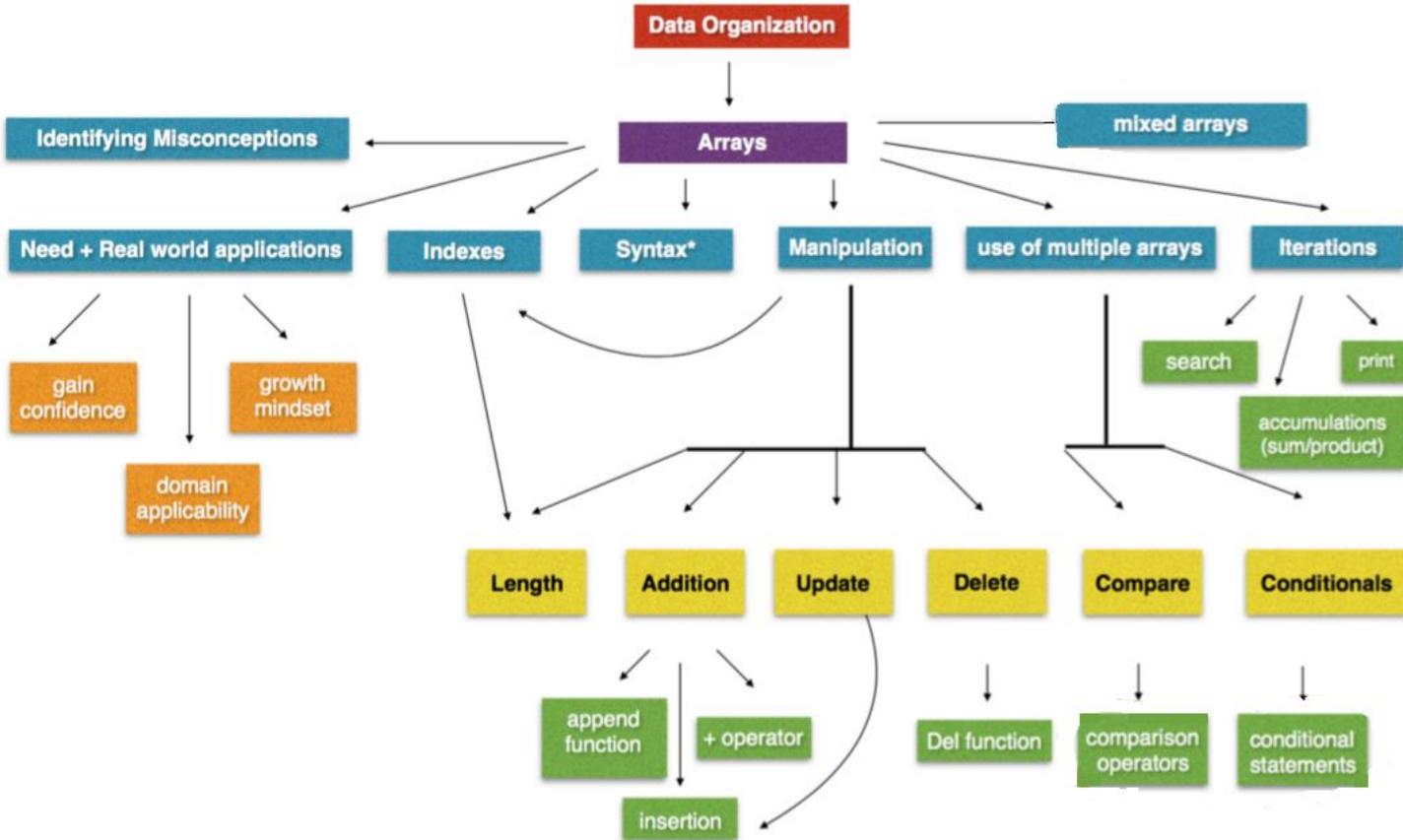




# Context

- **Who?** - Non major students enrolled in an introductory computing course
  - Business and Engineering students
- **What?** - Unit regarding data structures
  - Focusing on arrays
- **When?** - Both during and outside of class
  - System will be utilized both during the course and for outside practice
- **Where?** - Lecture, recitation, and anywhere else
  - Web-based system utilizable anywhere with internet access
- **Why?** - Students not engaged in material
  - Contextualized experience to increase motivation and thus learning

