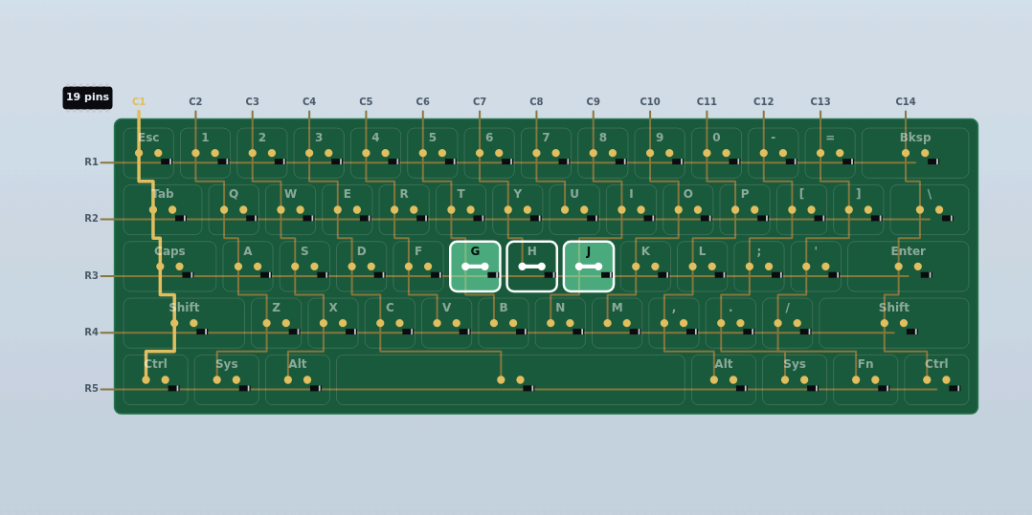
mytekDev

Keyboard Builder: Find What Broke

Grades 7-10 · 45 minutes

Computer science · Technology



Slides, rubric and answer key **Print and go** **No student accounts**

Chromebook friendly

What's included

- A one-page overview: objectives, essential question, vocabulary, standards and assessment
- A ten-minute walkthrough to rehearse before class, and background in plain words for the teacher
- A 45-minute lesson sequence: warm-up, direct instruction, guided practice, independent practice, closure
- Slides for the board: a PowerPoint file that also opens in Google Slides
- A student worksheet with a QR code and a repair log for three keyboards
- A 3-question exit ticket, two to a page, with an answer key
- A rubric: 3 criteria, 4 levels, scored out of 12
- Differentiation for English learners, students with IEPs or 504 plans, and students who need more support or more challenge
- Cross-curricular extensions, and notes for teaching it in grades 5 and 6 and in grades 11 and 12
- Standards: CSTA 2017

Keyboard Builder: Find What Broke

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Three customers bring in keyboards that stopped working. One has a dead H key, one lost T and the keys above and below it on the same day, and one types 8 when 7 is pressed. Students test keys on the Matrix bench, read the pattern the dead keys make, and choose one repair: a switch, a column line or a row line. A wrong repair is a part replaced for nothing, and the customer says so. The third fault has no broken part at all: the keymap was changed.

At a glance

ESSENTIAL QUESTION

How can you tell what is broken before you replace anything?

OBJECTIVES

Students will be able to:

- test a device to find which parts work and which do not before repairing it
- match a pattern of dead keys to its cause: one switch, or one line of the matrix
- tell a hardware fault from a settings fault
- write troubleshooting steps another person could follow

VOCABULARY

Symptom, Fault, Switch, Column line, Keymap

STANDARDS

2-CS-03, 3A-CS-03

TIME AND MATERIALS

45 minutes, grades 7-10.

- One computer or Chromebook per student
- A projector
- The worksheet and exit ticket, one copy each per student
- The rubric, one copy per student if you grade the work

PREP

Make copies of the worksheet and exit ticket. Before class, open mytekdev.com/try/keyboardbuilder?lesson=find-the-dead-key&ref=tpt-keyboardbuilder-3 once on a student computer: it opens with the order My H does nothing in hand, and checks that your school's filter allows the app. Run it yourself, about ten minutes: open the Matrix bench, click G and J (they light), then H (it does not), and press Swap its switch. Then take A column of keys died at once: T, 5, G and B are dead and their neighbors are fine; press Redo its column line. Then take I press 7 and get 8 and put the 7 key back on the Keymap bench.

ASSESSMENT

- Formative: the questions under What to look for, asked while students work, and the exit ticket (answer key included).
- Summative: the worksheet, scored with the rubric.

TECHNOLOGY AND PRIVACY

Runs in any browser, Chromebooks included, with nothing to install. Students need no account and no email: the link works signed out, and nothing they do is stored on our server unless they choose to save. Every key on the drawn keyboard can be clicked, so no lesson needs a key a Chromebook does not have. Key sounds start off, and you can lock them off under Setup.

