Incorporating Robotics Into A Middle School Curriculum

Presented by:
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Joe LaCourse, Eric Venning, Jacob McTague, Alex Caracappa - 7th grade students
Chloe Kipka, Heather Tourgee, 6th grade students

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Expanding Horizons Program

- Includes these subjects
  - Simple Machines
  - Mechanical Engineering
  - Sixth Grade Robotics
  - Competition Robotics
  - Radio
  - Web Design
  - Newspaper
  - Peer Mediation
Radio

- Radio students do morning announcements
- A few of the radio students are recruited by the robotic kids to help them with their research presentation.
Peer Mediation

- Students help students solve their conflicts
- Each year there are a few on the robotics team which helps when it comes to disagreements.
- Coach is also in charge of peer mediation so she uses that model for all of her classes.
- Respect each other.
Newspaper

- One year the research project was in the form of a newspaper in which the robotics team learned InDesign and Photoshop Elements.
- Robotics kids have learned new computer programs. Since they are in the same room as the other classes, they see what is happening and incorporate it into their robotic project.
Web Design

• Usually a web designer on the team does the web site
• Students on the team have access to other students to help them and teach them the programs that they are using
School Setting Pluses

- Whole school can participate
- Start with simple machines and build your way up to robotics with a background in other areas
- Students tend to get to know more kids in different grade levels
- This program started with the idea that all kids can be a part of it not just talented and gifted
Simple Machines

By: Eric Venning
7th grader
First Class Towards Robotics

- Simple Machines is a starting out program in E.H.P. 5th grade students start out using this program to build very simple and easy every day objects.

- At the beginning of a lesson you are given a packet. These packets have numerous machines to build and write about what you found out about the machines you built. Near the end of the packet you are given a challenge that you build from your own design.
Paperwork
Experimenting with LEGOS

On the first day of class each student is given the same pieces and is told to build something out of them. This is to teach them that everyone has their own ideas, and we have different machines from each person because everyone thinks differently; it doesn’t make one person right and the other wrong.
These are some of the things you learn about in simple machines

• Structures and Forces
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- Structures and Forces
- Levers
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- Structures and Forces
- Levers
- Wheels and Axles
These are some of the things you learn about in simple machines

- Structures and Forces
- Levers
- Wheels and Axles
- Gears
These are some of the things you learn about in simple machines

- Structures and Forces
- Levers
- Wheels and Axles
- Gears
- Pulleys
Structures & Forces

- The first thing that you do when you’re in simple machines is learn about structures and forces. You use strong shapes like triangles and squares. In this lesson you have to build a deck chair that can change back positions. Next you build a drawbridge that lifts up and goes down.
Levers

- In this investigation they have to use levers to solve every day problems such as a wheelbarrow or a teeter totter. One of the simple machines they had to build was a drumming machine.
There are 3 types of levers
There are 3 types of levers

![Diagram of levers]

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There are 3 types of levers
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Wheels & Axles

Wheels and axles are used in a lot of things like cars, bikes, conveyor belts, etc. In this investigation they have to build cars, conveyor belts, cranes. You don’t really think of how useful wheels and axles are until you actually notice them.
Gears

- Gears make some things easier to do. Gears are used almost every day, such as in a bike, can opener, rides at fairs, etc.
A concept that we learned.
Mechanical Engineering

*Presented by:*
Alex Caracappa
7th grader
Linear Motion

- We made a conveyor belt and learned the concept of a gear rack for linear motion.
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Rotary Motion

- For Rotary motion we learned the concept of an average computer printer.
Rotation Motion

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2 Dimensional Motion

- We built a pneumatic powered lift for 2 dimensional motion, a machine that moves vertically and horizontally and a different one that draws.
2 Dimensional Motion
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3 dimensional Motion

- For 3 dimensional motion that can rotate in a horizontal and a vertical plane at the same time.
Periodic Motion

- We built 2 types of timing mechanisms for periodic motion.
Periodic Motion (Pneumatic)
Grabbing Motion
What we got out of Mechanical Engineering

- How to put the simple machines together to create a compound machine
- How to build solid attachments when we get on the robotics team
- Getting to know others with like interests
- Knowing that you have to take this seriously or you may not make it on the team
- Helping each other learn can be fun
- Not to rush to get a project done.
Sixth Grade Robotics