# Content



Color	Represents
Blue	important overarching goals
Yellow	subtasks to perform manipulation
Green	python functions/ operators
Orange	dispositions

# Skills

	<b>Cognitive Skills</b>	<b>Meta-Cognitive Skills</b>
<b>Skills</b>	<ol style="list-style-type: none"><li>1. Organize information to solve data manipulation problems</li><li>2. Learn time management</li><li>3. Use arrays to manipulate datasets related to business majors and engineering students.</li><li>4. Implementing and Initializing arrays</li><li>5. Iteration</li><li>6. Learn how to append items to an array</li><li>7. Learn how to delete items from an array</li><li>8. Learn how to print an array</li><li>9. Learn how to update an element within an array</li><li>10. Learn how to find the length of an array</li><li>11. Learn how to concatenate two arrays</li><li>12. Learn how to repeat elements in an array</li><li>13. Learn how to check membership</li><li>14. Learn how to find the sum of elements in an array</li><li>15. Learn how to perform linear search of an array</li><li>16. Learn how to use multiple arrays</li><li>17. Learn how to insert items into a specific index</li><li>18. Learn how to use accumulators with iterations</li></ol>	<ol style="list-style-type: none"><li>1. Planning how to manage time; how to do assessments in a reasonable amount of time. How to finish learning the module topics in a reasonable amount of time.</li><li>2. Monitoring one's progress : Recognizing when to use various data manipulation functions.</li><li>3. Evaluating one's strengths and weaknesses</li><li>4. Adjusting procedures and strategies</li><li>5. Evaluating how arrays can be used to represent datasets in the respective areas of study (business, engineering,etc)</li><li>6. Organize information to solve problems</li></ol>

# Cognitive Task Analysis

- Three new production rules identified
  - conditionals, comparison operators, and combining arrays
- Remembering specific *Python syntax* was challenging
  - Participants knew multiple programming languages
- Language specific features
  - Combining arrays, indentation of code
- Multiple methods to solving problems that asked for code
  - Approximate desirable difficulty, assessing the right skills

# Assessment Screenshots

1. Given the array below, which of the following would return the string "American Airlines"?

flights = ["Delta Airlines", "American Airlines", "Southwest Airlines", "United Airlines"]

- flights[0]
- flights[2]
- flights[3]
- flights[1]

2. Google has the following apps to offer. Which of the following DOES NOT add their new product called "youtube" to this list?

googleapps = ["gmail", "drive", "search", "maps", "photos"]

- googleapps.add("youtube")
- googleapps.append("youtube")
- googleapps= googleapps+["youtube"]
- all of the above

3. How will you concatenate the following two arrays:

numbers = [3,5,6,7], names = ["abc", "mno", "rst"], result should be [3,5,6,7,"abc","mno","rst"]

- `numbers.cat(names)`
- `numbers+names`
- `number.combine(names)`
- These arrays can't be concatenated

4. You have a list of several employees, represented by an array called "invitations", and need to delete the last person the list. Write the code segment which will delete the last element in the array "invitations":

```
invitations.del(len(invitations) - 1)
```

## Quiz 1 : Implement/Initialize an array

1. Some types of regression models that can be applied to a data set are : "Linear regression", "Logistic regression" and "Bayesian regression". Declare an array named "regression" and store the strings as elements of this array in the given order.

```
regression = ["Linear regress
```

2. We want to declare an array named "primes" to store the first 5 prime numbers. Which of the following is the correct way to declare such an array:

- `primes = [2+3+5+7+11]`
- `primes = (2,3,5,7,11)`
- `primes = [2,3,5,7,11]`
- `"primes" = {2,3,5,7,11}`

Submit

Summative Assessment (used in CTA):

[https://docs.google.com/forms/d/1xn1bNS\\_IQXnJPj30mFZiejklSFZxP6U\\_U6JUg3w38/viewform](https://docs.google.com/forms/d/1xn1bNS_IQXnJPj30mFZiejklSFZxP6U_U6JUg3w38/viewform)

Formative Assessment One:

<https://docs.google.com/forms/d/1efvcgq5bs-wj0oOdgrqN1g1bSqfXkOdjwa6HLugnUSl/viewform>

