EDTC 5630 ROBOTICS IN THE CLASSROOM **July 9, 11, 16, 18, 23, 25**

WEEK 1

1. **Introductions**
2. **Handouts**
3. **Dates and times, restrooms, breaks, food, drinks**
4. **What we'll be doing overall**
   - discuss and create bots that do something and relate to the real world for pre-K to adults and special needs individuals
   - discuss and create projects and activities that include energy, force, and motion
   - discuss how to group students and how to incorporate robotics into classrooms and merge with curriculum to enhance pre-existing lesson plans or create new lesson plans

5. **The items that we'll attempt to create in this class may include:**
   - a balloon powered chassis-based robot
   - chassis based robotic– bounce bot
   - a combination propeller wind-driven battery powered chassis-based robot
   - merry-go-round (hand / wind powered)
   - a kit of gears to build a windmill (younger)
   - a kit of gears to create assorted items (older)
   - a pneumatic tipper truck
   - Solar powered motor and beads
   - energy variances (temperature reading)

4. **Important info:**
   a. Saving on Webster Computers - anything put on the computers will be erased once the computers reboot, so bring diskettes or flash drives if there is anything that you want to keep – or email it to yourself
   b. Print what you find throughout this class freely – I'll leave all printouts in the printer tray and you can pick them up when we break or during assembly times when no one is presenting
   c. Sometimes we'll work in groups, sometimes individually
   d. We'll create a variety of projects, the ones from the kit are yours to keep of course, others will have to remain with the university
   - We'll discuss how to shop for robot kits, for parts to duplicate parts of the kit you bought, how to create / design our own bots, and price the items to find the most cost effective method of incorporating bots into classrooms, and the text that comes with the kit
   - Point values for the final grade (100 points) will include activities, completed robots, and attendance – if you are NOT here when class starts and DO NOT remain here until class ends, then points will be deducted.

7. **Suggestions:**
   - Use the box top of your kit to carry items back and forth
   - Use the cardboard that comes in your kit to draw a template of each TechCard item that you use during this class. This way if you decide to create any of the chassis-based robots from the kit at a later date you won't have to go out and buy another kit

– you can purchase the pieces separately and use the template that you created on the cardboard. We'll discuss buying pieces separately later.
- Keep in mind; there are various ways to power bots – gears, pulleys, wind, hand-powered, motors, solar, hydraulics, pneumatics, balloons, and rubber bands.

TERMS, TERMINOLOGY, QUESTIONS - Pre-teaching ideas

What are robots and robotics?

- Robots can be categorized into:
  - robots in the real-world (robots in factories, homes, etc.
  - robots in science, technology, and space
  - robots in science fiction (in Hollywood, reading, i.e.)
- These site explain that robots most recently include many common objects, although true scientists would not declare your VCR as a robot
  http://schoolscience.rice.edu/duker/robots/robotwhatis.html
  http://www.thetech.org/exhibits/online/robotics/activities/page02.html
  http://www.42explore.com/robots.htm
- The word 'robot' is not a new word - it has been around for many years – click on both of these sites – one is geared more toward younger children and is more inclusive
  http://www.robotics.megagiant.com/history.html
  http://www.thetech.org/robotics/timeline/index.html
- Basically, robotics is the science or study of the technology associated with the design, fabrication, theory, and application of robots
- Robotics is considered the art and science of creation and use of robots and robotic devices
- The science and technology of general purpose, programmable machine systems, most of which are anchored to fixed positions
- Within the area of learning and play, robotics refers to a interactive devices-including toys, pets, assistants to the disabled and overtly educational tools used in ways that have profound and beneficial effects on how children develop (from textbook: **Robots for Kids: Exploring New Technologies for Learning**, by Allison Druin and James Hendler, **ISBN:** 1558605975, Morgan Kaufmann; 1 edition (March 29, 2000).

PRE-TEACHING ROBOT TOPICS

What is considered a robot?

- A stand-alone hybrid computer system that performs physical and computational activities.
- A machine or device that operates automatically or by remote control.
- A mechanism that can move automatically
- A typical robot has a movable physical structure, a motor or some form of movement or energy, a sensor system, and a power supply

What is technology?