Lesson sequence

MINUTES	STAGE	WHAT YOU DO	WHAT STUDENTS DO
0 to 5	**Warm-up** Hook	Show the title, essential question and Today I can slides (about 1 minute). Then the warm-up: a friend's keyboard is broken, what do you ask or try first? Sort the answers into test and replace.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open and read the customer's words aloud. Open the Matrix bench and click G and J: both light. Click H: nothing. Point at the three repair buttons and the line that names the last key touched, which is the key a repair is made on. Do not press one yet. Ask the class to vote, then let them find out. **It's working when:** H shares a row wire with G and J and a column wire with the keys above and below it. If its neighbors in the row and in the column all work, both lines are fine, and the only thing left is the switch under H.	Watch, vote, and fill in the vocabulary on the worksheet.
12 to 24	**Guided practice (We do)** Two repairs	Students open the link or scan the QR code. A short guide walks them through the dead key and the dead column. After each, ask: what did you test, and what did it rule out? **Watch for:** A click on a held key lets it go and does not count as a touch: students who want to pick a key that is already down press Let go of every key and click it again. And students who press repair buttons until one works. Each wrong repair draws a line from the customer, such as "A new switch, and it still does not light. One switch cannot stop a whole column." Have them write that line in the log.	Follow the guide. Fill in the first two rows of the repair log.
24 to 38	**Independent practice (You do)** 7 types 8	Students take the order I press 7 and get 8, find the fault, and put it right. Then they write three troubleshooting steps a friend could follow for any keyboard. Walk the room with the What to look for questions. **If they ask:** "The switch under 7 works. So where else could the 8 be coming from?" The third board	Close the third order, finish the log and write the steps.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students read their troubleshooting steps aloud, and the class checks them against the three boards. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/keyboardbuilder?lesson=find-the-dead-key&ref=tpt-keyboardbuilder-3. A short guide opens over the app. A customer's board is on the bench, and its diodes are on. Open the Matrix bench. Under the card is a

box named Repair the customer's board, with three buttons that stay gray until a key has been clicked.

1. **One dead key.** Click G and J: both light. Click H. It does not light, and the box reads "Last key touched: H (row 3, column 7)". A repair is made on that key, the last one pressed down. Press Swap its switch. The order closes: "It was the switch under H. On a real board, look for a bent pin before buying a new switch."
2. **A wrong repair.** If you press Redo its row line with H last touched, the customer says "You redid the row line. The other keys in that row were working, so the line was fine." If you repair a key that works: "That key was working. Find one that does not light."
3. **A dead column.** Take the order A column of keys died at once. Click R and Y: they light. T, 5, G and B do not. With any of those four pressed last, press Redo its column line. The order closes: "It was the column line. Every dead key was on it, and the keys beside them were fine." Swapping one switch here draws "A new switch, and it still does not light. One switch cannot stop a whole column."
4. **7 types 8.** Take the order I press 7 and get 8. The app moves to the Keymap bench. Click the 7 key: the line under the board reads "7 on layer 0 sends 8." Click 7 under Numbers. The order closes: "Nothing was broken: the keymap had been changed."

> The moment that lands is the third board. Students who have just replaced two parts go looking for a third, and there is none.

Background for the teacher

Troubleshooting is the same on a keyboard as on anything else: find out what works, find out what does not, and ask what the failures share. A keyboard makes the sharing easy to see, because its keys are wired in rows and columns. One dead key whose row neighbors and column neighbors all work can only be its own switch. Several dead keys in a line share a wire. A key that works but sends the wrong thing is not a hardware fault at all.

On a real board that can be opened, a dead switch is often a bent pin that missed its socket, and reseating it costs nothing. A dead column is usually a broken solder joint or a cracked trace on the circuit board, and is a harder repair than the app's single button suggests. A key that sends the wrong character is most often a changed keymap on a programmable keyboard, or the computer's keyboard layout setting.

The app counts each wrong repair as a part replaced for nothing and has the customer say why it did not help. Those lines are worth reading aloud: each one names the test the student skipped.

What to look for

Ask these while students work. A student who has understood the lesson can answer them without help:

- Which keys did you test before you repaired anything, and why those?
- G and J worked. What did that rule out?
- What do T, 5, G and B share that R and Y do not?
- How did you know the 7 key's switch was fine?

- Which of the three faults would cost nothing to fix on a real keyboard?

> The second question is the real test: a student who says the row line must be fine, because other keys on it work, is reasoning from evidence.

Cross-curricular extensions

- English: write the message you would send the third customer, explaining what was wrong and why no part was needed.
- Science: a doctor also goes from symptoms to a cause. Write two ways fixing a keyboard is like that, and one way it is not.
- Careers: find out what a help desk technician does in a day, and which of today's steps they would use.
- At home: with an adult, find a device that is not working well and list three things you could test before replacing anything.

Vocabulary

Symptom	What the user notices is wrong, such as "my H does nothing".
Fault	The one thing that is really wrong and causes the symptom.
Switch	The part under each cap that closes when the key is pressed.
Column line	The wire that joins every switch in one column of the matrix to the controller.
Keymap	The table inside the keyboard that says which code each key sends.

