Robots in Fact and Fiction

Maria Weaver
Cornelius Elementary School

INTRODUCTION

In the popular science fiction novel *Robot Visions* by Isaac Asimov, Asimov defines a robot as "an artificial object that resembles a human being." The degree of resemblance varies greatly among robots designed for different purposes. For example, a hard drive on a computer is designed to delegate and assign different tasks a computer can perform to different programs, similarly a human brain is designed to delegate different tasks that a body must perform to different parts of the brain which then carry out these functions. Therefore the resemblance is centered on the resemblance to a human's thought process. The next question a teacher will probably ask is the "What is the value of an object that is designed to function like a human?" The value is based on the fact that although designed by humans, robots are multiplying and evolving everywhere to varying degrees and the extent of their skills are exceeding human expectations and limitation. Robots are making it possible to achieve feats that were once believed to be impossible.

Throughout history, mechanical people, animals, and objects have delighted, fascinated, and frightened people. Automatons, which are dolls operated by compressed air or springs, were created by early toymakers, artisans, or scientists to do a variety of things such as marching like a soldier or a duck designed to quack like a real duck. Although seemingly useless, besides the amusement or aesthetic factor, the first "robots" paved the way for more useful robots. Although these early machines were often mysterious, they were usually complex machines or illusions designed to mystify the masses.

In 1798, an Italian anatomist by the name of Luigi Galvanav made an important scientific discovery. Through vast experimentation, he concluded that a spark of electricity applied to dead muscles could induce the muscles to twitch and move as if they were alive. This discovery raised the question of the possibility of man making a human through purely scientific methods. One of the first pieces of modern literature to introduce robots to the masses was *Frankenstein* by Mary Shelley, a book written and published in 1818. In this book a "mad" scientist pieced together human parts and made a complete human body and gave life to this body by unspecified new scientific technologies. This book was important because it brought science theories and fiction together to help define a new emerging genre, science fiction.

It wasn't until nearly one hundred years later that "robots" became part of our media culture. Playwright Karel Capek first introduced the term robot in 1921 in his popular play *Rossum's Universal Robots*. Capek derived the word robot from the Czech word for worker. Capek scared workers and employers everywhere with the story of a money

hungry factory owner who created a race of humanistic robots to replace the existing workers. Eventually the robots rebelled and took over the world. Although seemingly a story of purely science fiction, this play was also a compelling and dismal satire on communism.

The next popular use of robots was by director Fritz Lang in 1926 in his film *Metropolis*. Lang's creation, Maria, from the movie *Metropolis* started a renewed fascination with robots that seemed fitting with the advent of a new technological era. In the film, Maria was a malevolent robot designed to oversee the workforce of an urban metropolitan city named Metropolis. People everywhere were impressed and slightly frightened of the possibilities that were imminent with the advancement of scientific technology. Famous robots such as the Tin Man from the *Wizard of Oz,* R2D2 and C3PO from *Star Wars,* and Data on the popular television series *Star Trek: The Next Generation* have continued to captivate and intrigue audiences everywhere.

Currently, robots continue to help mankind in many ways from space exploration, prosthetic body parts, and weather analysis to automobile manufacturing, factories and even cooking. Today, it is often difficult to separate fantasy from fact as scientists work to create machines that can go to the farthest reaches of the galaxy and to the deepest depths of the oceans; into our homes to help us control our environments or into hospitals to help heal the sick.

Science fiction writers are always one step ahead of the game. What writers thought was fiction in the 1950s is now reality. What makes science fiction writers so important to literature and pop culture is the ability to predict trends, see possibilities, and make revelations about human nature in an interesting and unique way. It is these things that I want to explore with my unit.

Teaching Background

I am a bilingual third grade teacher in an inner city school whose demographics consist of a high percentage of minority students, specifically Hispanic and African American. Most of these students are considered "at-risk" because of their low socio-economic status and limited English proficiency. My personal philosophy is that all children come to this world with the same learning potential. I believe that a positive and intriguing environment can help to provoke a student to strive for and achieve his or her highest potential. However, because of their unique economic and cultural circumstances these students have a disadvantage when they start their education. Only exemplary teachers and a vast variety of experiences can help curb the effects of these disadvantages. Teachers need to be prepared to help students learn in the rapidly growing and ever-changing society. Science and technology are obviously growing fields, but many teachers lack the necessary skills, knowledge, and/or experience to show the real world implications of science. Further, I believe that science should become an integral part of

the curriculum and teachers should be encouraged to plan lessons with an interdisciplinary focus.

