Robotic Design for the Classroom

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Robotics

- While today’s robots don’t quite live up to their reputation from movies or books, they are an important part of today’s technological world.
- Like dinosaurs, robots are capable of capturing the interest of children of all ages and engaging their attention in a highly technical field.
- Robotics represents a merging of multiple technical disciplines.
Gifted Thinking Skills in BEST

- Fluency – Brainstorm how to build robot to meet requirements
- Flexibility – Determine what elements of the design are required
- Originality – Create robot
- Elaboration – Add features to robot based on purpose
- Evaluation – Test and modify based on performance
Robotics Resources for Students, Teachers, and Parents

- Educational Kits
  - Robotix
  - Lego Mindstorm
  - Sony Aibo
- Robot Competitions
  - BEST
  - FIRST & FIRST Lego
  - Botball
Robotics Resources for Students, Teachers, and Parents

- NASA's Robotics Education Program (REP): robotics.arc.nasa.gov
  REP works to capture the educational potential of NASA's robotics missions by supporting educational robotics competitions and events, facilitating robotics curriculum enhancements at all educational levels, and maintaining a web site clearinghouse of robotics education information.

- Robotics in the Classroom:
  www.occdsb.on.ca/%7Eproj4632/index.htm
  A very good Canadian site with lots of basic material on robots for both teachers and students.

- Rover Ranch: prime.jsc.nasa.gov/ROV/
  The ROVer Ranch is a place to learn about robotic engineering. You can learn about the development of robots, their elements and systems, and use a 3D simulation to build and run your own robot.
Ways to Develop Robotics Skills and Background

- **Rover Ranch** – The ROVer Ranch is a place to learn about robotic engineering. You can learn about the development of robots, their elements and systems, and use a 3D simulation to build and run your own robot.
BEST Mission

- To inspire and motivate students toward studies and careers in engineering, science, and technology by providing a sports-like technology competition.
  - Problem to solve with teamwork processes
  - Setting and achieving goals within time limits
  - Managing limited resources to effect optimum solutions
BEST ROBOTICS

- BEST defines game rules and local hubs supply consumable materials for building the robot and returnable electronics and motors for controlling robots.

- Students are furnished with materials and game rules on kickoff. They have 6 weeks to develop a working robot to perform to game rules and compete.

- Points are awarded in competition and also for documentation of project in “BEST” book.

- Winners of Competition and “BEST” book compete in National playoffs at Texas A&M at College station.
BEST Book

- All real engineering projects must be properly documented.
- To ensure this part is taken seriously, a team can qualify for the national competition if their BEST book is judged to be the best in its region (regardless of how good their robot is).
- Each team that competes in BEST must complete a book and make a short oral presentation about their robot.
School Participation

■ What do the schools need to provide
  ■ Administration support
  ■ Students (5-30, 10-20 works well)
  ■ Faculty coaches (1-2)
  ■ Parent support
  ■ Classroom/Shop access, typically after school hours
  ■ Technical mentors (3-4 engineers/technicians, can be parents)
Determining the Team

Students apply for the team current 6th and 7th graders apply in the spring of the previous year. Incoming 6th graders apply at the beginning of the year.

Teacher evaluations and student input is used for determination.
Attributes for Selection

- Previous robotics experience – Robotix mini-course, Lego Mindstorm team, other
- Teamwork
- Cooperation
- Stays on Task
- Follows Directions
- Problem Solving
- Academics
- Behavior
Skills the kids need

- BEST does not require extensive technical skills for the kids to participate
- Basic hand tools
- Simple electronics
- Most important skills are GT skills of fluency, flexibility, originality, elaboration, and evaluation.
Life Cycle for development

- Requirements – What is the robot supposed to do?
- Design – How will we make the robot meet the requirements?
- Develop – Actually building the robot, including prototype ideas
- Test – Make sure the robot actually works the way it’s supposed to
Competition day

- The BEST hub committee is responsible for organizing and running the actual competition.
- Teams in the HUB all meet and bring their completed robots for competing against each other.
- It is an all day event that involves multiple rounds of competition, the presentation, and book judging for each team.
Student Perspective on Competition Day

- Students must be prepared to handle changes, problems, and challenges on the spot.
- Team spirit is important.
- Students get the opportunity to interact with other teams and their robots.
- Parent involvement is valuable in the entire process but is particularly important on this day.
Competition Day

- Each student on the team has specific job.
  - Drivers
  - Spotters
  - Pit Crew
  - Presentation
  - Strategy
Pandemonium in the Smithsonian - 2000

- The Smithsonian is on fire and the robot must turn on the Halcion Sprinklers and rescue artifacts.
RAD to the CORE - 2001

■ There has been an accident at a nuclear power plant and the robot must move the reactor rods to a safe location.
Summary

- Robotics is a good topic for GT students
- It encourages higher level and GT thinking skills
- Many ways to involve students in Robotics
- BEST competition is an excellent low cost opportunity for schools to get involved with robotics.