THE EFFECTS OF USING MUSICAL SONGS AS A SUPPLEMENT TO A TRADITIONAL LIFE SCIENCE CURRICULUM

By

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July 2011
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ABSTRACT

Throughout the course of an academic school year, some students in my seventh grade science classroom struggle with recalling taught material. My project, which is based on the action research model, focused on using music as a supplement to traditional teaching techniques as a means of facilitating higher achievement scores, greater self-efficacy among students, and an overall increase in student success. The results of utilizing music to increase assessment scores, as well as student attendance and student attitude, were considered during my research.

Forms of data collection for the project included student interviews, student questionnaires, teacher journal, field notes, attendance rates, and assessment scores. These data collection tools were used to measure the effect of music on student assessment scores. The students were receptive to the project and the treatment group was excited when music was infused with their typical classroom instruction.

The results of the study indicated that students exposed to the music did in fact earn higher scores on assessments over the treatment time period. In addition, the attendance rate was higher in the classes being exposed to the treatment. In the future, I plan to incorporate music in each section of Life Science that I teach.
INTRODUCTION AND BACKGROUND

I teach seventh grade life science at Post Oak Middle School, Spotsylvania County, Virginia. Post Oak has 763 students and is located in the rural section of the county; therefore, most of my students are familiar with a rural lifestyle. The academic performance of my students is lower than that of other middle schools in the county. This is due to both the financial disadvantage and limited resources of my students. This limits the amount of work they can complete at home. Ethnically speaking, Post Oak has less diversity than other schools in the county as a direct result of its location. The county’s highest population density is concentrated mainly within the city of Fredericksburg; therefore, the closer to the city, the more ethnic diversity is present. The ethnic breakdown at Post Oak is as follows: 80% Caucasian, 15% African American, 3% Latino, and 1% Asian American (Education, 2010).

Learning style does vary among my students; therefore, my classroom climate is one where I strive to keep every student engaged by utilizing a variety of strategies. I have found that it is much easier to keep the students’ attention if they are actively engaged in the lesson. The majority of my students are kinesthetic learners; they best demonstrate achievement through hands-on activities.

In today’s current public education system, students are constantly completing standardized tests for both their respective counties and states. That being said, I am always searching for an effective method to help students retain taught information. When I began to think about a project topic that could benefit all students, my goal was to choose something to which all students can relate. While attending a science conference in Washington, DC, I participated in a workshop that ultimately gave me the idea for my
The workshop was titled: “Songs of Life Science,” and was led by a life science teacher who developed content-based songs to be sung by the class as the instructor strummed his guitar. I personally enjoy playing guitar as a hobby and am always thinking of a way to integrate music into the curriculum. As many of the students struggle with retaining information, integrating songs into the life science curriculum was something I wanted to attempt. Music is an art form that all cultures of the world utilize as a tool to send and receive messages; therefore, utilizing music as a teaching tool is a way to reach students, acknowledge diversity, and differentiate instruction. The primary question I want to answer through my research project is: What effect does incorporating music into the science curriculum have on assessment scores? Additionally, I have devised two secondary questions: How does incorporating music affect student participation, and what impact will the incorporation of music have on student attitudes?

CONCEPTUAL FRAMEWORK

There is no shortage of evidence to suggest that integrating music with other educational disciplines has ample benefits for learners of all levels. First, collaboration between music and other subjects provides solid links for learning (Cane, 2009). Furthermore, music in the curriculum supports diverse learning styles (Singer, 2008). Finally, music in the curriculum preserves the arts in education (Drake, 1983). Too often, it has been assumed that music is a frivolous learning tool. However, musical collaboration among educators has been viable for planning instruction, managing classrooms, and assessing achievement (Cane, 2009).
Music has been shown to be capable of altering mood as well as providing motivation. Brunk conducted a study that assimilated music into the science curriculum of middle school students. Upon completion of the study, the research suggested that learner achievement in science was increased when music was integrated with the subject (Cane, 2009). Weisskoff (as cited in Cane, 2009) led a study focused on learning motivation in which she utilized a three-point Likert-type scale to gauge student motivation. The participants in the study received one of several different motivational conditions. Results indicated that “students who received the music condition scored significantly higher with regard to continuing motivation” (Weisskoff, 1981).