Finally, teachers need to provide these students with the tools necessary to help them become well-informed critical thinkers, with an education equal to that of the middle class or their more affluent counterparts. The disadvantages of the "at-risk" students become even more evident in students enrolled in bilingual programs where they are not only lacking in English language skills but are also in an environment that is limited in American culture.

IMPLEMENTATION

I plan to teach this unit by using the bilingual requirements that are implemented at our school, which are designed to address listening, speaking, reading and writing skills. We will be reading an assortment of literary works in English by popular authors such as: Isaac Asimov, Ray Bradbury, and Donny Becker. These writers have contributed to present-day science, modern science fiction writers' imaginations, and have become important members of modern pop culture.

PREPARATION

In order to prepare for this unit, I will read biographies and literature by scientists and science fiction authors such as Ray Bradbury, Isaac Asimov, and Arthur C. Clarke. Asimov and Clarke were not only writers, but scientists as well. By introducing these authors to the students, it will help them to see how closely science is related to science fiction. I will also implement Internet newsletters from NASA to illustrate scientific theories at work that were once viewed as impossible. By implementing and using these newsletters the children will be introduced to the mechanics and value of the Internet. This will provide the students with a lifelong opportunity to access knowledge and information at their fingertips. I will also search the newspaper and scientific journals periodically to expose the students to the real life advances in science that have been made possible and inspired by the imagination of science fiction writers. Wonders that were only imagined a few years ago have now become a reality. Because of the spark that these authors have ignited in the imagination of the former youth, many of the advances in technology that we now enjoy and have become dependant on in our daily activities are possible.

OBJECTIVES

With this curriculum, I will incorporate reading, science, and math objectives that will help embark the students on a life long journey of learning, critical thinking and comprehension that will help the students understand and embrace culturally diverse written text. Throughout the unit, students will be introduced to new words and their meanings while listening to or reading the assigned texts. The students will learn to break

words down to their root, which will aid in comprehension. Further, students will be able to recognize that a word might have different meanings in different texts. These skills will help a student to find and define central parts of a story such as plot, main idea, setting, climax and characters. This will also help a student to succinctly summarize or narrate a story.

My Brother the Robot by Donny Becker is a novel that will be read in class that exemplifies characterization. After reading the book, the students will be able to:

- Understand characterization, as exemplified in *My Brother the Robot,* by Donny Becker, which will help the students think about characters, including personalities, qualities and feelings.
- Explore the relationship between characters, and think about changes that characters go through, both personally and in their relationships with others and the world around them. A good book that will help me to teach this objective is Ray Bradbury's *I Sing the Body Electric.*
- Use a variety of strategies to analyze culturally diverse written texts.
- Use the computer by using the NASA website as a reading tool (which one can receive as an email both in English and Spanish).
- Use story maps, graphs and charts to organize the information received and recognize the unique characteristics of articles, reports and will differentiate between fact and fiction.
- Relate what they already know to what they are currently reading and to their daily life.
- Make reasonable predictions about what might happen in the future. I will teach this concept by reading Isaac Asimov's *Robbie the Robot.*
- Compare and contrast two robot stories that were written several decades apart using *Robbie the Robot* and *My Brother the Robot*.
- Recognize the fact that although robots are wonderful, artificial intelligence does not compare to the wonder of the uniqueness of the human being.

The students will also learn of the advances of science in the field of robotics and how much work and imagination is required to develop artificial intelligence (AI) that exhibits the qualities of human intelligence. Scientists have been working to create AI for forty years, and although they have not yet achieved this goal, they have made significant progress.

Will science be advanced enough in the students' lifetime to be able to create a robot or android that will be able to think, feel and act like a human being? That question will remain unanswered at this time, but by exploring the possibilities, one of these students could someday be working on such a project.

SUMMARIES OF THE MATERIALS AND CURRICULAR USES

My Brother the Robot by Donny Becker

This story will work well with reading objective 2 of the TEKS: The student will think about characters, including their personalities, qualities and feelings and the changes that characters go through, both personally and in their relationships with others or the world around them.