- Much of today's technology implies that technology is the use of computers – but technology is far more than computers, it includes digital cameras, PDAs, and a variety of electronic or digital products and systems
- Applying a systematic technique - method or approach to solve a problem
- The discipline dealing with the art or science of applying scientific knowledge to practical problems

WHY ROBOTICS IN EDUCATION AND WHY THIS CLASS?

- In the 60's people were amused when Seymour Papert Ph.D., spoke of children learning and enhancing their creativity by using a computer. Papert's beliefs come from his personal experiences as a young child when he would visit his father's auto shop and play with gears. In the 80's as a researcher at MIT, Papert called upon those early learning experiences and he produced the Logo programming language, which led to the first children's toys with built in computation. During that time Papert wrote *Mindstorms: Children, Computers, and Powerful Ideas.*

- In the foreword of his book titled, *The Gears of My Childhood*, **Papert** speaks of his belief that students need cognitive tools to work through the operational level identified by Piaget:

- "What the gears cannot do the computer might. The computer is the Proteus (sea god) of machines. Its essence is its universality, its power to simulate. Because it can take on a thousand forms and can serve a thousand functions, it can appeal to a thousand tastes. This book is the result of my own attempts over the past decade to turn computers into instruments flexible enough so that many children can each create for themselves something like what the gears were for me."

- Today Papert is considered the world's expert in how technology can provide new ways to learn. His beliefs come from his personal experiences, and extensions of his ideas include robotic technology in the education field such as Lego Mindstorms and Robolab.

- An extension of Papert's belief is also evident in 1995 when Dr. Chris Dede, Harvard Graduate School of Education, suggested the use of robots in education during a discussion. Dede states that learning is enhanced when educators incorporate 3-D learning environments instead of relying solely on computer virtual 2-D environments, because children learn by manipulating objects physically.

- "When children build and come up with their own solutions to construction challenges they are encouraged to learn, not only about engineering, but also about science and math as well as reading and writing." *Chris Rogers, Assoc. Professor of Mechanical Engineering at Tufts University (USA).*

- Children learn easier by play according to Papert. But children need direction in play - they need a structured support plan that shows clear progression from one stage to the next with support before, during, and after and a method of assessing and evaluation.

- Creating simple machines assist and guides students to explore physical science as they build working models of levers, wheels, axles, chassis, pulleys, wheels, and gears. Robotics assist children in assessing and evaluating what they build, contributing to their development. Robotics increase children's desire to learn while allowing for progressive learning – at individualized rates of speed and level. Children are learning to think critically, improving their sequencing, communication, and tactile skills.

- Combining robotics technology with other disciplines will assist students to design a machine that will solve a real-world problem and apply mathematical and scientific principles for a concrete, practical purpose and solution. Some children plan their models;

some jump right into action and begin building without planning. These kinds of learning styles will reveal themselves through the building process.

THE TIE-IN OF ROBOTICS

- **Constructivism ties** - robotics technology is learning by design – learning by investigative play to design meaningful projects – in other words, constructivism. It increases the desire to learn while allowing children to learn at their own rate of speed and level using their own unique learning style. Robotics is creating a learning environment that helps students use objects to think. Robots are designed to be a part of a lesson, not an end - they make learning fun.

- **Technology ties** - students will examine how incorporating robotics technology into pre-existing lesson plans will create investigative play through the design of meaningful projects, encourage group participation, enhance social skills, increase comprehension, retention, and thinking and learning skills. Students will examine and discuss how robot building involves probability, planning and predicting, designing, hypothesizing, measuring, and applying mathematical and scientific principles.

- **Robots encourage** group participation; enhance social skills, and increase comprehension, thinking, and learning skills, aids in retention, assists in improving verbal skills, engineering, technology, oral, and vocabulary skills, sequencing, following directions, reading, writing, journaling, vocabulary, history, social studies, geography, physical education, technology, physics, electronics, art, reading, science, history, English, vocabulary, creative writing and social studies, physical science, math, geography, physical education, technology, speech, and involves exploration, data management, investigation and problem-solving skills, probability, planning and predicting, designing, hypothesizing, measuring, and comparing and contrasting.