According to Brewer (1995), music helps bring education to life. The intentional use of music in the classroom enhances learning and teaching activities. Music aids learning by establishing a positive learning state, which creates a desirable atmosphere for students. Implementing music in all subjects helps build anticipation, provoke curiosity, and gain and keep students’ attention, resulting in an engaging and energized learning environment. Music also has a positive effect on students’ concentration and memory. Similarly, Singer (2008) recalled presenting a challenge to her graduate students: try and find a name in a phone book or file a document alphabetically without singing the ABCs. To Singer, it was clear that music helped essential content stay in the mind, serving as a mnemonic device that aids rote memorization.

Rauscher, Shaw, and Ky (1993) first documented the Mozart effect, that music has a positive effect on cognition and behavior. A study based on the Mozart principle yielded the following results: 36 college students who listened to ten minutes of a Mozart sonata performed higher on a subsequent spatial-temporal task than after they listened to
relaxation instructions or silence. There has been some controversy as to whether or not the Mozart effect is valid. In a later paper, Rauscher (1993) shared that the Mozart effect was only studied in adults, lasted for only a few minutes, and was found only for spatial-temporal reasoning. Since then, Rauscher’s findings have been reinforced. Rauscher and her colleagues shared that after eight months of keyboarding lessons, preschoolers demonstrated a 46% boost in their spatial reasoning. Spatial reasoning is also an important skill for mathematical reasoning. After Rauscher’s research became public, there was a boom in the industry that includes books, CDs, and websites claiming that listening to classical music can make children more intelligent (Shinn, 2006). While the research certainly does not imply that it is necessary to spend money on music-related materials in order to boost intelligence, there is evidence to support the positive effects of music in all educational disciplines.

Schlaug, Steinmetz, Jancke, and Huang (1995) compared magnetic resonance images of 27 classically trained right-handed male piano or string players with those of 27 right-handed male non-musicians. The results indicated that the musicians’ planum temporals, a brain structure associated with auditory processing, were larger in the left hemisphere and smaller in the right than in the non-musicians (Shinn, 2006). In addition, the musicians had a thicker nerve-fiber tract between the left and right hemispheres of the brain. The differences were pronounced among musicians who began training before the age of seven. According to Schlaug, Steinmetz, Jancke and Huang (1995), studying music promotes growth of the bridge between the two hemispheres known as the corpus callosum, which is 10-15% thicker in musicians who began training at an early age. It
may be concluded that those who receive musical exposure early on will develop elevated levels of auditory processing.

Aside from neurological effects on learning, integrating music with classroom instruction is an effective differentiation technique. Differentiated instruction is an approach to teaching that addresses the various differences among students within a classroom (Ornstein & Levine, 2010). It is true that some students prosper only in an environment where sound is not a factor. However, test scores and attitudes are positively correlated with the congruency of students’ learning environments whether they are predisposed to learning in quiet or with sound (Pizzo, 1990). While music may distract some students, it could foster a powerful connection to the material for others. For instance, music may have different uses or meaning to various groups, but essentially it is similar across all cultures. Therefore, using music as an instructional tool accommodates diverse learning styles and extends multicultural experiences to all types of learners (Singer, 2008). Furthermore, preservation of the arts within educational environments is essential to the development of the learner. Liberal arts education contributes to essential societal needs such as keeping cultural values alive and facilitating creativity in problem-solving (Drake, 1983).

METHODOLOGY

The treatment for this action research-based project involved the introduction of musical songs with science content-based lyrics over a six week period. The class still included traditional teaching techniques such as discussion, note-taking, and hands-on lab activities. A pre-determined class had the musical songs woven into their instruction.
Data collection techniques included teacher-made quizzes, student interviews, student journals, attendance rates, pre and post-questionnaires, teacher-made field notes, and a teacher journal (Table 1).

