



QuestBotics[®]

TEACHERS' GUIDE

QUESTBOTICS' APPROACH

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Introduction

Anyone can be a roboticist with the QuestBot! The QuestBot is a robot that builds math and logic skills, and emphasizes teamwork, problem-solving, and communication, all in a fun, hands-on environment -- and without the need for a computer screen.

For those who like lists, the benefits of using the QuestBot include:

- Interaction with a real robot, not a virtual robot on a computer screen
- Empowers the user(s) in a STEAM activity that allows growth in the user's complexity and interests
- Encourages problem-solving, reflection, and revision of code
- Encourages teamwork and communication
- A great way to reinforce and extend math concepts
- Activity plans easily align with Common Core, ISTE, and state standards in multiple content areas

Why the QuestBot?

The current trend for STEAM products is to find one more way for kids to use a computer screen. However, research shows that even with all the benefits of these apps, kids who have excessive screen time are at risk for psychological and cognitive changes, depression, and a disconnect between virtual play and physical play^[1, 2, 3].

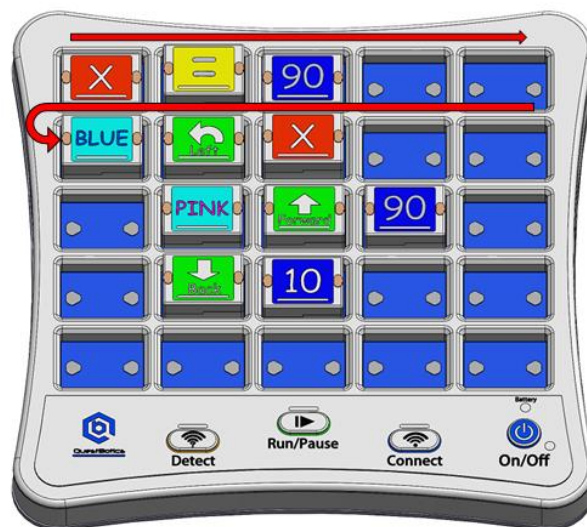
The QuestBot is a solution. Kids love to play, and the QuestBot is made for that. While kids make the blue robot move, they talk with each other as they practice logic sequencing, refine coding skills, review the robot's movements, and plan future adventures for the QuestBot. All kid-generated and no computer screen needed.

What is the QuestBot?

The QuestBot is a friendly blue robot that moves according to the code that the user creates with Qubes placed on the accompanying QuestController. That's it. The Qubes are the code and the possibilities are endless!



Users place Qubes in a logical mathematical sequence to create a movement pattern for the QuestBot. Sequences can include linear movement, circles, angles, functions, there is no limit! The QuestController hold the Qubes in a 5x5 grid, and the code is read on the QuestController from left to right, top to bottom, just like reading a book.



Alignment with Standards

The QuestBot is a self-contained robotics device that uses a mathematical coding logic system to tell the robot where and how to move. Anyone can use the QuestBot, and there is no need to connect a computer, tablet, or phone to the QuestBot or the QuestController.

The QuestBot activities developed by teachers and for teachers present challenging lesson ideas aligned to Common Core, ISTE, and state standards. We also encourage teachers to send us activities they have created for their classrooms at info@QuestBotics.com. For example:

ISTE Student Standards^[4]	What The Standards Say Students Should be Able to Do^[4]	How The QuestBot Approaches this Standard
Empowered Learner	Students choose their own learning goals and demonstrate how they have achieved this goal.	This is where the QuestBot really shines. Students use pseudocode and kinesthetic experimentation to plan the robot's path and use real-time assessment to check their code.
Digital Citizen	Students act in ways that are safe, legal, and ethical in a digital world.	Students work in teams to program the QuestBot in a safe, responsible manner. No digital component is needed, but the classroom teacher can encourage uploading videos of robot experiments.
Knowledge Constructor	Students use digital tools to produce creative and meaningful learning experiences.	This is another area where the QuestBot is superb. While we supply initial lesson plans to get teachers and students started, the possibilities with cross- and extra-curricular connections are limited only by imagination.
Innovative Designer	Students use a variety of technologies within a design process to identify and solve problems by creating new,	While the QuestBot is self-contained, it lends itself easily to use of other technologies. Why not have students make