- **Building a robot includes using practical purposes and solutions and then applying that acquired knowledge to real-life situations.** Students in this class will explore robot fundamentals, types of robots and their practical applications, basic tools, robot kits, pre-built robots, basic electronics and mechanical aspects of beginning robotics.

- **For the more advanced,** robotics would include sensors and programming applications, all necessary to manipulate more advanced robots and can include soldering, propellers, buzzers, and lights

- Later we'll examine **robot dogs, and robotic virtual pets,** and where and how to purchase tools and supplies, as well as how to record robot movements (i.e. attach a laptop with a webcam to a robot and move around the building or playground to record events) will also be discussed. Ideas for developing discussion among students in the field of robotic technology will be explored.

- Robotics - relative to **recent news in Science:**

    - Nanorover on the moon to return in 2006 - http://www.enchantedlearning.com/subjects/astronomy/glossary/indexn.shtml
    - Spirit and Opportunity on Mars - http://marsrovers.jpl.nasa.gov/gallery/video/spirit01.html count down nine pictures,

read the article under '**Virtual Rover Drives Toward Rock'**, click on either of the two video links beneath the article
    - **Handouts for both nano-rover and Spirit and Opportunity**

PRETEACHING – IDEAS (and EXAMPLES TO FOLLOW)

Students will be in a hurry to dig right in, but you need to pre-teach and you need to find activities to occupy those students who finish before others, or for when students are waiting for parts to set and glue to dry.

We're going to do what elementary students might do in a robotics lesson – first a pre-teaching exercise worksheet, and then build a basic chassis-based non-motorized nano-rover bot using Tech-Card (this is also a great way to begin using TechCard).

Later tonight you're going to create a worksheet/activity similar to one of these that will pre-teach robotics – either upper or lower grades – your choice.

- **Demo the download game/activity**

IN-CLASS ACTIVITIES (no need to submit activities)

- **For older students:** http://www.occdsb.on.ca/~proj4632/learnmore.htm visit this site first then take the online quiz here http://www.occdsb.on.ca/~proj4632/kidsrobotquiz.htm
- **For elementary students:** Listen to the song here first – all computers should have headphones connected http://www.learnenglish.org.uk/kids/archive/theme_robots.html then complete the activity sheet here http://www.learnenglish.org.uk/kids/print/docs/robot.doc

- **Share your experience** – fun, frustrating, etc.

IN-CLASS ACTIVITY *(no need to submit anything for this activity)*

- Form into groups of two or three – no more than three to a group
- you'll be given a chassis-based Nanorover to assemble
- while waiting for glue to dry and parts to set, continue reading and visit the sites below
- when your bot is ready we'll have a 'race' in the hallway
- **share you're first experience** building a Tech-card chassis based bot
- **print out a metric ruler** http://www.vendian.org/mncharity/dir3/paper_rulers/

- The nano-rover is a basic design that can **easily be made at little or no cost** – **handout idea sheets** – meaning that you can incorporate robotics into the curriculum even if you have zero funds – use straws for axles, i.e.

GEARS, QUESTIONS, THE KIT

- Visit this site and click on **'Click here to see robots in action'** at the left – halfway down the page, orange/red square - short demos will appear for two robots from the kit http://www.techcard.co.uk/pages/pubs.html click on **profile**, then **parts**, then **construct**
- how long does a typical class take for elementary and middle school students?
- dissect the kit - base is a chassis made out of TechCard – geared towards education and marketed as classroom kits, component resource packs, and a range of individual models
- two types of gears and motor – there are alternative ways to create bots without buying the entire kit and we'll get into that a little later -

http://www.rec.ri.cmu.edu/education/robo_preview/content/int/curric/help/worm_ger/worm_ger.htm worm and spur gears
- Hobby motors – 1.5 volts
- The text that came with the kit - discussion and method ideas to explain to students how robots work in the real world to help keep man safe.
- Tools that may be needed for students and teachers for robotics

DOWN-TIME ACTIVITIES and DISCUSSION IDEAS
Worksheets and activities:
IN-CLASS ACTIVITY *(please submit this activity)*

