

FOURTH-GRADE STUDENTS' LEARNING ABOUT WORK AND
ENERGY THROUGH MUSIC

A THESIS

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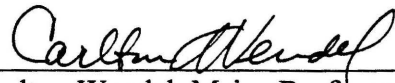
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To the Associate Vice President for Research and Dean of the Graduate School:

I am submitting herewith a thesis written by Kara Sartin entitled "Fourth-Grade Students' Learning about Work and Energy through Music." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Science.

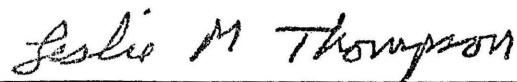


Carlton Wendel, Major Professor

I have read this thesis and
recommend its acceptance:



Accepted



Associate Vice President for Research
and Dean of the Graduate School

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ABSTRACT

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ENERGY THROUGH MUSIC

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DECEMBER, 1997

The purpose of this study was to integrate music into a hands-on work and energy science unit to reinforce the concepts being taught. The study involved two classes of fourth grade students in an urban elementary school and took place over a period of four weeks. During the first week, hands-on lessons were taught to both classes. After the first week, while both classes continued to participate in hands-on activities, the treatment class began writing lyrics about the science concepts. The lyrics were combined with a tune. The control class discussed the science concepts. At the end of the four weeks, a posttest was administered. The results did not support the instructional effectiveness of integrating music into this particular science unit.

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CHAPTER I

INTRODUCTION

Throughout generations, music has been an important part of living. Music begins before birth, when the mother sings lullabies to her womb. Throughout the child's early years, songs are an integral part of life. Finger plays and nursery rhymes are heard morning through night. As children get older, music follows them to school. Music in the elementary education curriculum allows the children to be creative through rhymes, rhythms, movement, and dance. It helps in memorizing important facts which are used for the rest of their lives. ABC's are sung in kindergarten, spelling and vocabulary words are incorporated into music. Multiplication and division facts are learned to rock and roll or rap songs. Social studies and science topics, such as learning the fifty states or how electricity works, are put to music.

Music has many benefits. For years handicapped children and adults have reaped the benefits of music therapy. People listen to music to calm them during stressful situations or to relax after a busy day. Television and movies use music to tell the viewer when a scary part is approaching, when sadness overtakes the character, or when a joyous occasion brings everyone together.

Conceptual Framework

Music is almost everywhere. It is in the stores, at the mall, and at restaurants. When calling a business and being placed on hold, music plays over the phone. Television shows have opening theme songs. Music intensity increases when the plot thickens during a movie. In schools, song bounces off the walls of music class, but too often, there is where it stops. Music rarely enters the homeroom. According to Langstaff and Mayer (1996), all children are born with musical ability. They also continue to say that a child will lose the ability if it is not used. This ability, once lost, may never be regained (p. 62, 63).

As far back as the 1960's, researchers were aware of the importance of music in all aspects of a child's life. This included the classroom. Raley (1966) states that "discovery has had a role in teaching and learning. The creative nature of music seems to lend itself to the act of discovery for oneself" (p. 10, 11). Mursell (1956) felt that "music can yield lasting and abiding values in anybody's life only if he himself achieves a developing grasp of feeling for, and understanding of it; if he grows musically... From this it follows that the basic direction of our whole program must be towards the furtherance of musical growth" (p. 18, 19).

More recent findings have reinforced these ideas from 30 years ago. The use of "...songs add to the curriculum...to help the learner utilize another approach to process and internalize the meaning of new sounds and structures being learned" (Purcell, 1992,

p. 92). Music is being used in special education classes. This is not to say that only special students, which includes special education, gifted, and bilingual students, can participate in musical activities. All children can benefit by the use of music in the classroom. Many teachers are concerned about a child's memorization of facts and how well they do on standardized tests. If only these tests had musical lyrics that the children listen to everyday. Many children are unable to tell you what nine multiplied by seven is, but they can tell you every word in the lyrics of the most popular songs on the radio. In addition, they can explain the meaning of the songs, even when the exact meaning is not stated in the song. Since this is often the case, why is not music utilized more in the classroom? Cassidy (1990) states that music can be implemented by "promoting cognitive, motoric, and emotional responses: giving aesthetic pleasure; building self-esteem; (a) providing enjoyment..." (p. 41).