> Chip didn't think anything could be worse than almost failing the fifth grade-until his new brother, Simon, arrived. Simon is the latest in robotic technology. He looks just like a human boy, but he is ten times better -- better at being polite, cleaning his room, spouting the multiplication tables and swimming, Chip's favorite sport. Dad hopes Simon will set a good example for Chip. Instead Chip feels as though Simon is taking his place --at summer school, on the swim team, even in his parents' hearts. Chip hatches a plan to take care of the "Perfect son" once and for all (Publisher's Summary).

I Sing The Body Electric by Ray Bradbury

This story is about three children and their father after the mother dies. They need someone to take care of them, so the father takes them to a wonderful factory. There the children pick out an electric grandmother. The fantastic robot moves in to care for them. The boys immediately take to her, she is almost real, but the girl is more cautious. The story goes on to tell about the children and the relationship with the electric grandmother. There are many passages about the love amongst them as the years go by, and how the children come to trust the Electric Grandmother and she becomes an integral part of their lives.

This a good story to teach students to "Distinguish Fact from Fiction," which is also a reading objective for TEKS.

Nova's Ark by David Kirk

The story is about a family of robots and their adventures as they travel through the galaxies. This story is a good story to teach sequencing and at the same time teach about family values and the common theme that as a family and with their support all of the adventures are a lot more fun. This is a good way to cover the reading objective to teach reading in a Culturally diverse variety of texts.

The Science of Star Wars by Jeanne Cavelos

Jeanne Cavelos is writer who is also a teacher and scientist and explores the possibility of one day man creating a robot that looks, acts, and thinks like a human being. The

students will be asked to explore the possibility of this event actually be achieved in their lifetimes. We will study timelines in the science field as well as their own lifetime.

We will meet Data, a robot of the future, who has been perfected to the point that he has the desire of becoming human even though some of his abilities far surpass those of man. Many of the reading objectives can be met as well as math objectives. The students will also meet the Tin Man from *The Wizard of Oz,* a 1939 movie, who was also looking for a heart just like man.

***The Norby Chronicles* by Janet and Isaac Asimov**

This is a series of books about the adventures of Norby, a robot. This series of books is written specially for children. Norby, a lovable mixed up robot, gets into trouble all of the time. He and his human companion Jeff Wells travel through the galaxy and even time in their adventures. It is a delightful book that will meet the reading requirement of distinguishing fact from fiction.

All of these stories have one thing in common: they all have as one of their main characters a robot that is almost human and to the main characters he is their friend and companion.

ACTIVITIES

The *Robbie the Robot* site on the Internet provides many resources for lesson plans, vocabulary activities, questions, links, and hands-on activities.

Marionettes

Marionettes (puppets with parts manipulated at the ends of strings) are a primitive form of animatronic entertainment made to mimic natural motions of human beings and other creatures. Working in small groups, choose a human, insect, or a zoo animal and study the ways it moves. Think about the number of moving parts it has and the joints around which those parts naturally rotate. From ordinary household materials, construct a "robot" marionette that closely mimics the subject.

Robots in the Workforce

In the future, robots, machines, and computers will continue to replace human workers in all areas of business and industry. Consider your own future. Choose a future career, then list the ways in which machines may eventually make parts of your job obsolete. Write a 40-year work plan that will keep you competitive in a job market that will employ an ever-growing work force of robots, machines, and computer. (TEKS Reading Objective: Make predictions).

This activity can be enhanced by teacher discussion from the book *The Physics of Star Wars* using the chapter on "Droids" and all of its ramifications.

Lending a Robotic Hand

Robots can often improve the quality of life of people with disabilities. Design a robot that would do just that. Choose a person whose life is limited because of some physical difference, and then identify the disadvantage that your robot will address. Your design should include a drawing, labels describing your robot's features, and a paragraph on how your invention will have both a positive and negative impact on the quality of your patient's life.

This activity can be modified to accommodate the younger students' cognitive abilities well as G/T students. A good follow-up activity would be to research advances in technology for people with disabilities. Write an essay discussing adaptive technology.

Twenty-First Century Time Capsule

Students develop predictions about technological developments of the 21st Century, and then write descriptions of those developments and seal them in a time capsule to be opened twenty years in the future. What do you think people of the future will think about our everyday lives? Discuss things we see today that are outdated or obsolete (typewriters, eight tracks, record players, etc.).