1. Read the topic ideas, the questions, visit the links below, or locate robotic-related web sites on your own
1. Create a scavenger hunt, worksheet, question/answer sheet, or a word search puzzle http://puzzlemaker.school.discovery.com/ relative to robotics (what are robots, what do they do, what are they used for, etc.).
2. Print one for yourself and one for each member of the and the instructor
3. You will present your worksheet to the class and distribute one to each classmate and your instructor

Topic Ideas:

- what are smart dust robots? (look this one up on the Internet)
- http://news.nationalgeographic.com/news/2001/09/0914_TVdisasterrobot.html search and rescue robots
- explain the value of robots in everyday life, in movies and books
- types of robots and where can each be found
- what elements have to be present in a machine to be a robot
- examine and explain the three elements of a robot
- where did the word ‘robots’ come from
- history of robots, first robots, Asimov, father of robots and why
- analyze the history of robots and create a time line
- analyze the history of robots and discuss the Russian/American scientist and author, Isaac Asimov
- what types of robots might appear in industry and why
- what kinds of robots are sent to space and what do they do while in space
- what are virtual pet robots
- name some robots in books, comic books, Hollywood, etc.
- what might future robots look like and do
- discuss bots in medical science and their purpose - nanobots or nanorobots
- humanoids - how are they like man - how are they unlike man
- why use robots instead of humans
- for older students – explain the legal, moral, ethical, human issues involving robotics, i.e. are robots ethically right or wrong, should they have emotions?
- what are humanoids, spider bots, micro robots, artificial intelligence robots

An activity idea for older kids – programming and robots:
What to Do (I substitute wrapped candy for the peanut butter)
One person will be the robot, and one will be the "programmer," who tells the robot how to make a peanut butter and jelly sandwich. The programmer's job is to use language that is as

precise as possible, so the robot will do exactly what he or she wants. The robot's job is to follow instructions, but at the same time to try hard not to do what the programmer wants.

For example, say the programmer asks the robot to scoop "a little bit" of peanut butter out of the jar. The robot might scoop a microscopic amount of peanut butter out. Once the programmer gets the robot to put a good amount of peanut butter on the knife, the programmer will probably ask the robot to spread it on the bread. The robot can then spread the peanut butter all over the edges of the crusts. It's great fun to be the robot. Use your creativity! Count how many commands it takes to get your robot to do what it's supposed to do.

What does this have to do with robots? Robots can't do anything unless a human tells them (usually this is done through a computer program). As this activity shows, the human must be very careful when programming the robot. Robots can't think about whether they're going to do something destructive or harmful, so they will always do exactly as they're told, even if the person made a mistake in the program.

Questions:

In 250 B.C., Ctesibius of Alexandria contributed to the history of robotics how?
In 1896 what was the title of the media that showed robot farmhands of the future?
In 1923 Who coined the word 'robot' and what was the name of the play?
In 1940 what did Isaac Asimov design?
What are the three laws of robotics in Asimov's book?
What was the name of Asimov's book?
What was the name of the movie in 1926 that portrayed robots in the year 2026?What was the robots name?
In 1956 what robot stared in 'Forbidden Planet'?
In the movie 'A Space Odyssey' what was the robots name?
In 1977 what two robots stared in George Lucas' movie?
What was the name of George Lucas' movie?
What type of robot was launched aboard the space shuttle Columbia?
What was the year of the shuttle launce Columbia?
What was the name of the first robot to be able to walk up stairs?
What was the date this robot was introduced?
When was the first operation using robots?
What is NEAR and when did this event take place?
In 2001 the first heart bypass operation was performed in the UK using a robot surgeon – what was the name of the surgical system?

Activity Web Sites

1. http://www.pltw.org/msprogram.shtml high school program
2. http://www.jcutting.freeserve.co.uk/
3. http://www.robotics.megagiant.com/index.html
4. http://www.littlefishsw.co.uk/software/rommy/index.html **Rommy Robot**
5. http://www.rec.ri.cmu.edu/education/multimedia/spur.shtml gears
6. http://www.robotgames.net/Resources/Gears/gears.htm Gears for older kids
7. http://www.sofweb.vic.edu.au/steps/students/5-6Years/machines/cogs.htm Gear game
8. http://www.rec.ri.cmu.edu/education/multimedia/gears.shtml Gears
9. http://schoolscience.rice.edu/duker/robots/robotwhatis.html What is a robot?