All areas of the curriculum should promote the benefits of music in the classroom. Mathematics has implemented the musical importance through its rap and rock and roll basic facts tapes and understanding money tapes. Science concepts can also be reinforced through the use of music. Singing the concepts and using movement to reinforce the words and concepts will assure the child better understands the scientific principles.

Purpose of the Study

The purpose of this study was to integrate music into a hands-on work and energy science unit to reinforce concepts being taught. The intent was to show that when science

concepts are made into lyrics and added to music and movement, there is a significant increase in the retention of the concepts when an end of the unit assessment is given.

Research Question

Is there a significant difference between the posttest scores of two heterogeneous groups of fourth-grade classes in learning science concepts between students who receive music and science instruction and students who receive science only instruction?

Definitions

Music: The combination of sounds to make a tune.

Movement: A series of organized activities working toward an objective.

Work: What happens when force moves an object.

Energy: The ability to do work.

Assumptions

Students are placed in classes according to school guidelines, to assure each class has a variety of abilities. It is assumed this process yields heterogeneous classes.

Limitations

This study was limited to two English speaking fourth-grade classes.

CHAPTER II

REVIEW OF LITERATURE

Music is an essential part in the lives of children and is important to bringing out the best in them. Schools need to recognize the impact music has on children and utilize it toward enriching the educational system.

The music teacher is not merely teaching music. He is not merely teaching boys and girls. He is at the center of a nexus of community desires and interests to which he must respond and on which he must exert influence. He stands for the community as a whole, in terms of a special kind of work. In this sense he is a public person, and his work, which extends far beyond the classroom, is a public service, and can only be done with real success when so regarded (Mursell, 1943, p. 10).

Too often music is neglected in the classroom, even though in 1994, GOALS 2000 included the arts among the core subjects (Brophy, 1994, p. 30). Whenever there are budget cuts, the arts are the first to be cut. Movement is another area which encourages children to creatively express themselves through the school's curriculum. Research shows that when involving the whole child, the mind and the body, in the learning process, the child understands so much more than when sitting in the classroom and doing worksheets. The importance of music and movement will be reviewed in depth.

The Importance of Music

There are so many benefits from music. Mursell, in his book, Music and the Classroom Teacher, has listed nine benefits that children get from music.

1. Through music children can discover possibilities for noble and rewarding enjoyment.
2. Through music children can experience the refreshing and renewing magic of beauty.
3. Through music children can be helped toward a better personal and emotional adjustment.
4. Through music children can have the stimulating and reassuring experience of significant success.
5. Through music children can be helped to achieve a happy and rewarding group spirit and feeling.
6. Through music the group morale of all the children in the school can be enhanced.
7. Through music children can discover rewarding interests and occupations in their out-of-school living.
8. Through music children can grow towards interests and occupations that will be rewarding in later life.
9. Through music children's cultural horizons can be broadened by means of exceedingly convincing and concrete experiences (Mursell, 1951, p. 42).

At the Common Ground Child Care Center, infants three to twelve months of age are exposed to classical music and are invited to shake or tap on objects in the room to make noises. Throughout the younger and older classrooms, children are sung to. They are read books and shown pictures as a part of their learning. Parents who play instruments are encouraged to come to the classroom and share their music. Teachers also teach children many songs and singing games which teach letters, numbers, and parts of the body (Wilcox, 1994).

In a primary classroom, music is used to help children become better readers and writers. Langfit (1994) uses simple and well known melodies to emphasize the concepts the children are studying. An example of this is to use the tune of “She’ll Be Comin’ ’Round the Mountain” and change the verses to coincide with the theme of wintertime (Langfit, 1995).

In 1990, the Auckland College of Education surveyed its school and community to find out their needs. Out of this survey they developed the Children’s Music Centre. It is open to children five to nine years old and helps children determine their musical interests and abilities. Teachers and children collaborate during songs and play. Reading is incorporated with music. This increased the children’s imagination to write musical stories at home as well as at school. When music was present in the home, children felt free to participate in the music activities. After the children were in the program for two years, they were introduced to orchestra instruments. They were ready to study the instruments in depth. As they learned to play their instruments, they continued to write stories. They included melodies in their stories which could be played or sung while reading (Manins, 1994).

