LESSON: Functions and Global Variables	Time: 45-50 minutes

Overview: This lesson should follow functions, parameters and local variables. It can be done before or after Create PT Practice #3. The lesson discusses the need for global variables and how to use them in functions. The lesson involves two examples to use for learning, and a coding activity.	Objectives: - I can define "global variable" - I can determine when a variable should be global - I can determine when a function needs a global declaration - I can use and change a global variable in a function

Standards:	CSP Framework:	Key Concepts:
2-CS-03 Systematically identify and fix problems with computing devices and their components. **2-AP-13** Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. **3A-AP-17** Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.	Computational Thinking Practices: 2.B Implement and apply an algorithm. 3.B Use abstraction to manage complexity in a program. 3.C Explain how abstraction manages complexity. 4.C Identify and correct errors in algorithms and programs, including error discovery through testing.	- A program will sometimes use a **global variable** that is defined in the main program and can be used throughout the program. - If the value of a global variable is changed in a function, it needs a **global declaration**. - A global variable can be passed to a parameter and used in selection.

Preparation:	Links:	Agenda:
Decide how students will access code. Can they use their own code or will you need to give them starter code? The lesson is designed for pair work. Do you want to do the lesson as a whole class? Do you want to do any group work?	[Instructions slide deck](#) [Assignment](#) [Display2 starter code](#) [Display3 solution](#)	- Warm-up and review (5-10 minutes) - Lesson & Examples (10-15 minutes) - Activity (15-20 minutes) - Wrap-up & Assessment (5 minutes)

Vocabulary: (function, parameter, argument, local variable: review from "Functions, parameters and local variables")
- **Global Variable:** Variables defined outside a function, and can be used anywhere in the code.

Assessment:
- Daily reflection journal or Google form
- Assignment completion
- Program completion

Teaching Guide

✅ This lesson can be taught partly with a whole class discussion for the lesson and examples, and then in pairs for the activity. Or the lesson can be in pairs. Look over the lesson and decide what is best for your students.

✅ NOTE: Students will need their code from "Functions and Global Variables". If they do not have access to the finished code for Display2, you can give them starter code (see link above).

Warm-up / Function Review (5-10 minutes)

The warm-up gives students an opportunity to review or see what they remember about functions.

💡 **Teaching tip – warm-up**
- Go through slides #2-3
- Students write their answers on their assignment. Discuss using a think-pair-share technique.
- The warm-up is really just reflection time for "Functions, parameters and local variables." It can be skipped if you don't think it is necessary. Or you can change the warm-up questions to something else.

💡 **Teaching tip – Review**
- Go through slides #4-10 slides with the whole class (or students can do it in pairs)
- This should be a review, recalling what they have already done in "Functions, parameters and local variables"
- Spend the time you need to clear up any questions or misconceptions, but don't take too long; try to get to the new material within 10 minutes.

Lesson and Examples (10-15 minutes)

💡 **Teaching tip – Lesson:**
Go through slides #11-14. During the slides you will discuss:

- Definition of a global variable
- Reasons to need and use global variables
- Examples of global variables from the missions
- An introduction to the upcoming examples
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💡 **Teaching tip – Examples:**
Go through slides #15-20. Two specific examples of using global variables are explained. Information included is:

- Code snippet showing a global variable declared and then used in a function
- How the global variable is changed in the function
- The need for a global declaration in the function
- Also, when a function uses a global variable but doesn't need a global declaration
- NOTE: If a global declaration is used when not needed, it doesn't affect the code at all. So it doesn't hurt if the student uses it even when not needed.

Students answer questions in the assignment at the end of this part of the lesson.

Activity (15-20 minutes)

🗝️The key here is to have students add a global variable as a counter to the Display2 program, and also use it as a parameter.

🗝️ **OPTIONAL:** Depending on time, the lesson can stop at slide 29, and then go to the reflection. The optional information will be included in the Create PT Practice #4. If you have class time, continue with the optional part and add a loop to meet most of the requirements for the Create PT.

💻 Students should work in pairs through the activity so they can discuss what they are doing.

💡 **Teaching tip - Activity:**
> Students will go through Slides #21-29. Students will use Display2 and add a global variable for counting the number of correct answers. If you are short on time, end here and just go to the reflection.
>
> Students answer questions in the assignment at the end of this part of the lesson.

💡 **Teaching tip - Optional:**
> Students will go through Slides #30-36. This optional activity has students add a loop to the ending function to meet a requirement for the Create PT. If your students don't have time to do it in this lesson, it is included in the next Create Practice #4 lesson.

Wrap-Up Reflection (5 minutes)
> The wrap-up is a review of global variables. If students don't have time for the review, the lesson can be completed without it. If there is time, it is a good reflection for students, but not essential. Also you can change the reflection questions as needed.
>
> Formative Assessment:
> - Daily reflection journal or Google form
> - Class discussion on what they learned about global variables
> - Assignment completion
> - Program completion
> - Exit ticket

✅ You decide what want you want students to turn in for a grade.

SUCCESS CRITERIA:
- ❏ Define global variable
- ❏ Identify where a global declaration is needed in a function
- ❏ Use a global variable in a function
- ❏ Use a global variable as a parameter and in a selection