10. http://www.42explore.com/robots.htm What is a robot?
11. http://school.discovery.com/lessonplans/programs/robbie/ help special needs people
12. robots in the real world - in the home, industry, and in business
    http://diwww.epfl.ch/lami/robots/K-family/vacuum.html vacuum cleaner
    http://www.sharperimage.com/us/en/catalog/productview.jhtml?sku=IR110 vacuum cleaner
13. http://athena.cornell.edu/educators/lp_06.html Rover Race
14. http://deepspace.jpl.nasa.gov/dsn/educ/gavrt-connectthedots.html Deep Space Network for k-2 connect the dots
15. http://kids.msfc.nasa.gov/Puzzles/Weight.asp What would you weigh and how old would you be on another planet?
16. http://kids1.nis.nasa.gov/Sites/ExternSite.asp?url=http://kids.earth.nasa.gov/archive/coloring/1/index.html Online coloring robot pages for 4-8 -
17. http://mars.jpl.nasa.gov/MPF/mpf/education/cutouts.html Build your own pathfinder
18. http://psychology.about.com/library/weekly/aa072001a.htm?terms=ai AI robots - discuss Steven Spielberg's what does AI include
19. http://spaceplace.jpl.nasa.gov/muses3.htm The real rover and a movie
20. http://puzzlemaker.com/ Create word search puzzles
21. http://robotics.arc.nasa.gov/a_educators.htm explore the real Mars
22. http://robotics.eecs.berkeley.edu/~pister/SmartDust/ Nanobots - 'SmartDust'
23. http://spaceplace.jpl.nasa.gov/muses2.htm How to build a nano rover
24. http://robotics.jpl.nasa.gov/groups/rv/homepage.html Vehicle robots
25. http://www.feedroom.com/iframeset.jsp?ord=916387 movies about robots
26. http://spaceplace.jpl.nasa.gov/muses3.htm The real rover and a movie
27. http://spaceplace.jpl.nasa.gov/robots/robot_puzzle.htm The spider bot
28. http://users.pandora.be/educypedia/electronics/robotics.htm Robotics Encyclopedia
29. http://webpages.marshall.edu/~hamilton/LEGOWEEK/LEGOp3.htm balloon cars
30. http://world.honda.com/ASIMO/event/wreport_12.html Asimo pays a Czech visit
31. http://www.androidworld.com/ a look at androids
32. http://www.androidworld.com/prod07.htm Androids in movies
33. http://www.asccxe.wpafb.af.mil/Robotics/index.htm How to know if the plan will work –
34. http://www.asccxe.wpafb.af.mil/Robotics/roboticseducation/Design%20Concepts.htm How to start – design process
35. http://www.bbc.co.uk/cbeebies/printables/printcolour/littlerobots/ color sheets
36. http://www.blackdog4kids.com/games/maze/shapes/index.html Robot mazes
37. http://www.bbc.co.uk/science/robots/techlab/sub_showcase.shtml Interact w robots
38. http://www.cartooncritters.com/onlinecoloring.htm Online coloring robot pages
39. http://www.ceeo.tufts.edu/ldaps/htdocs/Physics/ robots and physics concepts
40. http://www.chabotspace.org/vsc/exhibits/ws/robotics/pbjrobot.asp robot activity
41. http://www.imagiverse.org/activities/robotics/mer/elem/ Landscape ideas
42. http://www.gibsonteched.net/media/color%20code/resistor.html resistor look up
43. http://www.gigglepotz.com/robotics.htm Classrooms and Robotics
44. http://www.jeffbots.com/starwars.html Hollywood and fiction robots – R2D2, C3P0
45. http://www.lego.com/eng/create/designschool/lesson.asp?id=1_c&page=2 Gears
    http://www.lego.com/eng/create/digitaldesigner/default.asp Design Legos online
46. http://www.lego.com/eng/racers/dromeduel/default.asp Lego Robot games
47. http://www.miamisci.org/robotzoo/hotlists.php Robot Zoo (traveling zoo of robots)
48. http://www.mos.org/exhibits/robot/activities-pre.html Characteristics of robot
49. http://www.occdsb.on.ca/~proj4632/ Robotics in the Classroom

