.
 - It is made of particles that move farther and farther apart.
- ___ 2. What can you tell about matter from how its particles move?
- if it is a plant or animal
 - if it is living or nonliving
 - if it is a solid, liquid, or gas
 - if it is made of particles or atoms
- ___ 3. Look carefully at the illustrations below.

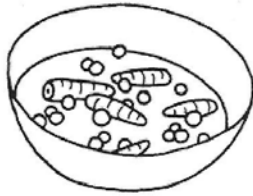


- What do these three illustrations show?
- different gases
 - states of solids
 - states of matter
 - different liquids
- ___ 4. What is matter?
- a kind of particle
 - the same thing as mass
 - a measurement of gravity
 - anything with mass and volume

Name: _____

ID: A

- ___ 5. Which would cause the mass of an object to change?
- changing the state of the object
 - using metric units to measure the object
 - changing the volume of the object
 - subtracting matter from the object
- ___ 6. Which can you use to compare and measure the mass of two objects?
- a balance
 - a metric ruler
 - a thermometer
 - a graduated cylinder
- ___ 7. Which determines if an object will float or sink in water?
- its shape
 - its gravity
 - its density
 - its milliliters
- ___ 8. Look carefully at the illustration below.



What does this illustration show?

- a solvent
 - a mixture
 - a solution
 - a chemical change
- ___ 9. Which can you use to compare and measure the volume of two solid boxes?
- a balance
 - a metric ruler
 - a thermometer
 - a magnet

Name: _____

ID: A

- ___ 10. Which of these is true of solubility?
- Solubility is a property of matter.
 - Solubility is the same as a chemical change.
 - An increase in temperature reduces solubility.
 - Solubility can be measured with a graduated cylinder.
- ___ 11. After it rains, the water on the street evaporates. Which is this an example of?
- density
 - solubility
 - a phase change
 - a chemical change
- ___ 12. When you take ice cream from the freezer, it melts. What is happening?
- a physical change; the particles in the ice cream do not move
 - a chemical change; the particles in the ice cream change shape
 - a phase change; the particles in the ice cream are moving faster
 - a substance change; the particles in the ice cream are moving slower
- ___ 13. A log burns. Which of these is true?
- The fire produces oxygen.
 - The log changes physically.
 - The ashes formed are a new substance.
 - The particles of the log remain the same.
- ___ 14. Which of these is a chemical change?
- A nail rusts.
 - Water freezes.
 - Sugar dissolves in water.
 - Lemon juice, water, and ice cubes make lemonade.
- ___ 15. Which is true about particles that make up solid matter?
- The particles move rapidly.
 - The particles are loosely held together.
 - The particles are closely packed together.
 - The particles move far apart in all directions.

Short Answer

16. Explain what is alike and what is different about mixtures and solutions.
(2 points)

Name: _____ Class: _____ Date: _____

ID: A

Ch. 13 Test**Multiple Choice***Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. What causes static electricity?
 - a. only an object losing electrons
 - b. only an object gaining electrons
 - c. when positive and negative charges balance
 - d. when positive and negative charges no longer balance

- ___ 2. Which of the following would be a good conductor for a closed circuit?
 - a. wood
 - b. copper
 - c. rubber
 - d. plastic

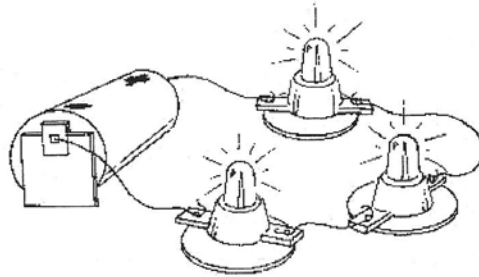
- ___ 3. Where is a magnetic field the strongest?
 - a. at both poles
 - b. in the middle
 - c. at the south-seeking pole
 - d. at the north-seeking pole

- ___ 4. A material that conducts electric current poorly is called
 - a. a circuit.
 - b. a charge.
 - c. a conductor.
 - d. an insulator.

Name: _____

ID. _____

___ 5. Look at the picture below.



What would happen to the other light bulbs in the circuit if one light bulb burns out?

- a. The other light bulbs will remain on.
 - b. The other light bulbs will be brighter.
 - c. The other light bulbs will be dimmer.
 - d. The other light bulbs will go out.
- ___ 6. Why does a compass needle point in a north-south direction?
- a. The needle reacts to Earth's magnetic poles.
 - b. The needle forms an electromagnet with Earth's poles.
 - c. The needle is lightweight, so it always spins to the south.
 - d. The needle is pulled in the middle by Earth's equator.
- ___ 7. How can the strength of an electromagnet be increased?
- a. by using less current
 - b. by using a smaller magnet
 - c. by using a smaller magnetic core
 - d. by using more turns in the metal coil
- ___ 8. What is produced when a coiled wire is spun around a magnet?
- a. electrical energy
 - b. magnetic energy
 - c. mechanical energy
 - d. geothermal energy

ID: A

9. Look carefully at the illustration below.



What type of particles will gather near the bottom of this cloud before energy is released as lightning?

