GoBabyGo! Using STEM Skills to Change Lives

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Gavin Wood is the STEAM Director for The Barstow School in Kansas City, Missouri, and award-winning coach of FIRST Robotics Team 1939. He holds a B.S. degree in Business Management from the University of Missouri – Columbia, and Masters in Education from UMKC. As the STEAM Director for The Barstow School, Wood has created a one-of-a-kind, project-based STEAM program that develops an ecosystem of innovation and design-thinking, giving students the 21st century skills to make their ideas a reality. His focus is creating real-world experiences for his students to use technology and engineering to improve the world around them.

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Kendra Gagnon is a Clinical Associate Professor at Baylor University, where she teaches pediatrics and professional competencies to graduate physical therapy students in an innovative, 2-year hybrid DPT model. Gagnon is a school-based physical therapist, Digital Media Editor for Pediatric Physical Therapy, and Director of Variety KC GoBabyGo. Her focus is promoting early mobility for young children, pushing the boundaries of the traditional medical model through user-centered design and co-creation, and leveraging technology and innovative approaches to education to improve the quality of learning experiences for all students.
What is GoBabyGo?

GoBabyGo! is an international "mobility movement" with the mission to provide self-mobility to every child, no matter their abilities.

The movement began in 2012 by Cole Galloway, Ph.D., a Professor at the University of Delaware. [https://sites.udel.edu/gobabygo/](https://sites.udel.edu/gobabygo/)

GoBabyGo! often focuses on modifying ride-on toy cars into affordable wheelchair alternatives for children in need.
GoBabyGo! by the Numbers...

$25,000
- The cost of a customized, motorized wheelchair for a child who may outgrow it in a short period of time.
- Many families cannot afford this.

ZERO
- The number of motorized wheelchairs for toddlers currently on the market.
- GoBabyGo! cars can accommodate children as young as 12 months old!

$250
- The cost of an average GoBabyGo! car, complete with custom modifications.
- Many communities have non-profit groups who will sponsor this fee.

40+
- The number of active GoBabyGo! chapters around the world!
- This doesn’t include numerous individuals and schools who also create GoBabyGo! cars!
GoBabyGo! is a perfect way to create an emotional, hands-on experience for your students, bringing technology and engineering skills to life!

GoBabyGo + STEM Education
GoBabyGo! + STEM Education = Inspired Students!

Incorporate GoBabyGo! into:

**FIRST Robotics**
- This is a perfect outreach for FRC and FTC teams, which already have some technical skills and the motivation to serve!
- Students learn that the same skills they’ve learned to build robots can also change a child’s life forever.

**STEM Classes**
- Perfect for project-based learning and NGSS. Students learn about wiring, motors, tool usage, the engineering design process, and user-based product design.
- More advanced builds can include lessons on coding, soldering, CAD, sensors, Arduinos, and adaptive technologies.

**Service Projects**
- Any after-school club with STEM-loving students can utilize GoBabyGo! to earn service and volunteer hours. A single car could make a great Eagle Scout project, National Honor Society outreach, or individual deep-dive service learning project.
A GoBabyGo build is a great way to incorporate project-based learning into your NGSS curriculum.

For more information about integrating GoBabyGo into your STEM Curriculum, contact Gavin Wood at gavinwood@gmail.com

What Skills do Students Learn with GoBabyGo?

- Electrical Engineering & Wiring
- Mechanical Engineering
- Tool Usage & Precision Measurements
- Optional: CAD, 3D Printing, Laser Cutting, Arduinos, Coding, Control Systems
- Engineering Design Process
- Empathy!
- But most of all...students learn how they can use their STEM skills to change lives!
"I tell my students that they don’t have to wait until they are ‘grown ups’ to change the world. Why wait? Let’s develop 21st-century high-tech skills, and use them to change the world right now.” - Gavin Wood, STEAM Director

In 2015, the Barstow FIRST Robotics Team 1939 partnered with Variety KC GoBabyGo! My students were so inspired, we’ve now built 53 GoBabyGo cars, and become global leaders in the movement!