50. http://www.occdsb.on.ca/~proj4632/answers_scavengerhunt.htm Scavenger hunt
51. http://www.occdsb.on.ca/~proj4632/faroutrobots.htm Far out robots
52. http://www.occdsb.on.ca/~proj4632/classroom.htm word search, scavenger hunt,
53. http://www.occdsb.on.ca/~proj4632/hondap3.htmHumanoids
54. http://www.occdsb.on.ca/~proj4632/kanataontario.htm Wheelchairs and robots
55. http://www.occdsb.on.ca/~proj4632/kidsrobotquiz.htm Scavenger hunt quiz
56. http://www.occdsb.on.ca/~proj4632/learnmore.htm#What%20is%20a%20Robot Scavenger hunt
57. http://www.occdsb.on.ca/~proj4632/teachers.htm#What%20can%20my%20class%20learn%20and%20do robot project from a school
58. http://www.occdsb.on.ca/~proj4632/wordsearch2.htm Robot word search
59. http://www.papert.org/articles/GearsOfMyChildhood.html Papert and gears
60. http://www.renfrew.edu.on.ca/grassroots/gr_alx/challenges.htm building robots
61. http://www.robotics.com/report.html what are robots?
62. http://www.robotics.com/robomenu/ Photos of robots that people made
63. http://www.robotstore.com/download/How_to_solder_1.pdf How to Solder
64. http://www.science-is.com/mechanical.htm Tools and Safety for Children
65. http://users.pandora.be/educypedia/electronics/robotics.htm dictionary
http://www.sofweb.vic.edu.au/steps/students/5-6Years/machines/cogs.htm Gear game
66. http://www.solarbotics.com/beam/default.asp what is B.E.A.M.- robots BEAM
67. http://www.thetech.org/exhibits_events/online/robotics/ Robots, sensing, thinking, acting
68. http://www.thetech.org/robotics/activities/page02.html What is a robot
69. http://www.thetech.org/robotics/atyourcommand/index.html Operate a robotics land rover
70. http://www.virtualpet.com/vp/vpindex2.htm robot pet page
71. http://www.wfs.org/forema03.htm Robots of the future –
72. http://www.windarooss.qld.edu.au/Main_Pages/Robot_Webquest/process.htm WebQuest on Robots
73. http://www.kidsdomain.com/down/pc/balloncar.html Balloon Car Builder
74. http://vulcan.wr.usgs.gov/Miscellaneous/ConversionTables/conversion_table.html metric conversion
75. http://www.quia.com/cm/17840.html matching electronics
76. http://sln.fi.edu/pieces/knox/automaton/onlineactiv.htm electronics
77. http://www.starfall.com writing, reading, elementary robot story problem solving
78. http://spaceplace.nasa.gov/en/kids/ space games – problem solving, critical thinking, real-life situations
79. http://cache.ucr.edu/~currie/roboadam.htm robot movies, games, etc.
80. http://www.occdsb.on.ca/~proj4632/what_is_a_robot.htm What are robots
81. http://robotics.nasa.gov/students/faq.htm NASA, questions, educators, challenges, activities, ask a question to robotic engineers
82. http://www.aaamath.com/ math, conversions, metric measurements
83. http://prime.jsc.nasa.gov QWhiz, make a quiz
84. http://www.kidsolr.com/science/page1c.html Kids online resources - robots
85. http://chaoskids.com/ROBOTS/robots.html gingerbread kindergarten
86. http://www.thetech.org/robotics/ older students
87. http://www.thetech.org/robotics/activities/ robotics high school
88. http://www.thetech.org/robotics/activities/fhhs_activities.html gears - preteach

