

# Build, Break, Learn: Collaborative Debugging with VEX GO


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# Workshop Goals

- **Learn about troubleshooting techniques and debugging strategies**
- **Practice debugging GO projects together**
- **Create your own bugged projects**
- **Learn how bugs in a project can be powerful learning tools**

# The VEX Continuum



**VEX 123**  
Coding Starts Early

Ages 4+



**VEX GO**  
STEM Starts Early

Ages 8+



**VEX AIM**  
Real World Coding

Ages 8+



**VEX IQ**  
Applied STEM Learning

Ages 11+



**VEX EXP**  
Real World STEM for Classrooms

Ages 14+



**VEX VS**  
Real World STEM for Competition

Ages 14+



**VEX CTE**  
Workforce Readiness

Ages 14+



**VEX AIR**  
STEM Skills Take Flight

Ages 14+



**VEX CODE VR**  
Virtual Robot Coding

Ages 8+

## A Paradigm Shift...

**“ The idea of designing bugs for learning  
—or *debugging by design*—  
makes learners agents of their own  
learning and, more importantly, of making  
and solving mistakes.”**

-Yasmin B. Kafai-

# A Paradigm Shift...

**“...bugs not as  
*accidents to be solved*  
but as objects-to-think-with and  
objects-to-share-with.”**

*Fields, Deborah A., et al. "Debugging by design: A constructionist approach to high school students' crafting and coding of electronic textiles as failure artefacts." British Journal of Educational Technology 52.3 (2021): 1078-1092.*

“Mischievousness and fun as well as empathy and sensitivity...were **productive emotions** exhibited during bug design, and **shifts away from frustration to increased comfort, security, and a sense of control with bugs** were expressed retrospectively weeks afterward.”

Fields, Deborah A., et al. "Debugging by design: A constructionist approach to high school students' crafting and coding of electronic textiles as failure artefacts." *British Journal of Educational Technology* 52.3 (2021): 1078-1092.

## 21st-Century Skills

### Foundational Literacies

How students apply core skills to everyday tasks



1. Literacy



2. Numeracy



3. Scientific literacy



4. ICT literacy



5. Financial literacy



6. Cultural and civic literacy

### Competencies

How students approach complex challenges



7. Critical thinking/  
problem-solving



8. Creativity



9. Communication



10. Collaboration

### Character Qualities

How students approach their changing environment



11. Curiosity



12. Initiative



13. Persistence/  
grit



14. Adaptability



15. Leadership



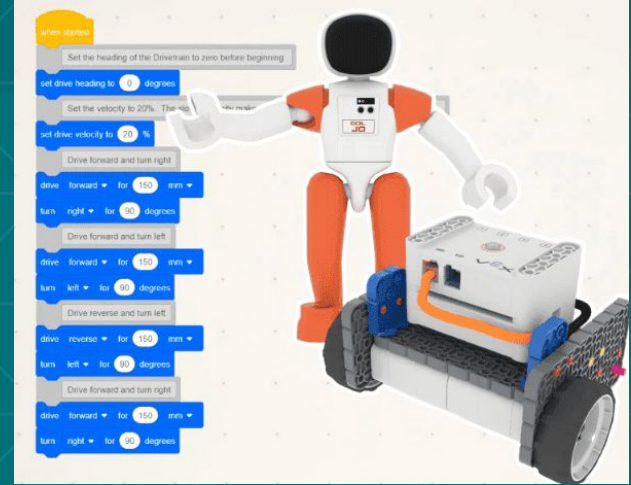
16. Social and cultural awareness

Lifelong Learning

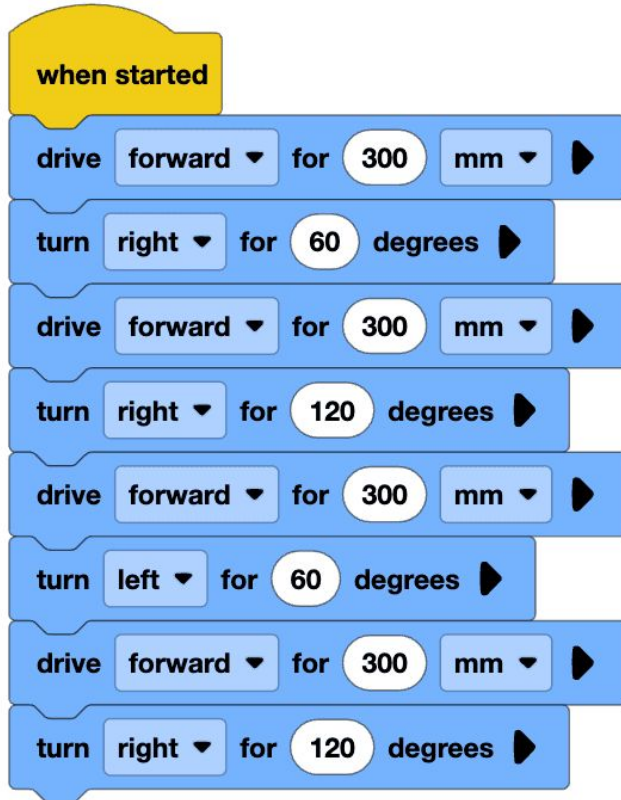
**Bugs support  
creativity,  
resilience,  
and learning.**

# What do you need to know to debug a project?

- What is the intention of the project?
- How are you trying to do that?
- Where does it go wrong?