Here’s a student-produced video about our latest build…
[Barstow GoBabyGo Video Hyperlink]
“For children with medical conditions and/or developmental disabilities such as Cerebral Palsy, Spina Bifida and Down Syndrome, impaired mobility not only affects physical development, it also impacts social interactions and the development of meaningful relationships.”

- Dr. Kendra Gagnon
Locomotion, in some form or another, underpins **human interaction** and **meaningful participation** in the world around us.

“**LOCOMOTION**: The act or power of moving from place to place.” - Merriam-Webster

**Early mobility matters!**
Locomotion drives participation...

- Socializing with peers and family
- Engaging in education
- Preparing for employment later in life
- Enjoying leisure and recreation activities
- Community life and civic engagement

(Berry et al., 1996; Bottos et al., 2001; Bottos & Gericke, 2003; Everard, 1984; Gibson et al., 2012; Palisano et al., 2003; Palisano et al., 2009b; Tefft et al., 2011; Wiart & Darrah, 2002; Wiart et al., 2004)
Once a child experiences self-directed locomotion they also experience...

- Increased response to the movement of space and objects around them.
- New memory and spatial capabilities, “hide and seek” activities
- New forms of social referencing
- Higher levels and ranges of infant emotion:
  - Smiles
  - Vocalizations
  - Fear in unstable perceptual situations
  - Frustration derived from new and sometimes challenging interactions with their physical environment

(Anderson et al., 2013; Campos et al., 2000; Gustafson, 1984; Uchiyama et al, 2008)
Striking Outcomes

Locomotion benefits are seen *in equal measure* in the children who develop self-directed locomotion via crawling, and those who experience self-directed locomotion with a walker or powered mobility device.

When mobility experiences are lacking, researchers report a cycle of learned helplessness...

**The Flip Side**

- Decreased self-initiation of social engagement.
- Decreased cognitive development and poorer spatial and kinesthetic awareness.
- Decreased caregiver recognition and reaction at the child’s attempts to communicate or move.

Anderson et al., 2013; Campos et al., 2000; Gustafson, 1984; Uchiyama et al., 2008
Principals of Developmentally Inspired Assistive Technology (AT)

**WHEN TO START:**
Specific criteria, “Readiness”

**WHAT TO FOCUS ON:**
Targeted movement or behavior

**WHERE TO USE:**
Controlled environments

**HOW OFTEN:**
2-3x/week for 30 minute sessions

#### NOW

#### EVERYTHING

#### EVERYWHERE

#### ALL THE TIME
How can we create devices that encourage Pediatric AT?

- Create mobile learning environments
- AT is so fun for both child and parents that they can’t help but make it a part of their daily life
- Provide several options that can be used together to amass higher frequency and duration of use
- The bottom line: Find a way to provide 6-8 hours of social movement every day for infants, toddlers and children with developmental delay and disability

- You can help…with GoBabyGo!
Whether for a STEM class project, FIRST Robotics Team, or service learning project, GoBabyGo! gives students a chance to use their STEM skills to change children’s lives!

Everything You Need to Get Started...
GoBabyGo! Just Follow These Steps…

**STEP ONE:**
Chapter Near You?
Search to see if there is a person or group who could assist you with building GoBabyGo cars in your area!

**STEP TWO:**
Identify Leaders
Who are the lead adults for this project? Who are the lead students? What other liaisons do you need to make this work?

**STEP THREE:**
Find Kids in Need
If there is not a GoBabyGo group near you, there are several ways to find children in your community in need. Then identify a liaison in that group that will help you find kids in need!

**STEP FOUR:**
GoBabyGo Manuals
Look at manuals that are pre-made for cars you can buy at Walmart, Amazon, Costco, and other retailers. Find a car that best suits the needs of your child.

**STEP FIVE:**
Gather Resources
One GoBabyGo car with modifications typically costs between $200-$300. However, there are typically local resources to help with the funding!
Is there a GoBabyGo! Chapter Near You?

Search here to see if your community is one of more than 40 worldwide with an active chapter!

https://sites.udel.edu/gobabygo/contact/

How Can a Local Chapter Help?