89. http://www1.webramp.net/Crowesclassroom/roboticshomepage.htm Fairytale, olympics, robot animals
90. http://www.nasa.gov/audience/forkids/games/index.html nasa games, sequencing, space food, dancing robots
91. http://lemurbots.org/ music and robots
92. http://www.mape.org.uk/startower/unit/index.htm remote control robot
93. http://www.windarooss.qld.edu.au/Main_Pages/Robot_Webquest/welcome.htm webquest
94. http://www.nis.lanl.gov/projects/robot// BEAM
95. http://www.mos.org/exhibits/robot/robot.html Sensors, motions, etc. build a robot

IN-CLASS ACTIVITY *(no need to submit anything for this activity)*

- **Start building the bounce-bot** – we're creating this bot because this robot bounces off obstacles and changes direction similar in design and purpose - at a very basic level - to the two robots that are on Mars – Spirit and Opportunity, it is relatively easy to build, almost any age group will enjoy it, it is aesthetically pleasing in design, makes sense, and does something.
- **Gather all pieces** according to the part's list
- we'll help each other, but each of you should make your own
- When the Bounce Bot is finished, we'll go out into the hallway to test drive
- See troubleshooting below for tips and suggestions
- As you're waiting for parts to dry and pieces to set, continue with the in-class activity below

IN-CLASS ACTIVITY *(you do not have to submit this activity but you will be asked to submit one for the final project)*

- Go to http://rubistar.4teachers.org/index.php?screen=NewRubric&module=Rubistar and create a basic rubric for assessing a bot
- Refer to the **troubleshooting tips** below for ideas
- Click on **'create a rubric' - follow these directions:**
    - choose **'Science'**
    - **'building a structure'**
    - enter **your name, project name, zip code**
    - choose **'yes my rubric is a temporary rubric'**
    - Choose **'construction' and 'function' and notice that you can change the wording**
    - Click on **'submit'** at the bottom, when you're finished
    - If you'd like, **print it** or close the window

Troubleshooting the BounceBot – list for assessing the finished product

- problems, solutions – what can go wrong and how to fix it
- are the front wheels staying in position?
- are the two gears touching? (may have to raise the spur gear using paper punch or a pencil to make the holes larger.
- is it moving too slow? Too fast?
- does it bounce off the wall?
- if it goes in small circles something is wrong with the cardboard wheels – may have to use tubing to keep them in place

- if it goes too slow it may be the battery or the two gears are meshing too close – raise the wheels using tape to make the holes smaller

Tech Card and Commotion and alternatives to the kit – handout catalogs

- There are actually three ways to build the Bounce Bot – 1) multiple kit - **Ultimate Robot Kit** - kit and text, **ISBN**: 0789479451, **Publisher:** DK Publishing, Inc. 2) as a single unit kit from **The Commotion Company,** and 3) **duplicate the kit** parts once you have one in hand.
- The TechCard construction system and models were devised by David Eckold and are protected by patent and copyright. TechCard is manufactured and distributed by The Commotion, LTD, a leading educational retailer and trade distributor specializing in science and technology equipment to education.
- I have no affiliation with this company and TechCard
- If you duplicate the kit parts it requires a lot of measuring and shopping, but you can do it – you can also purchase sheets of TechCard to make it easier – they are not scored or cut but you can use a razor, cutting board, and template.
- To order a catalog from The Commotion Group go to: http://www.techcard.co.uk/ http://www.commotiongroup.com/2003/pages/index.html - click on 'contact us' – fill out the form – make sure the first item beneath the information is selected – **'**Technology - Solutions For Education Key Stages 3 & 4**' then click on 'submit'**
- There are free projects using TechCard http://www.techcard.co.uk/pages/pubs.html – click on 'Educational Plans' then click on 'free plans' and scroll.
- Be aware of pricing – it is not US Dollars - look up currency exchange rates for the UK
- Order via mail or FAX

Decorating, racing, finishing touches, filming and recording – what you might consider doing and ideas