	useful or imaginative solutions.	a video of a robot competition or ask students to showcase a documentary of their problem-solving approach to a math problem using the QuestBot?
Computational Thinker	Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.	Can we say one more time that the QuestBot is built to meet this standard? It's not just about putting Qubes in the QuestController to make the QuestBot move along a certain path. Students use and reinforce their math skills, and even interpret higher math skills, in a kinesthetic and problem-based format that allows for real-time testing. Older students may find themselves exploring a quick math problem on the side while constructing a triangle, and younger students quickly internalize negative numbers with "going backwards."
Creative Communicator	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.	Working with the QuestBot requires students to work together and talk with each other about how the QuestBot moves. We have lesson plan ideas that incorporate storytelling with path construction, but how the teacher and students want to extend these opportunities is up to the creativity of the teacher.
Global Collaborator	Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams	Another place where the QuestBot excels. We've already mentioned that teamwork and communication are essential with the

	locally and globally.	QuestBot, and everyone on the team wants to be part of the hands-on experience. Why not set up a classroom connection to share experiences and successes with other QuestBot users? Maybe even have students suggest challenges for another class to try? Possibilities are endless.
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The QuestBot also meets and exceeds the Common Core Standards for Mathematical Practice^[5]:

Common Core Standards for Mathematical Practice (MP)	How the QuestBot Meets the Standard
MP1. Make sense of problems and persevere in solving them.	Students can usually use 25 Qubes or less to make the QuestBot move in the patterns desired. Sometimes, though, a student may want to finesse the computations and needs to persevere in using more advanced concepts to shorten the code. Other times, what looks easy on paper needs to be carefully planned when students try to construct a drawing for the QuestBot.
MP2. Reason abstractly and quantitatively.	Pseudocode, kinesthetic movement, collaboration, and math skills are needed and developed when using the QuestBot.
MP3. Construct viable arguments and critique the reasoning of others.	Communication, kinesthetic movement, and trial-and-error are key to making the QuestBot do what the student wants it to do. Did the QuestBot make a right turn when it should have moved left? Ah, time to revisit the code and try it again.
MP4. Model with mathematics.	Everything with the QuestBot rests on mathematical logic and modeling. Moving forward requires addition, turning requires angular movement, etc. The QuestBot is built from the ground up using mathematics.
MP5. Use appropriate tools strategically.	We have lesson plans that help teachers incorporate rulers, foam blocks, city maps, and other tools to

	help students expand their vocabulary, understanding, and use of mathematics.
MP6. Attend to precision.	The QuestBot is a precision machine. Each linear progression is 1 cm, and we encourage younger mathematicians to check this with a ruler. Don't want to bump into the wall or the foam block? Better check the number sentence created with the Qubes!
MP7. Look for and make use of structure.	The QuestController that uses the Qubes to control the QuestBot reads in a structured fashion, left-to-right and top-to-bottom, just like a book. If a student uses a Trouble Qube, and the code structure is confusing to the QuestBot, the QuestBot's eyes blink to show where the code is problematic. In addition, we encourage teachers and students to follow the QuestBot's movements along with pointing to the corresponding Qubes.
MP8. Look for and express regularity in repeated reasoning.	Each student group has a box of Qubes that does just about everything they want to do with the QuestBot. Sometimes students are challenged to create the same movement for the QuestBot using fewer Qubes. Is there a way to consolidate the commands? Is <i>Turn 90</i> (2 Qubes) the same as <i>Right Turn</i> (1 Qube)?