- Many chapters host “Community Builds” a few times a year. This is usually a one-day event (3-5 hours) where your group can build a car for a family in need. It’s a PERFECT way to learn how to “hack” a GoBabyGo car!

- Local GoBabyGo chapters often have partnerships or connections with families in need, physical therapists, Universities, non-profit groups, charities, grants, engineering volunteers, and other helpful resources.

- The local chapter will want to know that you are wanting to get involved!
STEP TWO: Find the People You Need to Make it Work...

○ First, identify the leaders – both adults and students – who are excited about the project and dedicated to seeing it through.

○ Make sure that you have at least one person with some engineering & wiring skills to help out. All GoBabyGo cars require some basic re-wiring. Robotics teams and STEM teachers should be good-to-go!

○ GoBabyGo encourages partnerships! Find others who are working on these cars at GoBabyGo Connect: www.gbgconnect.com (more on this online resource later)
Find Families in Need

If there is not a GoBabyGo group near you, there are several ways to find children in your community in need. Then identify a liaison in that group that will help you find kids in need and serve as a liaison!

GoBabyGo cars are most helpful to children ages 1-5 years old with conditions such as Cerebral Palsy, Spina Bifida, Down Syndrome, or any medical or developmental condition impacting mobility.

Resources to help you identify families in need:
• Local Children’s Hospitals
• Local Physical Therapists / Occupational Therapists
• Organizations, non-profits and charities that support local families with specific conditions, such as Cerebral Palsy or Spina Bifida.

Identify a liaison in that group who is willing to be the go-between you and the families.
There is specific information you need to gather from a family to properly modify a GoBabyGo car to fit their needs. This is a great opportunity to teach students about user-based design!

**I Found a Child in Need... Now What?**

**STEP THREE, PART TWO:**

**What You Need From the Families...**

- First, contact the child’s physical therapist and parents to find out this important information to support a user-based design:
  - How old is the child?
  - How much does the child weigh?
  - Can the child use both hands? Push a button?
  - Does the parent prefer to have a remote control option?
  - What seating support does the child need? A harness?
  - What characters or colors do they love? (for decorations)

- We also recommend having families sign liability waivers and photo releases. Examples here: [https://www.gbgconnect.com/t/liability-release-forms/265](https://www.gbgconnect.com/t/liability-release-forms/265)
Our FIRST Robotics Team 1939 created GoBabyGo! Connect ... a free online site where families and chapters worldwide can share their how-to manuals and helpful instructions! www.GbgConnect.com

**STEP FOUR:**

Find a Car and a How-To Manual

- Go to the “Manuals & Guides” portion of [www.GbgConnect.com](http://www.GbgConnect.com) to find “How-to” manuals for a variety of cars. Utilize the information about your child to find the perfect car to modify!

- Make sure to find a car with an appropriate weight/size limit for the child, and to consider a push-button steering wheel vs. a bar or joystick (which can be more difficult builds).

- A WildThing is an amazing option for older children (ages 6-12), or those who can only use one hand. However, it is more difficult to modify.
Gather Resources

Our FIRST Robotics Team 1939 is grateful to have Variety KC – GoBabyGo! as wonderful partners! This group is funded by the Variety Children's Charity of Greater Kansas City, which pays for the cars and materials, and connects us with kids in need. Our robotics team provides the space, STEM skills, and hands to do the work. We also partner with other FRC teams to organize and host a community build each year. This is one example of a great partnership!

FUNDING: There are many local charities, engineering firms, non-profit groups, grants and businesses who love to sponsor projects like this! Make sure sponsors get lots of branding opportunities, like logo stickers on the car!

MATERIALS: It takes approximately 10 days to order and gather all your materials. Your manual should outline everything you need. Make sure you have space allotted to store the car, wires, PVC, pool noodles, etc. Also print several copies of the manual.

ASSEMBLY: A simple GoBabyGo car with a How To manual takes 3-5 hours. A more challenging car (WildThing or one without a manual) can take several weeks if it needs any 3D printed parts or re-coding. We recommend that any students and volunteers involved in the assembly sign a liability waiver and photo release, similar to the ones signed by the families.
The Give-Away!