- neutral particles
 - positive particles
 - negative particles
 - positive and negative particles
10. What will a negatively charged object and a positively charged object do?
- attract
 - stay neutral
 - repel
 - insulator

Short Answer

- Explain what happens to a magnet's poles if a magnet is broken into two parts. What poles will seek each other on the two magnet parts? (2 points)
- Do modern homes use electricity that is arranged in series or in parallel circuits? Explain your reasoning. (2 points)

Matching

- | | |
|-----------------------|---------------------|
| a. static electricity | e. parallel circuit |
| b. electric current | f. magnetism |
| c. resistance | g. magnetic field |
| d. series circuit | h. electromagnet |

- the flow of an electric charge through a material
- a coil of wire that creates a magnetic field when current moves through the wire if the coil is wrapped around an iron core
- the imbalance of positive or negative charges between objects

Name: _____

ID: A

- ___ 16. two or more paths in which an electric charge can flow
- ___ 17. a quality of an object which means that electric current cannot flow easily through it
- ___ 18. a simple circular path in which an electric current flows only one way through each part of that circuit
- ___ 19. the invisible force that loops between poles, or ends, and gets weaker with increasing distance from the magnet
- ___ 20. a force that acts on moving electric charge and magnetic materials that are near a magnet

Name: _____ Class: _____ Date: _____

ID: A

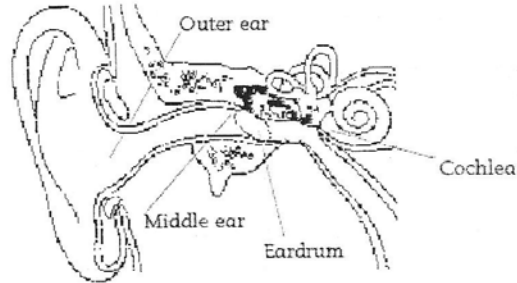
Chapter 14 Test--Sound and Light**Multiple Choice***Identify the letter of the choice that best completes the statement or answers the question.*

- ___ 1. Which type of energy is formed by vibrating objects?
- light energy
 - sound energy
 - chemical energy
 - mechanical energy
- ___ 2. Choose the word that belongs in the sentence.
A sound wave is a type of ___ wave.
- parallel
 - transverse
 - longitudinal
 - perpendicular
- ___ 3. Where would you be traveling in complete silence?
- in outer space
 - under the ocean
 - in a solid wood room
 - at the top of a mountain
- ___ 4. A guitarist strums two strings on a guitar. The first string vibrates more quickly than the second string. What is true about the pitch of the strings?
- The first string has a higher pitch than the second string.
 - The second string has a higher pitch than the first string.
 - The first string and the second string have the same pitch.
 - The pitch of the second string depends on the pitch of the first string.

Name: _____

ID: A

5. Look carefully at the illustration below.



Which part of the ear is filled with liquid that vibrates, causing little hairs to move?

- a. cochlea
- b. eardrum
- c. middle ear
- d. outer ear

6. How are light waves and sound waves similar?

- a. They both are invisible.
- b. They both carry energy.
- c. They both travel in vacuums.
- d. They both are harmful to cells.

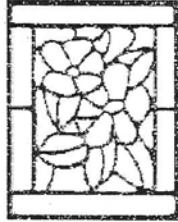
7. When does light refract?

- a. When light travels in a vacuum
- b. When light moves through cold air
- c. When light travels in only one medium
- d. When light moves from one medium to another

Name: _____

ID: A

- ___ 8. Look carefully at the illustration below.



What type of material is used to make the stained glass window?

- a. opaque
 - b. reflective
 - c. transparent
 - d. translucent
- ___ 9. Which muscular part of the eye controls how much light enters the eye?
- a. lens
 - b. iris
 - c. pupil
 - d. cornea
- ___ 10. What happens to light that passes through a concave lens?
- a. The light rays spread apart.
 - b. The light rays are absorbed.
 - c. The light rays come together.
 - d. The light rays move in a straight path.

Short Answer

- 11. Describe how wind instruments produce sound, and explain why shorter instruments have a higher pitch. (2 points)
- 12. Identify two sources of light, and explain the importance of each source of light to life on Earth. (2 points)

Name: _____

ID: A

Matching

- | | |
|----------------|----------------|
| a. reflection | f. refraction |
| b. absorption | g. frequency |
| c. transparent | h. wavelength |
| d. translucent | i. compression |
| e. opaque | j. pitch |

- ___ 13. part of the wave where particles are bunched together
- ___ 14. the number of waves that pass a point in a certain amount of time
- ___ 15. the distance between a point on one wave and a similar point on the next wave
- ___ 16. what makes a sound seem high or low
- ___ 17. This occurs when light rays bounce from a surface back to our eyes.
- ___ 18. materials that do not let any light pass through them
- ___ 19. materials that transmit nearly all of the light rays that hit them
- ___ 20. materials that let some light rays pass through but scatter other rays
- ___ 21. This occurs when an object takes in the light wave.
- ___ 22. bending of a wave caused by the change of speed that occurs when the wave passes from one medium into another