Differentiation

ENGLISH LEARNERS

- Keep the vocabulary slide up, and point at the screen as you say each word: the lit keys, the gold wires and the line under the board carry the meaning.
- Pair each learner with a partner; a key that lights and a key that does not are the same in every language.
- Accept the repair log as key names and the repair button's words copied from the screen.

STUDENTS WITH IEPS OR 504 PLANS

- Pair students for the independent part, one at the app and one filling in the log.
- Zoom the browser to 125%; the board and the repair buttons stay readable.
- Allow the first two repairs alone, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "The dead keys all share the same ___, and the keys beside them ___."

STUDENTS READY FOR MORE

- On purpose, try the wrong repair first on a fresh copy of the lesson and collect what the customer says each time. What does each line teach?

- A check-in after the first repair: every student can say why G and J were worth clicking.
- For the third board, give the hint that the fault is on the Keymap bench, on layer 0.
- Set the level to High school and explain why one broken column line stops four keys but one broken switch stops one.
- Write a fourth repair order for someone else to solve: the symptom the customer would report, and the pattern a tester would see.

Adapting for other grades

Younger students: In grades 5 and 6, leave the level on Middle school and do the guide together on the projector, with pairs sharing a computer, one clicking and one recording. Skip the third rubric row; total 8, and 6 meets the objectives. Do the third board together: open the Keymap bench on the projector and ask who can spot the key that sends the wrong thing.

Older students: In grades 11 and 12, have students turn their three steps into a one-page troubleshooting guide for a help desk: the questions to ask the user, the tests in order from cheapest to dearest, and what each result rules out. Compare guides and merge the best into one.

Student worksheet

Name: _____ Date: _____

Open the app: scan the QR code, or go to mytekdev.com/try/keyboardbuilder?lesson=find-the-dead-key

Essential question: How can you tell what is broken before you replace anything?

Warm-up: A friend says "my keyboard is broken". What would you ask or try first? _____

1. **Vocabulary.** Symptom, fault, switch, column line, keymap: write each in your own words.

2. **The repair log.** For each board write: what the customer said, which keys you tested, what the dead keys shared, and the repair you chose. If the customer said a repair was wrong, copy what they said.

3. **Your steps.** Write three troubleshooting steps a friend could follow for any keyboard.

1. One key is dead and every key around it works. What is broken, and how do you know it is not a wire?

2. The third keyboard had no broken part. What was wrong, and where did you find it?

Exit ticket

Name: _____

1. Before replacing a part, a good troubleshooter first (A) buys a new keyboard (B) tests what works and what does not (C) replaces the cheapest part

2. Four keys in one column stop working on the same day. The most likely fault is (A) four bad switches (B) the wire those keys share (C) the keymap

3. A key works but types the wrong character. Name one thing to check that is not a broken part.

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Exit ticket

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3. A key works but types the wrong character. Name one thing to check that is not a broken part.

Answer key: exit ticket

QUESTION	ANSWER	WHY
1	B	Testing shows which parts are fine, so only the part that is wrong gets replaced.
2	B	The keys share one column line. Four switches failing together is far less likely than one wire.
3	The keymap or the computer's layout setting	The switch closes and a code is sent, so the fault is in what the key is set to send or how the computer reads it.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
The repair log	All three boards, each with the symptom, what was tested, the pattern found and the repair chosen.	All three repairs made, with the tests written for at least two.	One or two repairs recorded.	Nothing recorded.
Reading the pattern	Says one dead key with working neighbors is a switch, a line of dead keys is the wire they share, and a wrong character with a working switch is the keymap.	Explains two of the three faults.	Names the repairs with no reasons.	No answer.
The troubleshooting steps	Three steps another person could follow: test first, look for what the failures share, change one thing and test again.	Steps that include testing before repairing.	Steps that only say what to replace.	No steps.

Total: ____ / 12. A score of 9 or more meets the objectives.

Standards

Troubleshooting standards from CSTA 2017. Students find three faults by testing, and write steps that someone else could follow.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
CSTA 2017	**2-CS-03**	6-8	Systematically identify and fix problems with computing devices and their components.	Students test keys, use the pattern of the dead ones to find the faulty part, repair only that, and check the board again.
CSTA 2017	**3A-CS-03**	9-10	Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.	Students write three troubleshooting steps for any keyboard and check them against the three boards they repaired.

Checked November 2026 against: CSTA 2017 K-12 standards progression chart.

Optional: save student work in a free class

The whole lesson runs at the link on the worksheet, with no accounts and no sign-up.

To keep students' work, and see it all in one place, make a free class. It takes about ten minutes, once, and covers every lesson in this series: mytekdev.com/tools/class-setup

Students in a class open mytekdev.com/tools/keyboard-builder/lessons/find-the-dead-key/start instead of the worksheet link. Each one gets their own copy of the starter, and the same link reopens it next time.

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