Tips for the BIG MOMENT…
the presentation of your car to the families.
GoBabyGo! Before You Start Your Engines…

**STEP ONE:**
When & Where?
Determine a good location, and work with your family and their physical therapist to pick out a good date and time.

**STEP TWO:**
Who?
Make sure to invite not just students and the families, but physical therapists, school administrators, and the media as well!

**STEP THREE:**
Why?
Take a moment with your students prior to the give-away to focus on “why” they are doing this, and develop empathy for the child and their family.

**STEP FOUR:**
What Else?
Other tips and tricks to making sure your give-away event is a smooth ride for all involved.
Plan the Give-Away

Determine a location with plenty of space, and work with your family and their physical therapist to pick out a good date and time. Putting a big, red bow on the car makes the give-away feel extra special!

STEP ONE: WHEN & WHERE

Give-Away Event Considerations...

○ Pick a convenient time and date for the family and physical therapist. Weekends typically work best.

○ If you are doing a one-day build, consider modifying the car on a Saturday morning (9-Noon), and inviting the family either in a shared lunch to meet the students, or have the family come right after lunch.

○ Car modifications can be done anywhere there is a table – a classroom, cafeteria, etc.

○ The Give-Away presentation to families should be in an area with plenty of room that is safe for the child to drive around.
Make Sure to Invite...

- Make sure to notify stakeholders with plenty of time for them to attend. Invite:
  - School administrators...let them know what cool things your students are doing!
  - Any sponsors or non-profits who helped fund your GoBabyGo car(s)

- Local media outlets. Some considerations:
  - Many school districts prefer that media be contacted through their public relations person. If so, make sure to work with them at least 2 weeks in advance.
  - Some non-profits have media contacts as well. If so, work with them as well.
  - Have at least one student media-ready, with “main idea” talking points.

Promoting Inclusiveness

Make sure to invite not just students and the families, but physical therapists, school administrators, sponsors and the media as well!

At least one student should be ready to act as an “ambassador” to talk to the media or administrators.
The give-away of a GoBabyGo! car can be a life-changing and emotional moment not only for the family, but for your students as well, as they connect with the child and watch them gain self-mobility...often for the first time.

The Power of Empathy in Engineering Design

○ Before introducing your students to the families, we recommend having a heartfelt talk with them about empathy. Here are some of the things we discuss:

• Don’t be afraid to talk to the kids and their families. Welcome them!

• Some children may feel overwhelmed by the situation, or have sensory overload. Have a quiet spot where the family can go if needed.

• Some parents may feel anxiety about their child not being able to move the car on their own. It’s a learning process for some children. For this reason, we applaud the child simply being in the car for the first time. We also give remote controls to the parents (if the car has one) so they can move the child if needed.
Testimonial from Parents

“At the event, everyone was watching, waiting for AJ to take off on his own. Even on the way there my husband and I discussed not getting emotional if he didn't respond immediately. At that moment though, I got that paralyzing feeling from wanting him to take off but knowing he wasn't going to. The way Gavin applauded AJ just for being in the car, that moment will also be with me forever. It's like his clap took me out of that trance and back to the real moment. The moment that we were in, receiving this new custom build for AJ. The excitement of the event. It took the focus off if AJ could drive it or not. Thank you for everything from the endless possibilities to the unconditional support! Thank you for the desire to modify and adapt equipment to the needs of those like our son!

All our love, The Zahner Family

Ivy was so exhausted last night from the event, she slept really late...but woke up asking for her car. I know you understand what this means for her, but I am not sure I understood the full impact it would have for her. I wish I had more than words to thank you!

The Whipp Family
More Event Tips & Tricks…

○ Have bottled water and snacks available for volunteers and families. Food makes people more comfortable, and people who are not hungry or thirsty will have more patience.

○ If you are building more than one car, create a sign with the child’s name on it, or some way to identify whose car is whose.

○ Take lots of video and pictures! Have at least one “posed” group picture of the students with the child in their GoBabyGo! car.

○ Allow time to show the family and physical therapist how to use the car, and to make on-the-fly modifications to make sure the child can sit comfortably.

○ Follow-up with the family!
Questions?

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https://www.gbgconnect.com/
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