Interactive Robots

Robots can now be purchased at toy stores and can be used to demonstrate the uses and abilities of robots. In order to use the robots children must be able to:

- Differentiate between their left and right
- Estimate distances and angles
- Develop strategies for problem-solving
- Develop spatial reasoning
- Use spatial language
- Communicate ideas in a variety of ways
- Use gross and fine motor skills

Suggested Activities

- Play Simon Says by starting with simple commands and building complex sequences
- Create an obstacle course
- Create a map and use the robot to negotiate the map

- Navigate a maze
- Use the robot to deliver letters or treats to the students
- Use the robot to teach compass directions

Design Your Own Robot

Assign a variety of missions to students in pairs or groups. Each group or pair is responsible for designing a robot that can accomplish its mission. Explain the six basic functions of a robot (sensing, movement, manipulation, energy, intelligence, looks) to the students. Have students explain which function their robot has and why.

Mechanical Arms

Research the way mechanical arms are constructed. Discuss with the students how for each direction a joint moves, a robot has one degree of freedom. For example, a robot with three degrees of freedom can typically move up and down, left and right, and forward and backward. The human arm has seven degrees. What are the seven degrees of movement for the human arm?

Robots

View clips from several movies including *Treasure Planet*, *Iron Giant*, *Lost in Space*, and *The Wizard of Oz*. Discuss the various representations of robots in the movies. Explain what characteristics each robot has and compare and contrast their various strengths and weaknesses.

Vocabulary

Trace the development of words related to robots and technology**.** Where do these words come from and why are they commonplace in our vocabulary?

Creative Writing

Write a story that has a robot as the main character.

Creative Writing Analysis

Using the above story, create a herringbone diagram, a plot outline, and a picture of a major scene in the story.

Journal

Pretend that it is one hundred years in the future**.** Write ten journal entries explaining what life is like in the future. What roles do robots play in daily life?

CONCLUSION

Robots are an important part of our culture. They are a physical manifestation of many people's hopes and ideas of the future. Above all, they often serve to fill gaps in our lives. Whether it is the Electric Grandma or an actual prosthetic arm that allows a person with a disability to regain freedom of movement, robots are here to stay. Students need to become familiar with them and their many uses.

LESSON PLANS

Lesson Plan I

The students will learn about the history of robots, and how they are now used in every day life.

Objective

To distinguish fact from fiction.

Activity

Lecture from *Here Come the Robots,* by Joyce Milton.

REAL ROBOTS. The robot is a science fiction fantasy come true. The first robots were imaginary beings that existed only in the minds of writers and artists. Later, imaginary robots starred in scores of movies and TV shows. Some of these robots were friendly and lovable, like R2-D2 and C3PO of *Star Wars* fame. Most were pure trouble. Every one knows about these imaginary robots, but you may not know about – real robots. Real robots are every bit as interesting and strange as imaginary ones. Sometimes they are even stranger.

Just for fun, try to guess which of the robots named on this page are real and which are imaginary. Read "robot quiz" to be used as a handout.

Robot Quiz.

1. ROBBIE is a robot babysitter. He can play hide-and-seek and carry children piggyback. But cannot speak.
2. MOXON'S ROBOT is a robot chess player in the form of a man.
3. SULLA is a robot typist. She can type in four languages.
4. THE SPACE HORSE is a robot horse that astronauts can ride as they explore the surfaces of distant planets.
5. ELECKTRO is seven-foot tall talking robot. He travels with his dog SPARKO.
6. AROK is a robot servant. He can run a vacuum cleaner, take out the garbage, answer the door, and even walk the dog.
7. RMIU—short for Robot Mobile Investigation Unit—is a robot in the service of the Royal Canadian Mounted Police. He always gets his man.

Did you guess that the first three robots were the imaginary ones? Moxon's robot appeared in a story written by Ambrose Pierse in 1913. This imaginary robot was good at chess but a sore looser. When he lost a game he went on a rampage and killed Moxon, the man who invented him.

Sulla the robot typist was a character in a play called *Rossum's Universal Robots* or *R.U.R.* The author of this play, Carel Kapok, was the first person to use the work robot.

Machines that play chess or type have been invented in the years since these imaginary characters first appeared. Unfortunately, no one has yet invented a robot like Robbie – he would probably be a lot more fun than the real babysitter. Robbie first appeared in a story by science fiction writer Isaac Asimov. Later, another Robbie the robot appeared in several movies and TV series, such as *Lost in Space.*

The last four robots mentioned in the quiz are the real robots. This lesson can be enhanced by discussing the answers and having the students predict what they think that the robots at NASA can do today.