Presented by:
Jacob McTague
7th grade

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Things I Learned

- Gear Ratio
- Wheels that work
- Programming
- Following Directions
- Taking Notes
- Focusing on work
- Helping each other
- Quiet is actually nice
Finding Pieces

• Having extra boxes of LEGO pieces help when creating your own robot. The robots tend to fall apart a lot but that is part of learning. We make the tankbot first and then we have to create our own.
Our own robots
Gear Ratios - Experimentation of Gears by building own robot
Wheels, Wheels, Wheels

- We had time to experiment with the wheels
- Some had too much friction which made the robot not turn as well as with other wheels
Programming can be tricky but with some patience and experimentation it went ok.
Teamwork - we need to help each other
Following Directions

- Following directions is a must, if you don’t you will miss steps and the robot may not do what you want it to do.
Teamwork

Presented by:
Chloe Kipka
6th grade
What We Do

- As a team, the robotics kids take a trip to the White Mountains every year to build strong relationships and teamwork.
- There are some Peer Mediators on the team to enforce conflict resolution.
- We learn about each other and ourselves during the game process, which strengthens us as a whole.
- Backpacking adds to the teamwork since we need to make sure all get to the hut safely.
The Two Teams in the Whites, NH
Reflecting on the Trip
Carter Notch Hut, NH
We have no distractions here (only an occasional moose and snow in October), so we can focus on each other.
Teams at the Hut

- Both teams go up to the Whites, so we have a lot of people to keep track of and get to know!
- We have dinner together, and then we work together to clean up.
- Never know what to expect
- Pipes froze and we needed to go to a pond to gather water for breakfast.
Fetching Water - It was fun.
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Reasons Why We Go To the Whites

- The room we have to work in is very small
- We share our room with all other EHP classes
- We have limited time in class for working on teamwork
- We work on conflict resolution (students solve their conflicts with the help of peers rather than adults telling us what to do)
- Listen to each other. We are able to take the time since we are in no rush to go anywhere.
Human Knot Game

All players form a tight circle. Each person puts in their left hand and holds someone else’s left hand. They then do the same with their right hand. Then as a group they try to untangle without releasing hands.

This can show you who are leaders, who are bossy and those who don’t get involved. Sometimes you can tell them to not talk as you do this or make some unable to talk to give others a chance to be in charge.
Good Frog? Bad Frog?

To do this game, there is no limit to how many people can play.

One person picks up an object (any object will do) and asks the people playing “Is this a good frog, or a bad frog?” This is while the person is holding the object a certain way.

This is a hard one!
Who was it?

Every person gets shown a playing card, but they don’t show anyone or tell anyone their color (black or red). A tray with a bunch of game pieces is placed out of the player’s sight arranged in a particular way, and then, the players have to try and recreate the tray with duplicate pieces. The tray with the items on it is a distance away so no one can see it. The group as a whole gets to see it for three minutes then they go back to recreate it. Then they have three more chances to send one person to look at it to make corrections with one minute time limit to look at it.
Who was it? Part 2

The trick is, the person that was shown a black card tries to make the group unsuccessful and secretly change the tray.

This is interesting to watch as people accuse each other of being the saboteur.

At the end of the game, show the players that they were all red cards after all!
We Share with...

- Peer Mediators
- Newspaper Staff
- Web Designers
- Simple Machines
- Mechanical Engineering
- Radio
- other robotics kids

- All our computers we share with all classes
- We have one competition board for everyone
- One teacher, coach, and mentor does it all
- There are times where we need to be quiet, since a radio show is going on.
What did we learn?

- To have patience with each other
- To share the board and robots
- To accomplish a set goal
- How to work amongst many kids
- To stick together
- Listen to each other even if it takes a lot of time
- Respect for each other
- Tolerance for different personalities
- Patience
Isn’t this what it is all about?
Competition Robotics

Presented by:
Joe LaCourse, 7th Grade
Two Teams

- Meet during the school day four times a week for 45 minutes each
- Free time we go to the EHP room to work on robotics
- We stay until 6 or 7 on Fridays
- What we learned in simple machines, mechanical engineering and sixth grade robotics we put in our robot for the competition
The Two Robotic Teams
What do we get out of Robotics?

