The Pedagogical Advantages of Programmable Robots

As With All Well-designed Manipulatives:

• Robots like the Pro-bot® or Botball® encourage children to work with their hands and to move around their environment.

"The hand is the instrument of the intellect."

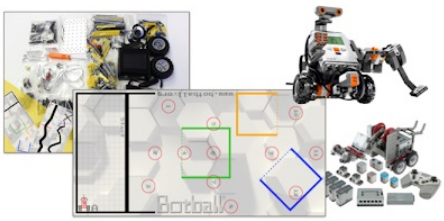
Pro-bot®
K-3rd Grade

• Programmable Robots provide a medium through which to explore the world.

• Programmable Robots allow for meaningful play (closely related to creativity): play that reveals to children the secrets of their environment.

• Programmable Robots provide a material path to abstraction: i.e., a material, or concrete, way for children to model abstract concepts like length, angle, degree, or negative vs. positive numbers.

Unlike Inert Manipulatives (And many electronic games, toys, and computer "educational" software):



Botball® 3rd-5th & 6th-12th Grade

• Robots like the Pro-bot® or Botball® are multiuse: exploration, modeling, and problem- solving tools.

• Programmable Robots are not limited to rigid or prescribed (pre-programmed) uses or behaviors: children can explore their environment creatively, testing and refining their concepts of it as they go.

• Programmable Robots allow children to think creatively about the solutions to a large variety of inherently interesting problems, and to easily and immediately test their possible solutions.

• The Robots' behaviors are transparent, not mysterious like the "black boxes" (software games driven by invisible code, electronic devices like X-Box with invisible circuits) that children are handed to play with or "learn" from but which they do not understand. A Programmable Robot's behavior is the direct result of the children's actions.

"Whatever I cannot recreate for myself I do not understand."
— Richard Feynmann, Nobel Laureate in Physics

Dramatic & Interactive • Early Learning Advantage • Gets Kids "In the Game"

An EARLY LEARNING ADVANTAGE path that gets all children writing code and seeing computers as tools, not toys or entertainment devices.

• Children can identify with their Robots, anthropomorphizing him (or her) and visualizing movement in space and possible solutions to PROJECT-CHALLENGES through his eyes: a powerful problem solving technique.

• This dramatic aspect of the Robots makes possible another powerful learning tool: the idea of the "Racer" Pro-bot® or Botball® as the children's student. Children learn by

"teaching" their Robot to solve PROJECT-CHALLENGES.

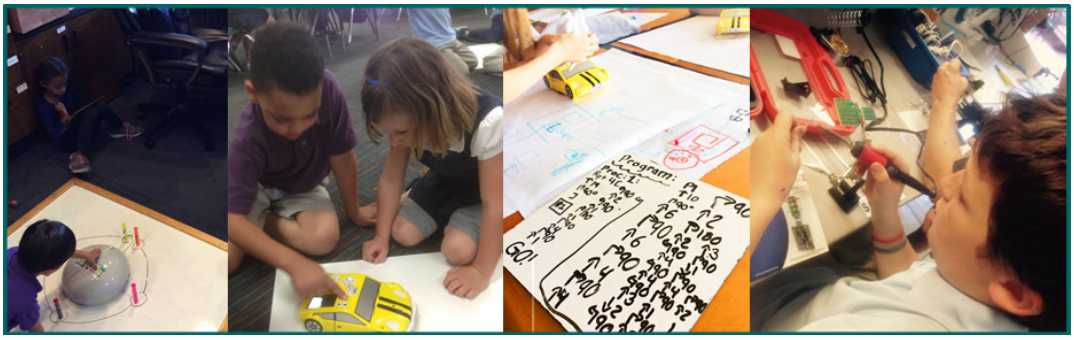
• This way of anthropomorphizing the Robots adds drama to every work period: *Will my Robot learn his or her task in time?!*

• As a "character" Robots are non-judgmental. They never humiliate but are at the same time absolutely fair: if you give a Robot a bad solution to a PROJECT-CHALLENGE, s/he will always fail to do the work. This non-threatening persona makes children more willing to risk failure in their attempts to find a creative solution to PROJECT-CHALLENGES.

Integrated and Cross-Currricular:

• Programmable Robots are extendible: using accessories and platforms children can use their Robots to explore such topics as *simple machines, light, color, design, electricity, electronics, computers, robotics, drama, dance*, etc.

• Programmable Robots like Pro-bot® or Botball® are adaptable to exploration of many areas of the curriculum: **STEM** (simple machines, electricity, electronics), MATH (geometry, arithmetic), **GEOGRAPHY** (map reading), **DRAMA & MUSIC** (robots dancing in sync), **LANGUAGE ARTS** (creating a book of programming solutions: "Tricks We Taught Our Robot"), **COMPUTERS** (programming: testing, debugging, & saving procedures, flow-charting & modeling PROJECT-CHALLENGES on a Computer Screen), **ART & DESIGN** (with pen accessories children can teach robots to draw; with repetition they can explore the fractal nature of movie special effects; children can costume and decorate their robots, etc.).



Let's Get Our Kids in the Game! ➢ K-8 Programming • Problem-Solving • Applied Math • STEM Design

A World Where Children Program the Computers (Not the Other Way Around!):

An EARLY LEARNING ADVANTAGE path gets all children writing code and seeing computers as tools.

• Programmable Robots like Pro-bot® or Botball® are sophisticated and powerful, yet, with their simplified keyboard and easy maintenance, they provide an **ideal entry** path (for both children and elementary school teachers) **to the worlds of computers, robotics, and information technology.**

In sum, when used in an Active Learning Zone™ arena, Programmable Robots can serve as the basis of a powerful *problem-solving, programming, applied mathematics, and STEM Engineering* curriculum that will help young children begin to develop **the active learning habits of curiosity, confidence, and creativity** (independent problem solving), while introducing them to the key technologies of the modern Information Age.