- Have your students decorate their bots – do not use heavy or bulky decorations or anything that will drag the bot down or get caught in the wheels or gears
- If using legos, younger students will want to name their LEGO robot and explain the 'good things' that their robot does and have their picture or video presentation taped
- Take photos or videos of creating and racing the bots
- Create a maze and run the bots through it
- Attach a wireless web cam to the chassis based and let the robot run free
- Create a movie or slide show and use MovieMaker or slide show in Windows XP and include music

IN-CLASS ACTIVITY *(no need to submit this activity)*

- create another one (your choice) from the kit
- a suggestion might be the Gobblebot - a robot that works in dangerous conditions, keeping humans safe – the Gobblebot makes for a good
- present what you created and explain how you will tie it in with curriculum

Final project - PREPARATION

- The final project will be completed and presented during the last night of class – you can have groups of two or three, or work alone
- Create a bot, a lesson plan, and a rubric
    - The **lesson** can be in outline or paragraph form – this is not a formal lesson plan, create it in Word only – please include the following items:
        - directions for building the bot
        - list of supplies
        - total cost if you'd designed a bot of your own
        - description of the bot – what does it do
        - intended age group
        - curriculum area
        - web addresses for at least two downtime activities (may be ones from the list in this document)
        - List any ethical or moral implications of the bot that you chose to create
    - The **rubric** should be created using http://rubistar.4teachers.org/index.php?screen=NewRubric&module=Rubistar and has to contain at least three categories – you may use their words or your own words

    - You may create any **bot** from your kit, use ideas covered during class such as a wind-driven or solar powered bot – do not use the BounceBot or the Nanorover – you may also design an original bot if you'd like

    - You and your partner(s) will give a short demo of your robot

    - Turn in the Word document only, not the robot, you might want to make enough copies for everyone in the class

Supply / check list for Bounce Bot (these supplies may vary depending on your method of building)

- one 4-part set of directions _____
- one supply list (this sheet) _____
- TechCard chassis base_____
- TechCard axle support _____
- TechCard disc support _____
- TechCard bracket _____
- Two – 30 mm discs for wheels _____
- One – 20 or 30 mm disc to keep main post in position _____
- One - 60 mm disc for top support for steering disk_____
- Two – 40 mm dowels for wheels _____
- One – 50 mm (or 55mm) dowel for post _____
- One – 100 mm dowel for spur gear _____
- One – 30 mm spur gear _____
- Colored steering disc _____
- One worm gear w/reducer _____
- One motor _____
- One battery holder NO_____
- Battery _____
- One paper clip NO_____
- One wire _____
- Four pieces of 5 mm lengths of plastic tubing _____
- 15 mm foam tape _____
- Double sided tape _____
- Decorations _____
- one paper metric ruler _____

Robotic definitions

- **Adaptable** - implies a modification according to changing circumstances.
- **Android** - a mobile robot usually with a human form .
- **AI** - Artificial Intelligence - the capability of a machine to imitate intelligent human behavior.
- **Autonomous** - existing or capable of existing independently .
- **Bionic** - a living creature that is enhanced by electronic or electromechanical devices.
- **Control** - to have power over.
- **Command** - to give orders.
- **Capek** - Czech novelist & dramatist; wrote plays satirizing science.
- **Cybernetics** - the science of communication and control theory that is concerned especially with the comparative study of automatic control systems.
- **Cyborg** - animal human crossbreed, combining a living creature with machine parts.
- **Chip** - a small wafer of semiconductor material that forms the base for an integrated circuit.
- **Circuit** - the complete path of an electric current including usually the source of electric energy.
- **Code** - a system of signals or symbols for communication.
- **Detect** - to discover or determine the existence or presence.
- **Humanoid** - having human form or characteristics.
- **Infrared** - situated outside the visible spectrum at its red end and can send messages.

- **NASA** - National Aeronautics and Space Administration.
- **Program** - a sequence of coded instructions that can be inserted into a mechanism (as a computer) .
- **Path** - the continuous series of positions or configurations.
- **Robot** - a device that automatically performs complicated often repetitive tasks.
- **Seek** - to go in search of .
- **Simulation** - the imitative representation of an action.
- **Sensor** - a device that responds to a physical stimulus (as heat, light, sound, pressure, magnetism, or a particular motion)