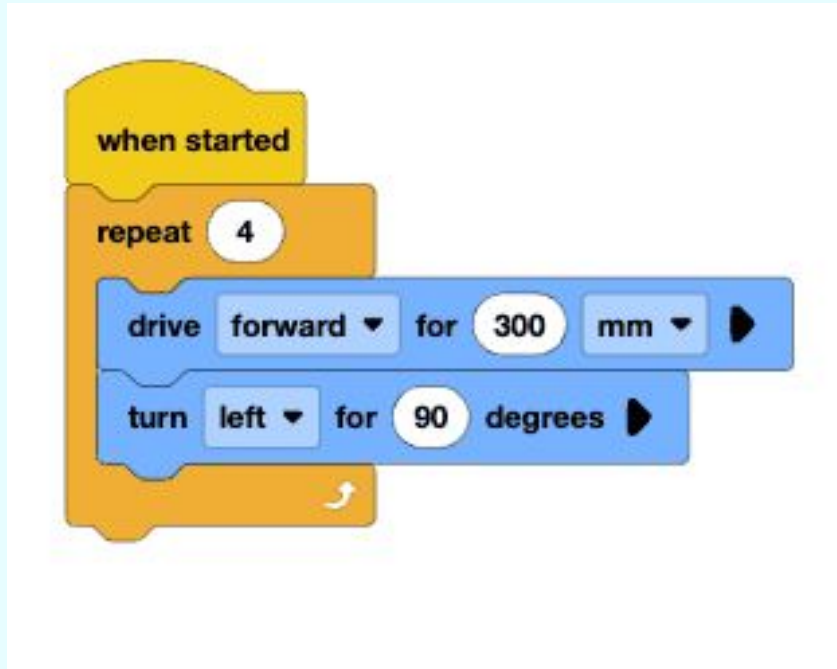


# Find the Bug



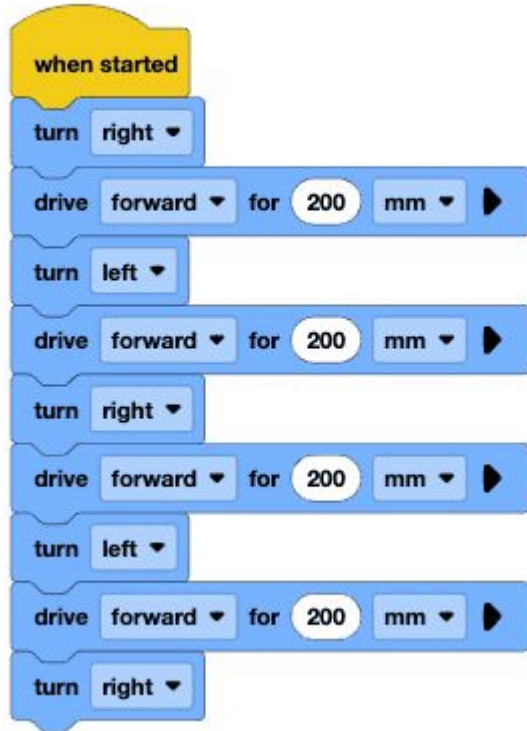
The robot should drive in a diamond shape, but it does not.

# Find the Bug



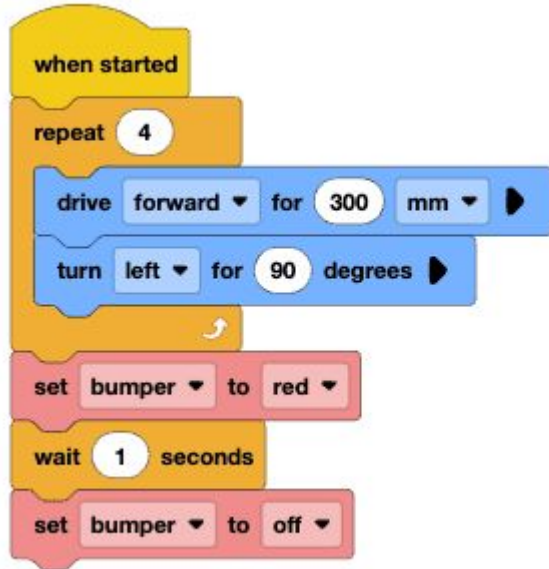
This project should make the robot drive in a square shape, but instead the robot drives in unexpected directions!