As expressed in the previous examples, children are involved in every aspect of music, based on their abilities. Teachers in these classrooms know the importance of totally immersing the child in musical activities (Wilcox, 1994).

As the children get older and become part of the elementary school, their interests need to be expanded to help them discover more about themselves. Young children like all kinds of music, especially music which catches their interests. Music in the elementary school has to occur both inside and outside the music room. Music teachers need to realize what an impact music has in teaching math, reading, science, social studies, and English (Brophy, 1994). "Music can be used to help teach language, poetry, art, science, and so forth but these things also help us teach music,..." (Wilcox, 1994, p. 62).

The interdisciplinary approach to learning is the way in which music can be utilized to the fullest extent. In English classrooms, teachers put rhythm and rhyme to rules of punctuation, capitalization, vocabulary, reading skills, and parts of speech, to name a few. Music is used to help children remember the elements because the tunes trigger something in the mind which allows the child to remember. "Simple singing games and poems that reinforce other academic subject material and achieve musical goals truly enhance the importance and necessity of the music specialist" (Brophy, 1994, p. 30).

The Learning to Read Through Arts (LTRTA) program includes music with its core subjects which improve motivation and test scores of students in grades K-12. Both urban and suburban students from diverse cultures have achieved success from this program. Music is the primary focus for all learning which takes place. Music stimulates the children to read and write. Since the children are interested in the learning, they show ownership to all their learning (Shuler, 1991).

The Ashley River Creative Arts Elementary Magnet School in Charleston County, South Carolina, has been successful in incorporating music into the curriculum. The school integrates the arts with their academic curriculum and has received high scores on both the county and state norms. A large amount of the instruction also focuses on using the arts (Shuler, 1991).

The Assured Readiness for Learning (ARL) program is also a successful program which was developed by Phil McInnis, a New York school psychologist. To improve the students' abilities in preschool and elementary subjects, music, art, and physical education increased the child's mental and physical development. Research has shown that there has been a vast improvement on students' achievement (Shuler, 1991).

English as a second language classrooms (ESL) utilize music in the classroom. A good way to have ESL children learn the different dialects and contexts of words is to teach them songs. This improves their pronunciation and fluency, thus increasing their vocabulary and success (Vahed, 1982).

Children with specific language disabilities need a multisensory approach to learning to promote self esteem and to show that creativity can open the door to academic success (Burrows & Wolf, 1983). "Children who do not achieve success in the language area, or who achieve it with great difficulty must meet success in other areas in order to strengthen their feelings of self-worth" (Burrows & Wolf, 1983, p. 271).

It is important to plan activities which are meaningful to the child. They must be planned according to the child's musical aptitude, used to show growth in the child, and open the child up to become critical thinkers (Raley, 1966).

The learning style of a child reinforces the way learning takes place. If the child does not learn a certain way, and is taught that way, there is no success. For example, if a child learns best by hearing things (auditory) and is only taught by copying off the board, the child does not pick up as much of the lesson. However, if music is added to the lesson in a creative and effect way that helps the child understand the lesson, the child learns more and is often able to remember it for a longer period of time (Shuler, 1991).

Schoolhouse Rock has been in circulation for over 20 years. Every Saturday morning, a cartoon with a catchy tune teaches children to multiply, use conjunctions, how a bill becomes a law, and so on. New Schoolhouse Rock cartoons and tunes have been developed within the past few years. These songs and cartoons stay with the child long after the child becomes an adult. The songs are educational and teach children without them realizing they are being taught (Hall, 1985). "Whatever the form, music can help children sing, play, move, say, and listen. Whether it is in language, math, science, or a learning area such as memory or cooperation, music reaches the young child in a way nothing else can" (Wolf, 1995, p. 32). Music therapists use many different approaches to reach their children. Aside from helping the children with their skills, music also helps alleviate frustration and alienation which are associated with these children, who are

learning-disabled and mentally retarded (Shuler, 1991; Kane, 1978). Music has a structure, timing, melodic patterns, pitch, tempo, rhythm, and dynamics (Gaston in Kane, 1978, p. 10). Music therapists who commit to working with these elements have helped learning-disabled and mentally retarded children (Kane, 1978). By making it more meaningful, the children's memory improves through music's organization and patterns, rhythm, and content (Isern in Kane, 1978).