I chose two classes as subjects for my action research project. The treatment class consisted of 27 students while the non-treatment class consisted of 24 students. The treatment and non-treatment classes were academically equivalent. The treatment / non-treatment model was chosen and comparisons were made between the two. I felt that using this particular research model would provide the most accurate representation of the overall impact of incorporating music as an instructional aid within the classroom. Prior to applying the treatment, I had to secure informed consent approval through an Informed Consent Exemption Form signed by my principal (Appendix A). 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.

To begin the research, I administered the Student Interview to gather baseline data on subjects (Appendix B). Selected students from the treatment class were asked the interview questions prior to the treatment. This afforded me the opportunity to collect student feelings relating to both music and learning. The interview questions were designed to focus on three aspects of students’ feelings. Interview responses were categorized into three core areas (role of music, preferred study environment, and learning needs). The interview questions fall into one of three categories: general interest in music, preferred study environment, or general student opinion.
The second step of data collection consisted of students completing the Student Questionnaire (Appendix C). This survey was administered to both the treatment and non-treatment classes. The goal of the survey was to gauge student attitude both before and after treatment. Through the survey, I was able to collect baseline data on the role music plays in the lives of each student. For data analysis, student responses were categorized into three main areas: learning styles, self-efficacy, and application to the real world.

The treatment took place during the Spring and included one genetics quiz and two classification quizzes. Three teacher-made curriculum-based songs were utilized as treatment during the project (Appendices D, E, F). The songs were introduced to the treatment classes after both the Student Interview (Appendix B) and the Student Questionnaire (Appendix C) were completed. The songs were sung as a class with copies of the lyrics provided to each student. The songs were practiced three times per class during the treatment.

Next, students completed the DNA quiz, Classification Quiz, and the Fungus Quiz (Appendices G, H, I); one for each song that was applied to the treatment class. These quiz scores were quantified and then compared with scores from the non-treatment class, which were derived from the same quizzes. The non-treatment classes were exposed to identical instruction with the exception of the treatment songs.

Table 1 illustrates the data sources to be used to answer my primary and secondary research questions. The Student Questionnaire was administered at the end of the treatment, which provided data relating changes in student attitude (Appendix C). Teacher observations as well as student journals were utilized to indicate the progression
of learning taking place in the classroom. Daily attendance was recorded to gauge student participation throughout the project.

Table 1
Data Triangulation Matrix

<table>
<thead>
<tr>
<th>Focus Questions</th>
<th>Data Source 1</th>
<th>Data Source 2</th>
<th>Data Source 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Question:</strong></td>
<td>Quiz scores</td>
<td>Teacher observations</td>
<td>Field notes</td>
</tr>
<tr>
<td>What outcome does incorporating music into the curriculum have on student</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>assessment scores?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Secondary questions:</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>How does incorporating music into the curriculum affect student participation?</td>
<td>Quiz scores</td>
<td>Pre &amp; post questionnaire</td>
<td>Attendance rates</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>What impact will incorporating music into the curriculum have on student</td>
<td>Pre &amp; post interview</td>
<td>Pre &amp; post questionnaire</td>
<td>Journal</td>
</tr>
<tr>
<td>attitude?</td>
<td></td>
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DATA AND ANALYSIS

The results of the Student Interview revealed that although it was evident that participants enjoyed a wide variety of musical genres, nearly all participants specifically indicated a favorite type of music (N=51). Responses ranged from “like classic rock” to “enjoy electronic music.” Many participants also provided examples of ways in which music plays a role in their everyday lives. One student stated, “I play guitar and sing songs with my sister,” while another student admitted, “I use it [music] to express my anger.” Finally, participants were asked whether they felt that music could assist them
with remembering and further understanding information learned in science class; all interview participants answered “yes.”

