

(<http://csmatters.org/pd-new>) P - 04

0bP - 0b100

# Python: Coaching Debugging

## Unit Programming

**Revision Date:** Jan 09, 2018

**Duration:** 60 50-minute sessions



### Lesson Summary

**Summary:** Teachers will be introduced to debugging, and practice coaching students on debugging.

**Objectives:**

- Teachers will be able to describe the main types of programming errors and the programming situations in which they commonly.
- Teachers will be able to match an erroneous piece of code with the type of error it will produce.
- Teachers will be able to coach their students on how to debug code for themselves.
- Teachers will learn about the types of errors and when they occur.
- Teachers will learn different strategies for teaching students to minimize the error in their code.
- Teachers will learn different strategies for teaching students to debug their code when errors occur.
- Teachers will practice coaching debugging specific examples of error-ridden code.

**Overview:**

1. Introduction to Debugging (15 min)
2. Coaching Debugging Activity (40 min)
3. Closure (5 min)

### Learning Objectives

### Teacher Resources

Student computer usage for this lesson is: **required**

PROG04\_Python Coaching Debugging Folder (<https://drive.google.com/open?id=0B5vAY-fhOT-iU1ZKMVFBZkNrZWs>)

## Lesson Plan

TOTAL: 60 min

### Materials/Set-up:

- Teachers will need read-only access to the Coaching Debugging (<https://drive.google.com/open?id=1hDoahlotQzUMylagMNzOJbaUzvrZVv93fuX-Uvx4hOw>) presentation as well as Internet access.
- The instructor will need to make the slips of paper needed for the matching activity (see Slide 7 description below). Each slip contains a few lines of code or an error message.
  - The slips of paper should be large enough that they can be read from most places in a typical classroom. See here ([https://drive.google.com/open?id=1K9GL\\_rUAugbZ9FZA061tECrs\\_fPKU7gEuw](https://drive.google.com/open?id=1K9GL_rUAugbZ9FZA061tECrs_fPKU7gEuw)) for images of the slips of paper.
  - See here ([https://drive.google.com/open?id=1PsQIRmLQEK3kmeGOc9HP1QR-tO1Xca5ANcvBE93\\_Dw](https://drive.google.com/open?id=1PsQIRmLQEK3kmeGOc9HP1QR-tO1Xca5ANcvBE93_Dw)) for a document containing examples of code, error messages, and how they match up.
- The instructor will also need to print out pieces of code with error messages, print out the envelopes and assemble the envelopes (see Slides 10,11 description below). **Note:** When printing out the envelopes (<https://drive.google.com/open?id=0B7-BtBqRDjG0MmstQkhzN1IGT2tXSjRHWXFyQkZxSTI3aWhn>), print the file single-sided. You will need to print as many copies as there are pairs of teachers.
  1. Fold each sheet in half, taping or stapling the sides to create an envelope.
  2. Print out the example code answers document (<https://drive.google.com/open?id=0B7-BtBqRDjG0U01Zc2cxSmZMa0E>) single-sided, one copy for each pair of teachers.
  3. Cut the example code document answers document so as to create eight small slips of paper, each containing an example code with the error message and description of cause of error.
  4. Examples 1,3, 5, and 7 should be placed in an envelope that says "ODD-NUMBERED SLIPS", and Examples 2,4,6, and 8 should be placed in an envelope that says "EVEN-NUMBERED SLIPS."
    - See this image (<https://drive.google.com/open?id=13qv6RqWkPY3RkkQvQOIWrLkINqMyejTPIQ>) for an example of what the envelopes should look like when finished.
  5. In each pair of participants, one person gets an odd-numbered slips envelope, and the other person gets an even-numbered slips envelope.

### Introduction to Debugging (15 min)

The instructor should walk through the slides of the "Coaching Debugging" Powerpoint (slides 2-9):

1. **Slide 2:** What is debugging?
2. **Slide 3:** What are the primary types of errors one encounters when coding?

3. **Slides 4, 5:** Tips for teaching students to program so as to make debugging more manageable.
4. **Slide 6:** Sometimes, error messages can seem cryptic, but if students are taught to analyze them, they are often a big help for syntax and runtime errors. When teachers are doing live-coding with students, they should model the process of reading error messages and thinking aloud with students to figure out the cause of the error message.
5. **Slide 7:** The instructor gets eight teacher volunteers and gives each teacher one of the pre-made slips/banners of paper. (Modify if a given group has less than eight teachers.) The instructor asks the rest of the teachers to pairing each snippet of code with the error message it would produce. Allocate 3-5 minutes for this matching activity, including set-up.
6. **Slides 8,9:** Tips for teaching students how to debug code on their own (without teacher help).

## Coaching Debugging Activity (40 min)

1. **Slides 10,11:** The instructor explains that in this partner activity, teachers will work in pairs to practice the coaching techniques that were just discussed. In each pair, one person takes on the role of the **teacher** while the other person is the **student**. The pair will alternate roles as they work through a set of examples, each of which contains a piece of code that has some type of error in it.
2. **Slide 12:** The instructor prompts teachers to open up repl.it (repl.it) in a browser and to open up the read-only file containing the code examples (<https://drive.google.com/open?id=0B7-BtBqRDjG0dGVEb29OT09YYUU>) they will be debugging.
3. **Slide 13:** The instructor passes out envelopes (one odd-numbered slips envelope and one even-numbered slips envelope per pair), insisting that each participant read their envelope completely and then talk with their partner to be sure they understand the activity. At this time, the instructor should reiterate the directions and be sure participants understand what they are to be doing for the activity.
  - **Note: The instructor should remind participants to stay in their roles as student and teacher. The student is coming to the teacher for help with their code, and the teacher is coaching them on how to fix the bug without directly telling them what to type.**
4. The instructor circulates as the pairs work, making sure that participants are staying within their roles so that each participant gets to practice coaching debugging.

## Closure (5 min)

**Slide 14:** Teachers journal in order to reflect on the strategies they have learned for supporting their students in learning to debug code independently.



(<http://www.umbc.edu/>)



(<http://www.umd.edu/>)



(<http://www.nsf.gov/>)

*Authored by:* CS Matters in Maryland

*Website:* [csmatters.org](http://csmatters.org) (<http://csmatters.org>)

*Email:* [csmattersinmaryland@gmail.com](mailto:csmattersinmaryland@gmail.com) (<mailto:csmattersinmaryland@gmail.com>)

This work is licensed under a  
Creative Commons Attribution-ShareAlike 3.0 United States License  
(<http://creativecommons.org/licenses/by-sa/3.0/us/>)

by University of Maryland, Baltimore County (<http://umbc.edu>) and University of Maryland, College Park  
(<http://umd.edu>).