# Find the Bug



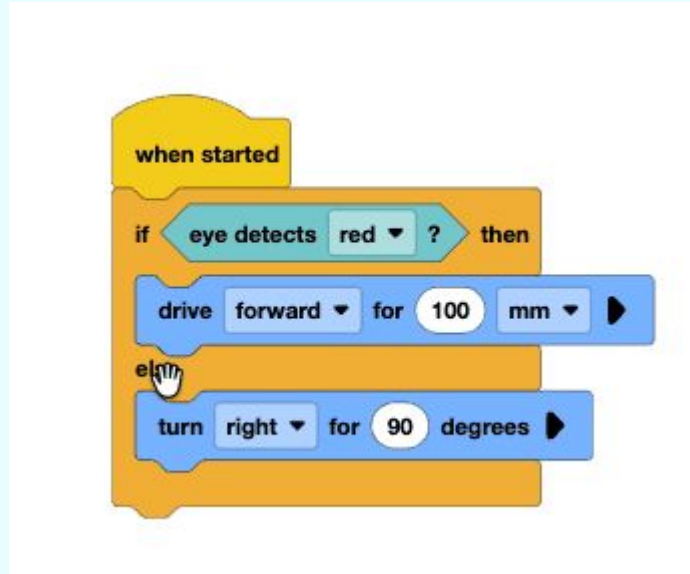
This project should make the robot drive in a zig zag pattern, but instead it just spins to the right.

# Find the Bug



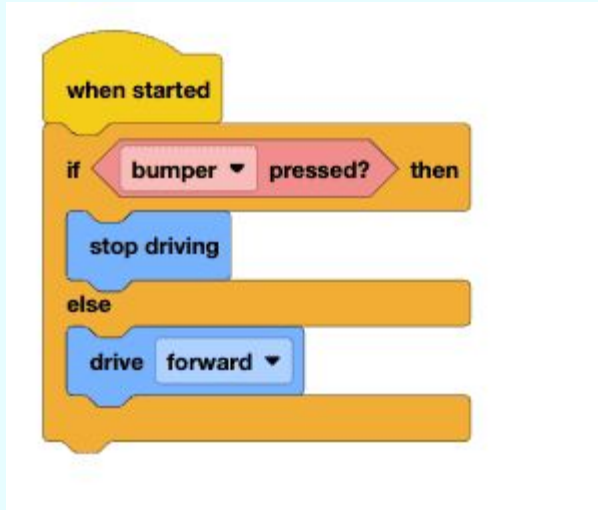
This project should make the robot drive in square, and turn the LED Bumper to red at each corner. Instead, the bumper only glows red once.

# Find the Bug



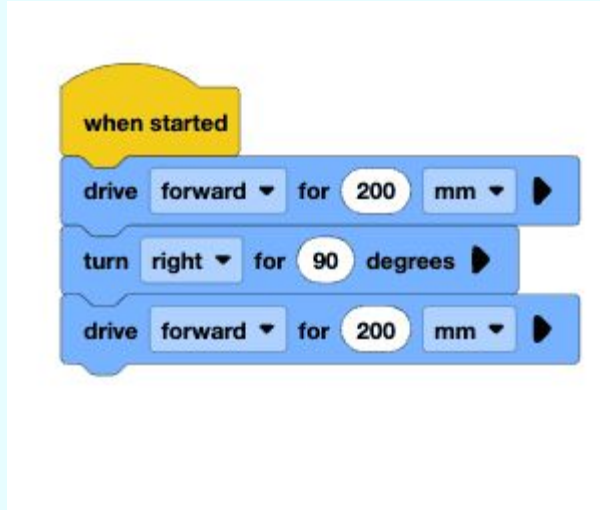
This project should make the robot turn right if the eye sensor detects red, and drive forward if it does not.

# Find the Bug



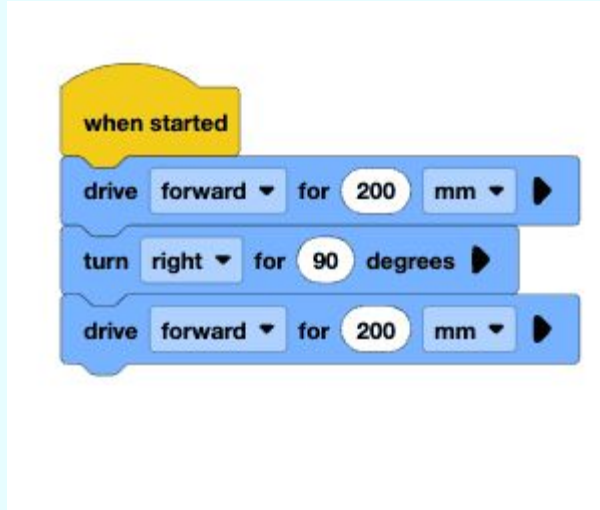
The robot should drive forward when the bumper is pressed, but it doesn't move.