When asked about music preference during study time, some students said, “I can’t concentrate with music on” or “I don’t like any music or noise when I do homework.” Other students, however, indicated that they enjoy listening to background music while studying. Still others responded with claims that their preference “depends” on outside factors such as importance/difficulty of the material being studied or even their mood that day.

The Student Questionnaire (Appendix C) was administered pre as well as posttreatment. All questions the students were required to answer can be sorted into three main categories: personal learning style, sense of self-efficacy, and perception of the connection of academic Life Science to the real world. Some questions addressed the need for “hands-on” instruction (learning style), belief in one’s own ability to teach a peer (self-efficacy), and interest in pursuing science outside of the classroom (connection to the real world) (Figure 1).

Results of the Student Questionnaire (Appendix C) indicated that the average student was uncertain of his or her personal learning style. Additionally, teacher observations were conducted during general conversations in the classroom. These conversations suggested that some students were unaware of a personal need or preference for a specific mode of instruction. Posttreatment data showed that incorporating music into the curriculum increased overall student awareness of individual learning styles. This data also suggested that many students may in fact be auditory learners (Figure 1).
Student Questionnaire data also indicated that the average student was unsure of his or her ability to provide instruction on life science to a peer. By using music to demonstrate an alternative means of presenting academic information, the researcher was able to raise the self-efficacy of participants such that post-treatment data showed a significant increase in students’ belief in personal ability to instruct a peer (Figure 1).

The average survey participant showed some interest in learning science outside of the classroom during the pretreatment Student Questionnaire. Post-treatment, however, participants’ desire to pursue science beyond academia increased significantly. This increase suggests that presenting science content in a musical format helped participants build a connection between science and the outside world. Finally, the data revealed that the overall confidence level of students regarding outlook on academic science increased from pre to post-treatment (Figure 1).

![Figure 1. Average scores from treatment group (N=24).](image)

The results of the Student Questionnaire indicated that students felt more successful when learning hands-on science from pretreatment to post-treatment. The pre-treatment average score was 2.8 and the post-treatment score was 3.7, where 2=neutral,
3=agree and 4=mostly agree. The Student Questionnaire also indicated that students felt they could teach another student science content they have learned with more success from pre to post-treatment. The pretreatment average score was 3.1 and the post-treatment score was 3.9. Finally, student interest in science outside of the classroom also increased after the treatment was administered. The pretreatment average score was 3.8 while the post-treatment score was 4.6 on the Student Questionnaire.

Students in both the treatment and non-treatment groups were assessed on knowledge of DNA, classification, and fungus through three separate quizzes (one for each category). Average quiz scores for the non-treatment group are as follows: DNA = 78%, classification = 79%, and fungus = 78%. Average scores for students in the treatment group were 79% for DNA, 86% for classification, and 82% for fungus. Participants in the treatment group reported in student journals that the “Classification Song” was easy to memorize; therefore, the simplicity of the song’s lyrics directly impacted student achievement scores (Figure 2).

![Chart of assessment scores](image)

**Figure 2.** Average assessment scores for treatment and non-treatment classes (N=51).

Student attendance rates on average were higher among the treatment group over the course of the four week study (Figure 3). One hundred percent of students in the
treatment group were present on Day 8 of the study; interestingly, this same group of students scored highest on the classification quiz, which was given on Day 9. Overall, the average attendance rate for the non-treatment group was 79% while the treatment group average attendance rate was 90%.

![Student attendance percentage over the treatment time period (N=51).](image)

**Figure 3.** Student attendance percentage over the treatment time period (N=51).

**INTERPRETATION AND CONCLUSION**

The data were analyzed to answer my focus question of the effects of incorporating music into the science curriculum on student assessment scores. Evaluation of the data suggests that the utilization of music in the science classroom did assist students in completing assessments with a higher rate of success. This transformation is signified by the triangulation of the data collected throughout the project.