As children get older, their musical opportunities decrease. The classes become departmentalized and only those children who make a commitment to practice their singing or musical instruments continue in music classes. General music classes broaden musical perspectives and put music into the lives of all students (Hughes, 1992). Even in the core classroom, music adds to the overall learning. Songs hold the student's attention, interest, and is an alternative to textbooks (Abate in Purcell, 1992, p. 192). Too often when talking to middle and high school teachers, they express their frustration with lethargic and unmotivated students. General music classes are a motivator for students who have no success anywhere else. General music classes can offer the students a better understanding of all types of music. Some students will continue to go to school just for that opportunity of success in the general music class (Hughes, 1992).

In college classes in the foreign language department, music is used to teach vocabulary (Baechtold & Algier, 1986). In the vocabulary class at Eastern Kentucky University, Baechtold and Algier teach vocabulary through musical projects. By replacing

words in lyrics with the vocabulary words being studied, the students better understand the word in context and were able to remember the word for a longer time because of the words being in context (Baechtold & Algier, 1986). “Adult learners express a positive attitude toward the arts. They believe the arts contribute to the quality of life and are essential to the developing person” (Boswell, 1992, p. 38).

Adults who participate in music classes in school are finding opportunities to express themselves musically. Summer workshops for novice to professional musicians are being offered throughout the country. They are attracting a growing population of musicians, singers, and dancers (Boswell, 1992). “Making music has the power to fulfill the need for identify, participation, and partnership” (Boswell, 1992, p. 39). Young and old adults perform during these workshops. This is vital to closing the generation gap and increasing cultural awareness. “Research indicates that older individuals who participate in adult choirs do so not exclusively for social, physical, therapeutic, or recreational reasons, but primarily for musical reasons” (Boswell, 1992, p. 39).

Whatever the reason, either educational or therapeutic, music is beneficial for everyone. The positive attributes of music correlate into success on the job and in every day experiences.

Music and Movement

Many examples have already been expressed to show the benefits of music. Music teaches as it tells “and provides a new avenue of approach to traditional education. By

taking nursery rhymes and adding music and movement, the children have created something new” (Wolf, 1995, p. 32). In nursery school, children learn songs and finger plays. The songs move the children through the room to get them in line, to march outside, to act out animals, and to learn parts of the body (Langfit, 1994).

In kindergarten classrooms, children get to move around and work in centers. As soon as the child begins first grade and through twelfth grade, they are expected to set in their seats, quietly working on assignments. Most adults cannot be still for as long as we expect children to sit. Movement is only allowed in special classes and at recess, which is not allowed in some schools. Teachers need to realize the attributes of movement, as well as music. “The essence of music is sound and motion” (Erickson, 1995, p. 21). Music has motion and movement accentuates the feeling music gives people. Incorporating movement when discussing language and science concepts, children better understand the lessons being taught. Acting out vocabulary words or how an inclined plane makes work easier, allows children to express themselves through creative movement and ideas. By allowing children to move during the music, they are also “developing concepts about time, space, and energy” (Hoffman, Kantner, Colbert, & Sims, 1991, p. 24).

Choose any piece of music. As children listen to it, some will feel the movement and tap their foot, clap their hands, snap their fingers, or rock back and forth to the music. The movement of a class can be individual or in a group. When the child feels comfortable, they will loosen up and readily express themselves. There are four approaches of

movement. They are: “free creative activity, through impersonation, through dramatization, and through the use of fundamental movements” (Mursell, 1951, p. 128). These movements can be combined to develop a new creation or can be used individually.

There are several ways movement can be used in the classroom. A great way to incorporate multiculturalism in the classroom is to play ethnic songs and teach children the dances which go with the songs. Dances are often of a historical nature. Battles of independence and greed, along with love for the country are expressed through creative dance (Hoffman, et al., 1991).

Jacques-Dalcroze is a method which includes an area of movement called eurhythmics. Movement is not choreographed. It is flexible and is used to guide the children through the musical skills (Johnson, 1993). Children need the teacher to approach this type of instruction in a positive manner so they feel comfortable with it. If the teacher is timid, the children will be uncomfortable. Activities which are good to start with are bending, straightening, twisting, swinging, swaying, pushing, pulling, and other nonlocomotor movements. These encourage children to use all of their body parts and make big movements (Neill, 1990). After the children become more comfortable, movements which need more space can be introduced. The students will gradually feel less uncomfortable as these opportunities for movement become part of the classroom curriculum. Children move all the time. It is something they need to do. By including

movement with the music, children remember concepts being taught for longer periods of time (Neill, 1990).