# Find the Bug



In this project, the robot is supposed to drive forward, turn right, and stop just before the Field wall. It works sometimes, but not always.

# Find the Bug



In this project, the robot is supposed to drive forward, turn right, and stop just before the Field wall, but instead it veers to the left.

# Find the Bug

The screenshot shows the VEXcode IDE interface. The top menu bar includes 'GO', 'File', 'Tools', 'TUTORIALS', and 'BUILDS'. The main workspace displays a project titled 'Using the LED Bumper'. The code block is as follows:

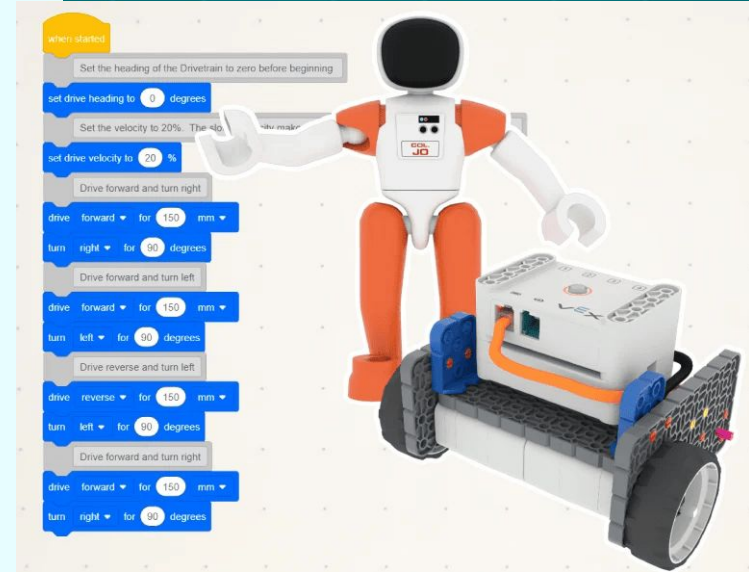
```
when started
  Repeat color changes 10 times
    repeat 10
      set bumper to red
      wait 1 seconds
      set bumper to green
      wait 1 seconds
      set bumper to off
      wait 1 seconds
```

The left sidebar shows the 'Drivetrain' category with various action blocks. The right sidebar shows the project description and configuration.

The LED bumper should flash a color pattern from green, to red to blue, but it doesn't do anything.

# What did you notice?



- How was this experience for you?
- How does it feel when you find a bug?
- Can we think about bugs in the same ways we think about challenges?







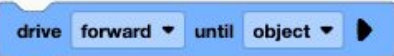








# Bug “Buckets”

-

# Your Turn!

Code  Drive 

## Drivetrain Drivetrain - Actions

-  Drivetrain
  -  Inertial
    - 
    - 
    - 
  -  Console
    - 
  -  Logic
    - 
  -  Switch
    - 
    - 
  -  stop driving

```
when started
  if bumper pressed? then
    drive reverse for 100 mm
    turn right for 90 degrees
  else
    drive forward
```

Project: Bumper Press

Description: Drive forward until the LED Bumper is pressed, then drive in reverse and turn.

# Debugging Check-in

- What bugs did you find?
- How did you fix them?
- How did debugging feel for you?

# Stump the Software Team!

# Create your own bugged project to try to stump our VEXcode Experts!

- **Create a project with 2-3 bugs in it**
- Think *creatively* about the bugs you make
- Use one of the projects we've talked about or create your own

# Bring this experience to your students

- **Making bugs demonstrates understanding**
  - You have to know the concept in order to create a bug with it
- **Intention is important**
  - Creative ideas are good – execution is the problem
  - Have to know what the coder was trying to do, to debug intentionally

# Bring this experience to your students

- **There is more than 1 way to fix a bug**
  - Multiple solutions to the same problem helps us all learn
- **Creating bugs builds creativity and resilience**
  - The more you deal with bugs in non-threatening ways, the more persistent and comfortable you become in solving them

# Stay Connected

## Let's Connect!

Tag me in the **VEX PD+ Community!**  
@Aimee\_DeFoe

**Want to Learn More? Join VEX PD+ as an All-Access Member!**

- Schedule a **1-on-1 Session** in VEX PD+