Student attitude about the science classroom in general increased over the six-week time period of the research. This is evident through the results of the Student
Questionnaire that was administered to the treatment group both before and after exposure to the treatment. An additional piece of data that exhibits transformation is the average score on quizzes for the treatment group. All three of the quizzes used in the research indicated that the treatment group achieved higher scores. The assessment on classification proved to have the highest average score. Coincidentally, students appeared to be the most excited when singing the correlating classification song. This leads me to believe there is a direct connection between student excitement and the learning process. Finally, there was a transformation in the overall attendance. The treatment group was present in class more so than the non-treatment group. One could have predicted this to occur from the student interviews as it was clear that music played an important role in most of their lives.

There are some parts of the research project that could be improved for future studies. For instance, when students answered the interview questions, several of them gave very short or one-word answers. I would tell them at the beginning of the interview to be as specific as possible when answering the questions. Also, I would indicate that “I don’t know” is not an acceptable answer to any of the questions. A second improvement that could be made would be to categorize achievement data into subgroups based on ethnicity, socio-economic status, etc. From this data, I could analyze possible effects of each student’s individual background on his or her achievement in the science classroom.

In my personal experience, music is a great avenue to enhance learning across curriculum as well as differing levels of education. Music seems to have an important place in the lives of most people across cultures, which enables it to be an effective tool for both informing and educating people.
This action research project has provided a great professional development opportunity for me as a teacher. Most importantly, it has allowed me to improve student learning in the Life Science classroom. As the data revealed, the project yielded positive results overall for improved retention of material by students. Incorporating music into a subject is a tool that could be utilized across both curriculum and grade level to supplement the learning of students.

As I looked back on the completed project, I was excited to see students engaged in lessons and interested in content. Some of the students that typically have trouble focusing during class performed at a higher level throughout the treatment. This indicates how important the mode of delivering information to students is. Although I was conscious of the fact that students all have different learning styles, this project increased my awareness of the need for differentiation.

As I anticipate future years in the classroom, I will apply the results of this project to my lesson planning. I am going to write or borrow songs for each topic within the subject I teach and apply them to each section that I instruct. I always had a favorable opinion concerning music in the classroom, and after conducting this research, my opinions have been confirmed. I feel that my overall effectiveness as a teacher increased throughout the course of this project. As I had hoped that music would strengthen the motivation of my students to learn, my own motivation to teach was consequently elevated by the excitement and anticipation I felt during the classes in which music was incorporated. I believe that this rise in my personal self-efficacy as an educator was perceived by my students, who in turn became similarly inspired to view themselves as
capable, enthusiastic learners. I believe it is in the best interest of my students to continue using music in the classroom as a tool to supplement their understanding of the subject as well as to improve personal belief in their own ability to be successful in any classroom.
REFERENCES CITED


APPENDICES
Appendix A

Informed Consent Exemption Form
Research approval document

I, Keith Wolfe, Principal of Post Oak Middle School, verify that the classroom research conducted by Cameron Novak is in accordance with established or commonly accepted educational settings involving normal educational practices. It is understood that the parents have been notified of the research taking place.

(Signed Name)

(Printed Name)

(Date)
Appendix B

Student Interview
1.) What is your favorite type of music?

2.) Has music played an important role in your life? If so, how?

3.) Besides music class, have any of your past teachers used music in the classroom to help you learn?

4.) Do you think that using songs with science information could help you remember the information?

5.) When you are studying at home, do you prefer a quiet environment or do you like background music?

6.) What do you think I could do to help you be more successful in class?

7.) What things do other teachers do in class to help you remember what they teach you?

8.) Is there anything else you would like me to know?
Appendix C

Student Questionnaire
Student Questionnaire

*Please respond to the following questions by circling the response that reflects your opinion. 

*Your answers will not impact your science grade in any way.