Assessment
Orally have the students tell what they have learned about robots by participating in this quiz.

Lesson Plan II

Objective
To develop language skills.

Activity
By determining the meaning of vocabulary words taken from the previous lecture about robots the students will use context clues, dictionary skills and their own critical thinking to determine the meaning of words.

What is a robot? What is an automaton? What is an android? What is a cyborg? These words will help the students know their differences and whether we have the scientific knowledge to develop this advanced forms of robots.

Terms that we will discuss are:

- A **robot** is usually defined as a machine that looks or performs like a living creature. This is a good definition for every day use, but most scientists feel that looks should not count. As far as they're concerned, only machines that can follow a set of complex instructions and do something to change their environment are real robots.

- An **automaton** is any machine that works on "its own." A cuckoo clock is an example of an automaton because the cuckoo appears on the hour; no one has to push a button to make the cuckoo jump out of the clock. Some people use the word automaton to apply to robots too.

- An **android** is any machine that looks or acts human. The word android was used many years ago to describe mechanical toys, or automatons. But today, it usually means a robot with soft lifelike skin. Such robots are more likely to show up on the TV or in the movies than in real life. SIM ONE, an artificial hospital patient, is an example of a real android.

- A **cyborg** is part robot and part human. The movie *Robocop* is a good example of a modern day cyborg as is Seven of Nine, one of the characters in "Star Trek the Final Frontier."

The students will find out the meaning of these words first in an English dictionary, then in an English/Spanish dictionary, and for better understanding the students will find the meaning in a Spanish dictionary. This writing exercise will not only help them in their dictionary skills but will greatly help them with their comprehension of both the English and Spanish reading.

Assessment
The students will write sentences both in English and then in Spanish using the vocabulary words to assess their understanding of the words used.

Lesson III

Objective
To compare and contrast.

Activity
The students will watch excerpts from *The Wizard of Oz, The Iron Giant, and Treasure Planet* to compare and contrast the different robots. Questions presented to the students will reflect the different scenery, characters and setting of the story presented on film.

Assessment
Oral discussion of plot, setting, and characters as presented in the films.

Lesson IV

Objective
To use the bilingual objectives of Listening, Writing, Reading and Speaking in English.

Activity
The teacher will read to the students Isaac Asimov's *Robbie* and discuss what was read to them.

Assessment
The students will draw a cartoon of the story in a sequence of at least 8 drawings.

Lesson VI

Objective
To learn how to make a timeline.

Activity
The students will be presented with material about ROBOT RECORDS and will be taught how to make a timeline with the information presented.

The information will be taught by first reading and discussing facts and dates so that the students can prepare a timeline.

The following was obtained from *Here Come the Robots:*

- **The World's Largest Robot** was built for the Japanese world's fair Expo '70 in Osaka. This robot was twenty-four feet tall, and its body could be raised and lowered like an elevator. At the end of one of its arms was a platform big enough to hold several people.
- **The World's Most Expensive Robots** were the Viking Landers built for the Viking Mars expeditions of 1976. These robots were also the most complex to build. The whole project at that time cost close to a billion dollars.
- **The World's First Automatons** were mechanical birds built by the Chinese as early as 500 BC. The first automatons that we know much about, however, were created by Hero of Alexandria—a Greek who lived in Egypt during the first century A.D. Hero's creations worked by waterpower.
- **The first Walking Automaton.** George Moore's Walking Locomotive, built in 1893, was a life-sized medieval night dressed in a suit of armor. It was powered by steam and could walk in circles at a speed of nine miles per hour.
- **The first Talking Automaton.** In 1778, Baron von Kempelen, the same man who fooled people with the chess playing Turk, demonstrated a talking automaton that was able to say such words as *opera*, *astronomy*, and *Constantinople.* A similar automaton, named Euphonia was designed by a German inventor named Joseph Faber and appeared in London in 1830. Euphonia worked by means of bellows which were attached to a keyboard operated by Faber. Many people suspected that both of these automatons were hoaxes but no one was able to prove this.