Curriculum Connections

The QuestBot is ready to engage students in learning and extending mathematical thinking. And we are here to help. We have lesson ideas for the classroom, Makerspaces, and technology clubs. Our library of lesson ideas is organized by grade span and also accessible for vertical teaming since each lesson concept includes suggestions to access higher order thinking skills, older grades, and mixed grade technology clubs.

Sample lesson ideas for the classroom, Makerspaces, and technology clubs

Our website has a growing library of tried-and-tested lesson ideas that are aligned with Common Core learning standards, we encourage users to contribute lesson ideas of their own. These lesson activities are great for the classroom, for Makerspaces, and for technology clubs. You can browse and download ideas at [QuestBotics.com/courses](https://questbotics.com/courses).

Vertical teaming

We know that it's important for teachers to talk with each other, and to know where their students are coming from, and where they are going in the content. We also know that differentiation is imperative for individual student success and that good teachers can stretch a lesson to cover learners' needs at all levels. We're here to help with that because the lesson ideas in our library provide reinforcement and deep thinking of content, suggest extensions to reach higher order thinking skills, and provide opportunities for vertical team talks and multi-grade applications.

Collaboration with other teachers in the QuestBot community

We have a library of lesson ideas to get you started, and maybe what we have already developed (and continue to develop and post on our website) is all that you need. The QuestBot is used by teachers across the United States and other countries such as Japan, Taiwan, Mexico, South Korea and Peru. Our hope is that we can foster a collaborative community of lesson and activity ideas using the QuestBot in many different curriculum contexts. Have a success story using the QuestBot? Send it our way and we'll post it on our website. Have an idea for using the QuestBot? Send it our way and we'll develop it with you so that each concept plan has been tested by real kids in real classrooms.

Professional development

We also provide professional development at conferences and in the schools for teachers and administrators in how to use the QuestBot in the classroom or Makerspace so that the QuestBot meets multiple uses for the teacher and school. We focus on grade level, grade span, and content area. Mathematics for grade 3? Sure. Physics applications for high school? No problem. An application of coding structure? Of course.

Security and Privacy Issues

We are excited to bring the QuestBot to the classroom, and we encourage teachers to help drive interesting lesson concepts for their students. We want to help establish and grow a connective community of QuestBot users and learners that utilize different media programs. That said, we are committed to teacher and student safety.

Security

The QuestBot and QuestController are not connected to the Internet. Therefore, we don't have to worry about hacking or students accessing inappropriate content. However, teachers and/or students might want to upload videos of the class using the QuestBot to solve problems. In these cases we encourage teachers to remind their students about internet privacy, permission from parents to participate in these activities, and to exercise professional standards in publishing.

Privacy

Anything submitted to us for lesson concept review or community contribution is reviewed for inappropriate content, bias, and adherence to the professional standards in publishing. Personal information of children (photos, video, audio, contact info, etc.) or content that is irrelevant, sexual, dangerous, repulsive, hateful, abusive, spam, misleading, content that infringes third parties' rights, or violates the QuestBotics Agreements will not be tolerated. We reserve the right to reject or remove any contribution for any reason.

Conclusion

We are excited to join you in the QuestBot journey to be a roboticist! The blue robot will be a hit in your classroom, and students will enjoy making the QuestBot move, all while reinforcing their skills in math, logic, communication, and teamwork. We are here for you, and can't wait to hear from you about the successes your students have with the QuestBot. We are always adding new lesson ideas to our website ([QuestBotics.com/courses](https://questbotics.com/courses)), so feel free to browse and find something that you can use tomorrow in your classroom.

Resources

Connect with QuestBotics by:

QuestBotics: <https://QuestBotics.com/courses/>

Twitter: <https://twitter.com/QuestBotics>

Instagram: <https://www.instagram.com/QuestBotics/>

Facebook: <https://www.facebook.com/QuestBots>

References

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- [5] Common Core Standards for Mathematical Practice (2018). Retrieved from <http://www.corestandards.org/Math/Practice/>.