SA = strongly agree     A = agree     U = undecided     D = disagree     SD = strongly disagree

1.) I typically do well on tests in science class.
   SA   A   U   D   SD

2.) Science is a difficult subject for me to learn.
   SA   A   U   D   SD

3.) I feel more successful when learning science through hands-on activities.
   SA   A   U   D   SD

4.) I find that I learn material more successfully during labs.
   SA   A   U   D   SD

5.) I feel that I could teach another student the information I have learned in science class.
   SA   A   U   D   SD

6.) I pay close attention during all aspects of my science class.
   SA   A   U   D   SD

7.) I am interested in learning science when I am OUTSIDE of the classroom.
   SA   A   U   D   SD

8.) I am interested in finding a career that involves science.
   SA   A   U   D   SD

9.) I am excited to attend my life science class
   SA   A   U   D   SD

10. I have the ability to earn a successful grade in science (A or B).
    SA   A   U   D   SD
Appendix D

DNA song
DNA song:

Each of us has 10 trillion cells, in the nucleus is where the DNA is
Split into strands 2 yards long, tightly wound into chromosomes

Yeah it’s D…………DNA……………Yeah it’s D……..DNA.

DNA had it’s picture taken, in an X-ray by Rosalin Franklin
In 1953 it’s shape was discovered, by James Watson and Francis Crick

Yeah it’s D…………DNA……………Yeah it’s D……..DNA.

These chromosomes give us our traits, like your blonde hair and my brown eyes
Shaped like a twisted ladder, but it’s called a double helix.

Yeah it’s D……DNA…………….Yeah it’s D…………..DNA.

DNA is made of smaller things, called nucleotides and there are 4
Adenine bonds with thymine, guanine and cytosine bond too
A, T, G, and C are the bases, but there is more to know
The sides are made of, a sugar and a phosphate too

Yeah it’s D……..DNA………………..Yeah it’s D…………..DNA.

Deoxy…………ribo…………nucleic…………acid !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Appendix E

Classification song
Classification song:

Welcome to the world of classification.
It’s the life science way of organization.
There’s a 2 name naming system you’ve got to memorize,
It was developed by Linneaus back in 1755.

Binomial nomenclature that’s the name
First genus, second species that’s the game.
But all in all, there are seven levels you must know.
Get ready to say them, here we go…

It goes Kingdom, phylum, class, order, family, genus, species.
It goes Kingdom, phylum, class, order, family, genus, species.
It goes Kingdom, phylum, class, order, family, genus, species.
It goes Kingdom, phylum, class, order, family, genus, species.

To read a taxonomic key, go step by step
This helps identify organisms you don’t know yet.
You could also use a field guide
To help you with ways to classify.

Welcome to the world of classification.
It’s the life science way of organization.
There’s a 2 part naming system you’ve got to memorize,
It was developed by Linneaus back in 1755.

Binomial nomenclature that’s the name
First genus, second species that’s the game.
But all in all, there are seven levels you must know.
Get ready to say them, here we go…

My buddy, King Phillip came over for good spaghetti.
My buddy, King Phillip came over for good spaghetti.
My buddy, King Phillip came over for good spaghetti.
Appendix F

Fungus song
Fungus song:

The kingdom of life called fungus is cool
You sometimes eat it for lunch when at school

They are eukaryotes with a nucleus inside
Mushrooms, mildews, molds are all alive

Mushrooms, mold, and mildews, what is all the fuss
Decomposers are very important to us

They break things up and return nutrients to the ground
Without all their work, many dead plants & animals would abound

**Ch:** Fungus is among us and it will be till the end
Depending what you are it could be foe or friend.

Most fungus eat with hyphae and digest with a chemical ooze
As they are heterotrophs, they must look elsewhere for food

You sometimes see it grow on your bread
You surely don’t want a killer fungus in your head

Bread is a food abundant to people of the West and some of the East
It wouldn’t be possible without the fungus we know as yeast

There are disease fighting fungi, penicillium is one you can note
It may be a very good friend when you come down with strep throat

**Ch:** Fungus is among us and it will be to the end
Depending who you are it could be a foe or a friend

Fruiting bodies produce spores and can travel by wind
Used for reproduction to help a new fungus begin

As you can see fungus is a kingdom we need around
For if it was gone, life as we know it would not be found
Appendix G