- **First Real Robot** was probably Eric, designed and built in England in 1927 by a man who had seen Karel Copek's R.U.R.
- **The Smallest Working Robot** is a model of the industrial robot known as PUMA. It weights only fifteen pounds.
- **Young Robot Builders.** Dr. Meredith Thring, a British robot expert is said to have built his first robot at the age of eleven. Jonathan Kaplan of New York City built his first robot when he was twelve and designed a new robot every year until he was eighteen.
- **A Robot Chess Champion.** Built in 1968 Scottish chess champion Davie Levy offered a prize of 500 English pounds for any computer that could beat him at chess. The prize was finally claimed in 1978 when Levy was defeated in a match against a computer-controlled arm. The match was held in Hamburg, Germany but the brain/computer was located in Minneapolis, Minnesota!
- **The Heaviest Robot Smoker.** Many of the demonstration robots of the 1930s smoked cigarettes or cigars, but the heaviest smoker if all was Elektro, whose pictures usually show him enveloped in a haze of smoke. In those days, the dangers of smoking were not as well known. Today, smoking robots are not seen anymore.

Assessment

A student-generated timeline. The students will pair up and discuss which of these facts do belong in a timeline and what information is irrelevant.

Many of these lessons and activities can be enhanced by additional reading of the books mentioned. Teachers can present the materials from these reading materials and carry it over across curriculum. In addition many of the concepts presented can be used to study math and science.

The students' imaginations can motivate them toward the further exploration of the science of robots. They could become the generation that could lead to the invention of a robot like R2C2 or 3CPO, and maybe even Data.

ANNOTATED BIBLIOGRAPHY

Arroyo, A. Anthony et al. *Robots in the Classroom: Using Mobile Autonomous Agent to Stimulate Interest in Science and Engineering*. 1997. University of Florida. June 2003. <http://www.mil.ufl.edu>.
Several experiments used in elementary and middle school classrooms to aid in better understanding of engineering, experimental science, mathematics, and physics.

Asimov, Isaac. *Robot Visions*. New York: Penguin Putnam, Inc., 1990.
A short story collection about robots interacting with people in different situations.

_____. *Norby and Yobo's Great Adventure.* New York: Walker and Company, 1989.

_____. *Norby Chronicles.* New York: Walker and Company, 1983.

_____. *Norby Through Time and Space.* New York: Walker and Company, 1986.
Series about a robot who travels the galaxy.

Barry, Patrick L. and Tony Phillips, Ph. D. *Amazing Magnetic Fluids*. 2003. NASA. June 2003. <http://www.science.nasa.gov/headlines/y2003/02apr_robotblood.htm?friend>.
Astronauts are studying a fluid that might one day be used in the veins of robots, and help buildings resist earthquakes.

Becker, Bonny. *My Brother the Robot.* New York: Penguin Putnam Books, 2001.
A story about a boy who learns life lessons about the misguided value placed on perfection when his father buys a robot advertised to be "the perfect son."

Cavelos, Jeanne. *The Science of Star Wars.* New York: St. Martin's Press, 1999.
An astrophysicist attempts to explain the scientific concepts used in the popular movie series *Star Wars.*

Graham-Rowe, Duncan. *Robots in the News.* 28 Apr. 2003. <http://www.robotbooks.com/intelligent-robots.htm>.
Building a robot with human intelligence.

Kirk, David. *Nova's Ark.* New York: Scholastic Inc., 1999
A picture book geared towards early elementary featuring a family of robots and their adventures.

Krauss, Lawrence. *The Physics of Star Trek.* New York: HarperCollins Publishers, Inc, 1995.
A renowned physicist explains the scientific theories behind the popular science fiction television series, *Star Trek.*

Minsky, Marvin. *Will Robots Inherit the Earth?* 1994. Scientific American. June 2003. <http://www.ai.mit.edu/people/minsky/papers/sciam.inherit.html>.
Article theorizing that with the technology of replacement body parts and intelligence aids, humans might be replaced by robots.

MIT Artificial Intelligence Laboratory. *Humanoid Robotics Group: Kismet the Robot.* 25 Apr. 2003. <http://www.ai.mit.edu/projects/humanid-roboticsgroup/kismet.html>.
Outline of the specifics of a particular robot called Kismet.

MIT Artificial Intelligence Laboratory. *Socializing With People.* 25 Apr. 2003. <http://www.ai.mit.edu/projects/sociable/regulating-interaction.html>. Focuses on machines with sociable attributes.

SciToys. *Magnetism.* 24 Apr. 2003. <http://www.scitoys.com/scitoys/scitoys/magnets/magnets.html>. Explanation of magnetism geared towards elementary aged children.