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Keyboard Builder: Build to the Order

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 build sheet for four customers
- 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 and CSTA 2026

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Four customers each describe how they use a keyboard and how much they have to spend. Students build a board for each one from five sizes, six switches, four cases and two keycap plastics, and the customer answers the way a person would, one complaint at a time. The backpack board closes at $80.20 of $85. The school store board has exactly one build that fits its $125. Students record each build and say which need drove each choice.

At a glance

ESSENTIAL QUESTION

How do you design a device for one particular person instead of for yourself?

OBJECTIVES

Students will be able to:

- turn what a user says they do into requirements for a device
- choose the size, switch and case of a keyboard to meet a user's needs inside a budget
- explain a trade-off: what each choice gave the user and what it cost
- justify a design with the user's own words

VOCABULARY

User, Requirement, Constraint, Trade-off, Tactile switch

STANDARDS

2-CS-01, HS-SYS-HW-30

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=build-to-the-order&ref=tpt-keyboardbuilder-4 once on a student computer: it opens on the Build bench with the order One for the backpack in hand, and checks that your school's filter allows the app. Run it yourself, about ten minutes, and note that the board stays as the last customer left it: click Clear acrylic under Case ($80.20, order closed). Take The school store: Full size, Tactile, and the case back to Plastic ($123.20). Take A small desk: 75 percent ($101.20). Take Loud and long lasting:

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.

Clicky, PBT plastic, and a smaller size
(65 percent is $101.40).

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: the counter and the backpack. Write each person's needs in a column.	Answer the warm-up on the worksheet.
5 to 12	**Direct instruction (I do)** Model it	Project the app with the starter open. Press Exploded view and name the five layers, then press it again. Read the customer's order aloud and underline the needs: small, no click, clear case, $85. Read what they say about the board now. Change the size to Full size and read what they say, then put it back. **It's working when:** The price is the kit for that size, plus a switch for every key, plus the keycaps, plus any extras. A bigger board costs more twice: a dearer kit and more switches.	Watch, and fill in the vocabulary on the worksheet.
12 to 24	**Guided practice (We do)** Two orders	Students open the link or scan the QR code. A short guide walks them through the backpack order and the school store order. After each, ask: which words in the order decided the size? The switch? **Watch for:** Students who build the board they would want. The customer answers one complaint at a time; have them read the complaint aloud and find the words in the order it comes from.	Follow the guide. Fill in the first two rows of the build sheet.
24 to 38	**Independent practice (You do)** Two more customers	Students build for A small desk and for Loud and long lasting, recording the size, switch, case, keycap plastic and price of each. Walk the room with the What to look for questions. **If they ask:** "Tenkeyless has the arrows and the F keys too. Why did the customer turn it down?" The small desk	Close both orders, finish the build sheet and answer the questions.
38 to 45	**Closure** Showcase and exit ticket	Show the Showcase slide. Two students name the hardest customer and what they gave up. Compare prices for the same order across the room: more than one build can be right. Hand out the exit ticket.	Answer the exit ticket.

Before you teach: a ten-minute walkthrough

Open mytekdev.com/try/keyboardbuilder?lesson=build-to-the-order&ref=tpt-keyboardbuilder-4. A short guide opens over the app. The keyboard on the Build bench is the plain one: 60 percent, light linear switches, a black plastic case, $70.20. The customer's words are on the right, and under them what they say about the board as it is now.

1. **One for the backpack.** Small, no clicking, a clear case, $85. They say "I cannot see inside this case." Click Clear acrylic: $80.20, and the order closes. Tactile switches would feel nice and come to $86.30: "That comes to

$86.30. I have $85."

2. **The school store.** A number pad, a key they can feel go in without a click, $125. The board is still the last customer's. Only Full size has the number pad. With light linear switches they say "I cannot feel when the key has gone in." With Tactile they say "That comes to $133.20. I have $125.": the clear case is still on. Put the case back to Plastic: $123.20, and the order closes. It is the only build that does: any extra goes over.
3. **A small desk.** Arrow keys, F keys, 32 cm of room, $105. Tenkeyless has both and they say "That is 36.0 cm wide. I have room for 32." 75 percent is 31.7 cm: $101.20 with the tactile switches still in, or $92.80 with Light linear.
4. **Loud and long lasting.** A click on every key and the keycap plastic that wears longer, $105. On the 75 percent board, Clicky and PBT plastic come to $116.20, over the budget. The customer never asked for a size: 65 percent is $101.40 and 60 percent is $91.30.

> The moment that lands is the school store. The clear case the first customer wanted is still on the board, the price passes $125, and students have to notice that this customer never asked for it.

Background for the teacher

The sizes are the real ones. A full-size keyboard has 104 keys. Tenkeyless drops the number pad, 75 percent packs the same keys tighter, 65 percent drops the F keys, and 60 percent drops the arrows as well, down to 61 keys. Nothing is lost for good: on a small board the missing keys move to a second layer. The switches are the three real kinds. A linear switch is smooth all the way down, a tactile switch has a bump you feel just before the key is sent, and a clicky switch adds a sound to the bump.

The prices are round numbers typical of 2026, not a store's. No brand is named and there is nothing to buy. Where the app repeats what keyboard builders say about sound, about foam or about a metal case, it says "builders say", because nobody has measured it. And the evidence that any switch makes a person type faster is thin, so the app never says one does.

What the lesson practices is older than keyboards: listening to what a person does all day, turning that into requirements and limits, and defending each choice with their words instead of your own taste.