- Learn how to get along with others
- Leadership skills
- Public speaking
- How to get our ideas across
- Organizational skills
- Programming
- Learn how to build a robot
- Commitment to a group
National Anthem

- We had the privilege of singing the National Anthem at our State Competition in New Hampshire.
Thinking is something that takes time.

- Figuring things out together.
- Having the time to spend to think about something and then trying new ideas.
- Realizing that it takes time to work on a project and you have to keep going back to make it better.
What happens after competition?

- Clean all the LEGO\textregistered s
- Pack up the competition board
- Set up new boards from previous years
- Work on own robot now to do all the tasks on two separate boards
- Fine tune skills
- Think about next year’s subject
- Get to know each other better
Our room
One more thing

- Sometimes a team will get assigned to do a project after competition such as exploravision in which the students take their research project and present it in a different way, which in this case is a web design project. We learn then how to extend ourselves one more way.

- We also go to an elementary school for their science day to show the students what is waiting for them at the middle school.
What’s next?

- The 8th grade students on the team get to work on the VEX robot for two semesters.
They also have to make their own board.
Research

Presented by:
Heather Tourgee, South Meadow School

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Things I learned while doing research (Heather):

- How to work on a deadline (for our presentation, we were literally working up to the last day!)
- Perfection
- A lot about the topic being researched (nanotechnology)
- Teamwork
- How to think in unexpected and creative ways
How to Work under a Deadline

- When working on a project such as this research project, you must have it done and perfected by a certain date
- Use Props
- Dress-up

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Things I learned while doing research (Chloe):

- Different computer programs (Indesign, Photoshop, Firstclass, Robolab, and the Internet)
- How to work on a set goal (all of our time was spent working on getting it RIGHT!)
- Teamwork and patience
- Tolerance for other people
- Have examples of things
**Indesign**

- Indesign is a computer program used to create layouts
- At SMS, the peer mediators use it to design “Student of the Month” certificates
- The newspaper staff also uses it to create the school newspaper
- Our team used InDesign to make the Gracious Professionalism poster

**Photoshop**

- Photoshop is a program we use to make graphics and to work on the pictures.
- We learn the difference between a jpeg and a tiff.
- We learn about resolutions.
First Class

- All students in EHP receive a First Class account
- First Class is a program with which students and teachers can communicate
- Students also have access to First Class at home, making it easier to submit homework
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Conferences in First Class

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Sending and Saving Programs

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South Meadow

- At South Meadow School, we have two robotics teams, a boys and a girls team.
- Some days, when there was a workshop or a day off, we would come in and work only on research.
- There are no strict guidelines when it comes to research, making it not only more fun and creative, but also more challenging.
- We got our idea for a fashion show from some magazines like *Odyssey* and *Science News* that our coach gave us.
The Presentation

- Each team in FLL is required to create a presentation on one aspect of Nanotechnology (this year’s theme)
- Our team chose to write and perform a fashion show, relating to the growing field of nanotechnology in clothing.
Team 1773: Artificial Intelligence
Our team chose to recruit one person designated to organize the rest of us on the research project. This proved to be very helpful.

The person we chose had to be hard working, able to stay on task, and focused.

The person we chose fit this outline perfectly, and helped us take 2nd place in research at the NH state competition.

We all contributed to the research project but she pulled everything together for us, including the display board, and told us when things were due.
Our presentation (continued)

- In addition to the display board and presentation, our team also conducted an experiment with different fabrics and stains.
- We tested fabrics like NanoTex, DesignTex, Polar Tec, untreated NanoTex, and Greenyarn EcoFabric.
Use the scientific method

• Do an experiment
• Collect data
• Write it up
• Present in an interesting way
• Include the judges in the experiment
• Have display board that is interesting
• Have all members participate
The Experiment
Treated NanoTex vs. Untreated
DesignTex, PolarTec, and Greenyarn
Ecofabric

-DesignTex

PolarTec

-EcoFabric

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Thank you for coming!

- Hope you enjoyed our talk.
- Robotic Web Site
- Simple Machines Web Site
  - http://www.conval.edu/Schools/sms/www/Classes/Machines/index.html
- Vex Web Site
  - http://www.conval.edu/Schools/sms/www/Classes/Vex/index.html
- SMS Web Site
SMS robotics