Success in school and in every day life are attainable for the children. Since they are the future, they need every opportunity to succeed. Including music and movement in the classroom leads to academic success. When academic success is achieved, dropout rates will decrease, motivation in the classroom and later, on the job, will improve, and people will overall feel better about themselves and their environment.

The right approach in bringing music to your children is to aim always at human values, to vary your procedures in accordance with your situation and to be confident in so doing, to be quite sure that your procedures are directly and simply associated with your aims, to think and plan in terms of musical experience rather than music lessons, to be sensitive to the intrinsic musical quality of those experiences, and to persist in spite of early difficulties and partial frustrations (Mursell, 1951, p. 65-66).

Music and movement are important to motivating our children and improving their self esteem. This self esteem contributes to their future success in the generations to come.

CHAPTER III

METHODOLOGY

The purpose of this study was to integrate music and movement with a hands-on work and energy science unit. The music and movement reinforced the following concepts being taught: (a) forces make things move; (b) work is done when a force makes an object move in the direction of the force; (c) energy is needed to do work; and (d) machines make work easier.

The subjects for this study were two classes of fourth grade students in a low socioeconomic area. There were 15 students participating in the first class, or the treatment class. Of those 15 students, 11 were on free or reduced lunch, one was in the talented and gifted program, and one was a Special Education resource student. There were 22 students in the control class, 17 were on free or reduced lunch, five were in the talented and gifted program, and two were English as a Second Language students.

Procedure

The instructional period was 20 days, or four weeks. The work and energy unit was part of the fourth grade curriculum. Each class was given a pretest on the first day of class. The pretest was taken from the Scott, Foresman & Co. Discover Science (1991) series for fourth grade, chapter seven. The pretest consisted of 11 multiple choice questions, six draw pictures, and four short essay.

Beginning on the second day through the seventh day, both classes participated in the same hands-on activities which introduced the concept for this study.

Beginning on the eighth day of this unit, the treatment class began writing lyrics to a tune called Breathe Easy Blues. While writing the lyrics, both the treatment class and the control class continued to participate in hands-on activities. These activities reviewed the concepts already learned and also introduced other concepts not previously taught. Five sessions were needed to complete the lyrics. In the amount of time which was taken to write the lyrics in the treatment class, the control class discussed the concepts being taught.

On the thirteenth day of the unit, the treatment class began and ended the lesson by singing the song and doing the movements to the lyrics. The control class continued to discuss and share what they previously learned. The rest of the class time was spent participating in additional hands-on activities which reinforced the concepts of forces make things move, work is done when a force makes an object move in the direction of the force, energy is needed to do work, and machines make work easier.

On the twentieth day, the treatment class sang the lyrics a few times as a review, while the control group discussed the concepts. A posttest was given to both classes. The posttest was the same test as the pretest.

Evaluation/Data Analysis

The evaluation measure from the science textbook had 21 items. The breakdown of these items was 11 multiple choice, six draw pictures, and four short essay. The test was scored for the number correct. Students were assigned a code number for data entry. Means and standard deviations were computed for pre- and posttests by group. An analysis of covariance was conducted to test for differences between groups.

CHAPTER IV

RESULTS AND DISCUSSION

Music and movement are important to the overall academic growth and development of children. Success in these areas increases the child's self esteem, which carries over into academic success. This success can make a difference in the future successes of generations to come.

The purpose of this study was to determine if integrating music into a hands-on work and energy science unit enhanced the learning of the science concepts.

Music is a focal point in many facts of life. Related literature indicates the importance of music. This study attempted to show a significant increase in the scores received by the treatment class as opposed to the control class.

Fifteen students in the treatment class were given hands-on science instruction covering work and energy topics. The treatment class also wrote lyrics and developed movements which coincided with the topics covered in the classroom.

The control class, consisting of 22 students, received hands-on science lessons only. A discussion took place daily to review the concepts being taught.

Based on the results of the treatment class and the control class, there was no significant difference between the two classes. Table 1 shows the results of the pre- and posttests for all students.

Table 1.

Pre- and Posttest Results for All Students.