# Assessment Results

Students	Array Indexing	"+"operator for addition	mixed arrays	delete function	length of the array	loops	setting counter variable	initialize arrays	loop to print all elements	linear search
Student 1	✓		✓			✓	✓	✓	✓	✓
Student 2	✓					✓	✓	✓	✓	✓
Student 3	✓				✓		✓		✓	✓
Student 4	✓				✓	✓	✓	✓	✓	✓
Student 5	✓	✓	✓		✓	✓	✓	✓	✓	✓

# Key Principles

- Anchoring
  - Meaningful context that fits the student's domain of business
- Worked-example
  - Interactive examples that utilize a combination of what the student has learned
- Personalization
  - Conversational and engaging text throughout the entire unit
- Self-explanation
  - Students prompted to explain code segments and worked-example
- Feedback
  - Both correct and incorrect answers provide feedback

# Prototype Testing

- “...was so frustrating, I couldn’t remember where the dots [colon] were supposed to go.”
- Not understanding core concept (arrays are zero indexed)
- Code segments didn’t resemble Python
- Less wordy, more doing
- Confusing wording
- Feedback not as helpful as intended
- Didn’t spend enough time with the instruction part

# Prototype Revisions

- Segmented instruction and practice into smaller chunks
  - Less reading of instructional text and more practice opportunities
- Added self-explanation principle
  - Added prompts for the user to provide explanations and provided them with feedback
- Clarified wording
  - Added pronouns to worked example, bolded key terms, formatted code text to resemble Python, made wording concise
- Made feedback more detailed
  - Changed the provided feedback to be less about the specific problem and more about the underlying knowledge component

# E-learning Screenshots

## Intro to Arrays

A list in Python is just an ordered collection of items which can be of any type. By comparison an array is an ordered collection of items of a single type - so in principle a list is more flexible than an array but it is this flexibility that makes things slightly harder when you want to work with a regular structure. A list is also a dynamic mutable type and this means you can add and delete elements from the list at any time. We'll be treating lists and arrays as the same, since in Python arrays are implemented as lists.

To define an array you simply write a comma separated list of items in square brackets:

```
myList = [1,2,3,4,5,6]
```

In Python, lists can hold **any types**, even if the types aren't the same! Feel free to mix *booleans*, *numbers*, *strings*, etc. together in your arrays. The following are all valid arrays in Python:

```
mixedArray = ["first", "second", 1, 2]
mixedArray = ["first", 1, "second", 2]
mixedArray = ["keep", "it", 100, True]
```

Each of these items in the array is known as an **element**. Finally, it doesn't matter if you use spaces after your commas, it's personal preference. Regardless of the spacing, these two arrays function exactly the same:

```
arrayOne = ["you're", "doing", "great"]
arrayTwo = ["you're", "doing", "great"]
```

[Next >>](#)

## Initializing Arrays

Which of the following would create an array with five elements?

```
array = ["zero", "one", "two", "three", "four"]
```

Correct, this array has five elements which are contained in between a pair of []!

Which explanation describes why the above answer is correct?

```
In Python, arrays can only contain strings and this array contains five string elements.
```

In Python, arrays can contain mixed types. This means you can have any combination of *numbers*, *booleans*, *strings*, etc.

## Scenario One

Your Name:

Your Company:

Your Product:

Hello Steven, as you're the boss of Moore's Shoes, today you've been tasked with managing the inventory of sneakers!

Moore's Shoes has five warehouses full of sneakers. Utilizing what you've learned in this unit, you've created an array of the five amounts contained in the warehouses.

```
inventory = [15, 13, 12, 18, 20]
```

You need to print out the amount of sneakers that's in the **third** warehouse. How would you go about doing this?

```
print inventory[2]
```

You just remembered that the value in fifth warehouse, 20, is not correct. Please enter any value below to indicate how many tons of sneakers that Moore's Shoes actually has in that warehouse? (ex: 16)

Oh, that's right, there are 5 tons of sneakers in the last warehouse. Being the sharp individual you are, you know the value you previously had entered for the fifth warehouse is now incorrect!

How would you correct the last value in the array `inventory` to be the correct amount that's stored in the fifth warehouse?

```
inventory[5] = 5
```

The array contains five elements and when indexing into an array you need to do one minus the array position you want.