What to look for

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

- Which words in the order told you the size?
- Why not a clicky switch for the school store?
- What did you add that the customer did not ask for, and could they afford it?
- Two people closed the same order with different boards. Can both be right?
- Which board would you want yourself, and which customer is that most like?

> The third question is the real test: a student who took something off because the customer did not ask for it has stopped designing for themselves.

Cross-curricular extensions

- Math: the full-size board has 104 switches at $0.30 each. What do the switches cost, and what share of $123.20 is that?
- Math: a 75 percent board is 31.7 cm wide and a tenkeyless is 36.0 cm. How much desk does the smaller one save, in centimeters and as a percent?
- English: write the order a customer would give for the keyboard you would want, in four sentences, with a budget.
- Art: on the Build bench, choose the three cap colors for one of the customers and say why they suit that person.

Vocabulary

User	The person a device is made for.
Requirement	Something the design must do or have for that user.
Constraint	A limit on the design, such as a budget or the width of a desk.
Trade-off	Giving up one good thing to get another.
Tactile switch	A switch with a small bump you can feel just before the key is sent, and no click.

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; the board changes on screen with every choice, and the price is a number.
- Accept the build sheet as part names and prices 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 build sheet.
- Zoom the browser to 125%; the board and the price card stay readable.
- Allow three customers instead of four, where the IEP allows a modified assignment.

STUDENTS WHO NEED MORE SUPPORT

- A sentence starter: "I chose ___ because the customer said ___."
- A check-in after the guide: every student has two closed orders and two prices before anyone moves

STUDENTS READY FOR MORE

- For A small desk, find the cheapest build that closes the order and the dearest one. What did the extra money buy the customer?

on, and can say why the clear case came off.

- Give a highlighter for the order text: one color for needs, another for limits.
- Open the Switch bench and compare Tactile with Clicky. What is the same about the two lines, and where is the click?
- Write a fifth order for a real person you know: what they do, what they need, and a budget. Trade orders with someone and build theirs.

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 school store order together and add up its price on the board: the kit, the switches and the keycaps.

Older students: In grades 11 and 12, have students write a one-paragraph design rationale for one customer, naming each requirement, the part that meets it and the trade-off accepted. Then open the Matrix bench on the full-size board: it needs 27 pins and the controller has 26, a constraint no customer asked about.

Student worksheet

Name: _____ Date: _____

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

Essential question: How do you design a device for one particular person instead of for yourself?

Warm-up: Name one thing a person typing at a counter needs from a keyboard that a person carrying one in a backpack does not. _____

1. **Vocabulary.** User, requirement, constraint, trade-off, tactile switch: write each in your own words.

2. **The build sheet.** For each customer (the backpack, the school store, a small desk, loud and long lasting) write: the size, the switch, the case, the keycap plastic, the price, and their budget.

1. Pick one customer. Which words in their order decided the size, and which decided the switch?

2. Name one thing you wanted to add to a board and took off again. What did it cost, and why did it have to go?

Keyboard Builder: Build to the Order

Exit ticket

Name: _____

1. A requirement is (A) something the design must do for its user (B) the dearest part (C) the color of the case

2. The school store customer turned down a clicky switch because (A) it costs more (B) they asked for no click at the counter (C) it has no bump

3. Name one trade-off you made today: what the customer got, and what it cost.

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Exit ticket

Name: _____

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2. The school store customer turned down a clicky switch because (A) it costs more (B) they asked for no click at the counter (C) it has no bump

3. Name one trade-off you made today: what the customer got, and what it cost.

Answer key: exit ticket

QUESTION	ANSWER	WHY
1	A	Requirements come from what the user does and asks for, not from what the designer likes.
2	B	The order asked to feel each key go in without a click. A clicky switch has the bump and the click, and costs the same as a tactile one.
3	Any real one	For example: the small desk got arrows and F keys in 31.7 cm by giving up the number pad; or the school store board came in under $125 by going back to the plain plastic case.

Rubric

Score each row from 1 to 4.

Name: _____

CRITERIA	4 EXCEEDS	3 MEETS	2 APPROACHING	1 BEGINNING
The build sheet	All four customers, each with the size, switch, case, keycap plastic and price, and every order closed.	At least three orders closed and recorded.	One or two orders recorded.	Nothing recorded.
From needs to parts	For each customer, names the words in the order that decided the size and the switch.	Links a need to a part for at least two customers.	Lists parts with no link to the customer.	No answer.
The trade-off	Names what one choice gave the customer and what it cost them, with numbers from the screen.	Names a trade-off with no numbers.	Says one board is better, with no reason.	No answer.

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

Standards

Computing systems standards from both CSTA sets: 2017, which many state standards are still based on, and the 2026 standards that replace them. Students fit a computing device to the way named people use it.

FRAMEWORK	CODE	GRADES	STANDARD	HOW THE LESSON MEETS IT
CSTA 2017	**2-CS-01**	6-8	Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.	Students read how four people use a keyboard and change its size, switches and case to suit each one, justifying every change with the user's words.
CSTA 2026	**HS-SYS-HW-30**	9-12	Demonstrate the capabilities and limitations of a physical or simulated computing device to address a task or problem.	Students weigh what each simulated board can and cannot do for a task: no arrows on the smallest, no room on the desk for the largest.

Checked November 2026 against: CSTA 2017 K-12 standards progression chart, CSTA 2026 high school foundational standards.

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/build-to-the-order/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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