<u>Group</u>	<u>Test</u>	<u>Mean Score</u>	<u>Gain</u>
Control	Pre	24.3	26.9
	Post	51.2	
Treatment	Pre	22.8	18.8
	Post	41.6	

The results are quite similar when the Special Education, English as a Second Language, and Talented and Gifted students are removed. Table 2 represents the results of the reduced population.

Table 2.

Pre- and Posttest Results for Reduced Population.

<u>Group</u>	<u>Test</u>	<u>Mean Score</u>	<u>Gain</u>
Control	Pre	26.1	20.2
	Post	46.3	
Treatment	Pre	24.9	19.1
	Post	44.0	

The research question asked if there would be a significant difference between the posttests of the treatment group versus the control group. Based on the results, the answer to the question is no, there is no significant difference between the two groups.

Learning did take place, though, since there was a significant gain from pre- to posttest within groups. The discussion of the topic may be of more value, however, than the music and movement, as suggested by the results of both groups' posttests.

There are other indications, though, that show this study was successful. The students in the treatment class enjoyed the addition of music in the science classroom. This is something with which the students were unfamiliar. Music and movement are often associated with leisure time, not with science or other school subjects.

The students asked to sing the song when they knew the science lesson was to begin and during other subjects throughout the day. They also were heard humming the tune outside the class while at their lockers, at lunch, and when switching classes. During other science units, the treatment group asked to include music and movement. The control group often asked when they would be able to write lyrics and develop movements in their future science units.

Future studies may indicate different results. There are many more workshops and teaching units which include music and movement in learning since this study began. Research continued to take place which indicates the value of music in more activities than leisure.

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APPENDIX

SIMPLE MACHINES

Multiple Choice

Directions: Choose the best answer and circle it.

1. A force that pulls two objects together is
 - a. gravity.
 - b. inertia.
 - c. friction.
 - d. speed.
2. Stored energy is called
 - a. kinetic energy.
 - b. friction.
 - c. potential energy.
 - d. inertia.
3. A machine with many moving parts that usually has low efficiency is a
 - a. pulley.
 - b. simple machine.
 - c. complex machine.
 - d. wheel and axle.
4. Any tool that makes work easier to do is called a
 - a. machine.
 - b. lever.
 - c. computer.
 - d. motor.
5. A speedometer measures
 - a. friction.
 - b. speed.
 - c. inertia.
 - d. distance.

6. High efficiency means a lot of work is done for the amount of
 - a. energy used.
 - b. energy saved.
 - c. time taken.
 - d. friction.
7. The result of a force moving an object is
 - a. inertia.
 - b. work.
 - c. friction.
 - d. speed.
8. What is a machine called that has only one or two moving parts?
 - a. compound.
 - b. complex.
 - c. simple.
 - d. not efficient.
9. The tendency of a moving object to stay in motion is called
 - a. friction.
 - b. inertia.
 - c. force.
 - d. gravity.
10. Anything that does work uses
 - a. gravity.
 - b. energy.
 - c. friction.
 - d. inertia.
11. When a moving object rubs against something, its motion slows down because of a force called
 - a. inertia.
 - b. speed.
 - c. gravity.
 - d. friction.

Short Answer

Directions: Draw a picture of each simple machine in the space provided.

1. wedge
2. screw
3. inclined plane
4. wheel and axle
5. pulley
6. lever

Short Essay

Directions: Use complete sentences to answer each question or statement below.

1. Compare the friction between two smooth surfaces with the friction between two rough surfaces.
2. What is meant by efficiency?
3. Name two kinds of force and tell how they affect objects.
4. What is chemical energy? Name one way it is used.

SIMPLE MACHINES

Verse 1:

You can work and play with friends.
 Strength and energy are the best.
 Friction, force, and gravity
 Help the world go 'round and 'round!

Verse 2:

Raise the bat and hit the ball.
 Energy is important to all.
 Potential energy is the power.
 Kinetic energy makes things move.

EFFICIENCY! —getting the job done well.

Verse 3:

Simple machines make work easier,
 By using pulleys, screws, and wedges.
 Inclined planes make moving fun—
 Very soon your work is done.

COMPLEX! —Hold up signs of: pencil sharpener
 wheelbarrow

COMPOUND! —Hold up signs of: radio
 VCR

Simple machines make work easier, simple machines make
 work easier, (fade)