

Beyond the Screen

The impact of program design



Who wins, who loses?

PAUSE AND TRY

A study app rewards a "streak" for every day in a row you open it.

WHO MIGHT IT HELP?

WHO MIGHT IT HARM, AND HOW?

Talk with a partner first, then write one idea in each box.

By the end of class you can...

1

Describe a program's impacts on society, the economy, and culture, both helpful and harmful.

2

Explain how a program can cause harm beyond its intended use.

3

Explain system reliability and what "stated conditions" means.

4

Choose test cases: typical, boundary, and special.

5

Decide when code can be reused: open source, or permission first.

A large white square with rounded corners, tilted slightly to the right, containing a large teal number '1'.

1

PART 1

Programs affect people

Society, economy, culture: help and harm



Programs have impacts on **society**, the **economy**, and **culture**. Those impacts can be **beneficial and harmful**, often for different groups.

A MADE-UP SELF-CHECKOUT APP, QUICKCART

Area	Helps	Harms
Society	Shoppers in a hurry wait in shorter lines	Shoppers who struggle with screens get less help
Economy	The store spends less on each sale	Cashiers lose working hours
Culture	Shoppers can pick the app's language	Fewer everyday chats with familiar cashiers

Harm beyond the intended use



A program made to fill a need can have **unintended harmful effects** beyond its intended use, even when everyone meant well.

Step	What happens with a made-up running app, RunMap	Intended?
1	Runners share a map of each run so friends can cheer them on.	Yes
2	Most runs start and end at the runner's front door.	Not planned
3	Anyone who sees the maps can work out where runners live.	No
4	A stranger can learn when a runner leaves home, and for how long.	No: a safety harm

"I didn't mean it" doesn't erase the harm



An effect counts as your program's impact whether or not you planned it. **Ask how it could be used beyond its purpose.**

STOPS TOO EARLY

"RunMap helps people stay active. We never meant for anyone to be tracked, so that's not our problem."

THINKS IT THROUGH

"RunMap helps people stay active. It could also reveal where runners live, so we'll hide the start and end of every map."

Spot the unintended harm

PAUSE AND TRY

A homework app gives 1 point per problem answered, right or wrong.

1. What is the intended use of the points?
2. Name one unintended harmful effect.
3. Who is harmed?

A large, bold, teal-colored number '2' is centered within a white rounded square that has a slight 3D effect and a shadow.

PART 2

Reliable programs

Reliable under its stated conditions



System reliability: the program performs its tasks as expected, **under stated conditions**, without failure.

BUSBUZZ PROMISES: ARRIVAL TIMES FOR EVERY STOP IN THE CITY, WHILE BUSES ARE RUNNING

Situation	Inside the promise?	Reliability failure?
Shows the wrong time for a downtown stop at noon	Yes	Yes
Crashes for a stop that was just added to a route	Yes	Yes
No times for a stop in another city	No	No
No times at 3 a.m., when no buses run	No	No

It worked for every name we tried...

BEFORE: A USER WITH NO NAME YET

```
String name = "";  
System.out.println("Badge for:");  
System.out.println(name.substring(0, 1));
```

OUTPUT

```
Badge for:  
Exception in thread "main" java.lang.  
StringIndexOutOfBoundsException: Range  
[0, 1) out of bounds for length 0
```

"It worked when I ran it" is not reliability. Test every situation the program promises to handle.

AFTER: HANDLE THE SPECIAL CASE

```
String name = "";  
System.out.println("Badge for:");  
if (name.length() > 0) {  
    String first = name.substring(0, 1);  
    System.out.println(first);  
} else {  
    System.out.println("(no name yet)");  
}
```

OUTPUT

```
Badge for:  
(no name yet)
```

Test with a variety of conditions

RULE: THE TEEN RATE IS FOR AGES 13 TO 17

Typical

8, 15, 40

Ordinary values from each group

Boundary

12, 13, 17, 18

At and next to where a rule changes

Special

0

Values that might need their own handling



Each kind of test catches errors the others miss. Many values that are all alike are really **one** test.

Only the boundary test fails

RULE: LIBRARY CARDS ARE FREE FOR AGES 17 OR UNDER; OTHERWISE \$5

TEST PROGRAM

```
for (int age = 16; age <= 18; age++) {  
    if (age < 17) {  
        System.out.println(age + ": free");  
    } else {  
        System.out.println(age + ": $5");  
    }  
}
```

OUTPUT

```
16: free  
17: $5  
18: $5
```

with age < 17

OUTPUT

```
16: free  
17: free  
18: $5
```

with age <= 17



A < versus <= mistake changes the result **only at the boundary**, so only a boundary test can find it.

Pick the best test set

PAUSE AND TRY

Free shipping on orders of 5 or more items. Which test set is best?

A

1, 2, 3

B

2, 4, 5, 9

C

5, 5, 5

D

6, 7, 8

Then say which kind of test case each value is.

A white rounded square with a dark teal number '3' centered inside it.

3

PART 3

Whose code is it?

Code is intellectual property



Intellectual property is something a person creates with their mind. Using someone else's code raises **legal issues** that must be settled before it goes in your program.

NOT THE QUESTION

"Could I get the code?"

Code you can see on a website, or copy from a friend, is not automatically free to use.

THE QUESTION

"Did the owner give permission?"

Look for a statement from the owner that says what you may do with it.

Two legal routes to reuse

Open source

FREE TO USE

Published so anyone may use it for free.

Comes with a license: follow its conditions.

Example: keep the authors' names in the code.

Not open source

ASK FIRST

Belongs to its owner in the ordinary way.

Get the owner's permission before using it.

Often you must purchase the right to use it.

What must the team do first?

PAUSE AND TRY

A student team building a made-up hiking app finds three pieces of code.

1

An open-source map library whose license asks users to keep the authors' names.

2

A weather data package that a company sells.

3

A copy of that weather package a classmate found and shared.

Words to know

Impact

An effect a program has on people: helpful, harmful, or both.

Unintended effect

A result the designers did not plan, sometimes harmful.

System reliability

Doing its tasks as expected under stated conditions, without failure.

Boundary case

A test value at or next to where a rule changes.

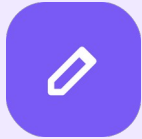
Intellectual property

A creation of the mind, like a program, owned by its creator.

Open source

Code published free to use, with a license to follow.

Before you ship it



Pick an app you use. Who could it harm? What test would you run? Whose code might it use?

SENTENCE STARTER

It could harm _____ by _____. I would test it with _____, because _____.

Next: the Beyond the Screen puzzle worksheet.