DNA quiz
DNA quiz

Directions: Circle the correct answer to the following questions. (5 points)

1.) What two people discovered the DNA molecule in 1953?
   A.) Johnson & Mendel
   B.) Watson & Crick
   C.) Turner & James
   D.) Novak & Crick

2.) The DNA molecule is tightly wound into which of the following?
   A.) Genes
   B.) Nucleotides
   C.) Adenine
   D.) Chromosomes

3.) The sides of the DNA molecule are made of:
   A.) Nucleotides
   B.) Guanine
   C.) Phosphates & Sugars
   D.) Adenine & Thymine

4.) The name of the twisted ladder shape of the DNA molecule is known as a:
   A.) Double Helix
   B.) Single Helix
   C.) Triple Helix
   D.) Cytosine

5.) What is the name of the woman who played an important role in the discovery of
   the DNA molecule?
   A.) Rosalin Crick
   B.) Kelly Clark
   C.) Rosalin Franklin
   D.) Teresa Novak

Directions: Complete the stands of DNA by writing the correct nucleotide symbol.
(5 points)

Appendix H

Classification quiz
6.1 quiz: Classifying Organisms

Directions: Circle the correct answer for each of the multiple choice questions below.

1.) Which of the following is NOT an advantage of identifying an organism by its scientific name?
   A.) Identifies an organism’s enemies
   B.) Avoids confusion about living things
   C.) Allows scientists world-wide to communicate about living things
   D.) Identifies an organism’s genus and species

2.) What type of tool uses a series of yes and no questions to determine the name of a species?
   A.) Punnett Square
   B.) phenotype
   C.) genotype
   D.) dichotomous (taxanomic) key

3.) What is the correct way to write the scientific name of a human being?
   A.) homo sapiens
   B.) Homo sapiens
   C.) Homo Sapiens
   D.) H. S.

4.) When using binomial nomenclature, what two levels of classification do the names identify?
   A.) family and class
   B.) kingdom and species
   C.) genus and species
   D.) phylum and order

5.) Which classification group has the most characteristics in common?
   A.) Kingdom
   B.) Phylum
   C.) Class
   D.) Species
Directions: Match the term with the correct response.

6.) _____ the study of classification          A.) classification

7.) ______ the two part naming system used          B.) taxonomy
     by scientists.

8.) _____ the process of grouping organisms          C.) genus
     based on their similarities.

9.) ______ the second part of an organism’s          D.) binomial nomenclature
     scientific name.

10.) _____ the first part of an organism’s          E.) species
     scientific name.

Directions: Complete the task below.

11.) List the seven groups of classification scientists’ use around the world, starting
     with the largest group ending with the smallest group.

a.) __________________

b.) __________________

c.) __________________

d.) __________________

e.) __________________

f.) __________________

g.) __________________
Appendix I

Fungi quiz
Fungi Quiz

Directions: Write true or false in the space provided.

1.) _______________ Organisms in the fungi kingdom are prokaryotes.

2.) _______________ The fungus kingdom contains mushrooms, mildews, & molds.

3.) _______________ Bread is made using a multi-cellular fungus called yeast.

4.) _______________ Some fungi are used to make antibiotics.

5.) _______________ Fungus lives more successfully in dry environments.

6.) _______________ Spores are the structures released for reproduction in Fungi.

7.) _______________ The fungus that usually grows on bread is mushrooms.

8.) _______________ There are some “killer fungi” that can attack other organisms.

9.) _______________ The fungi kingdom of life contains all heterotrophs.

10.) _____________ In general, mushrooms grow more successfully in direct sunlight.

11.) _____________ The Earth would remain as it is without the fungi kingdom.

Short answer: Please answer each of the following questions in sentence form.

12 & 13.) Explain what would happen if there were no organisms from the fungi kingdom on Earth (be sure to use and define the term decomposer in your explanation).

14 & 15.) Describe how organisms from the fungi kingdom obtain and eat food from a source (be sure to use and define the term hyphae in your explanation).