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**CS-210 Programming Languages**

**Module 7-1 Programming Languages Explanation**

Throughout this project, and the course in general, some of the most prominent benefits of C++ in a project is the overall control you have. Dealing with things such as pointers and memory addresses, while also controlling and validating input are some of the great benefits with C++. Pointers give the added benefit of being able to manipulate the structure of data, and when dealing with input/interface with users, cin and cout are very effective especially for windows cmd prompt. I found the extensive library to be very helpful, and there’s so much documentation with C++ that is another benefit in itself. Some of the drawbacks of C++ is definitely the complexity, and how thorough you may have to be when considering user error or even runtime bugs. With this more extensive control, there can be a point where you’ll mess up because of it. When dealing with the grocery-tracking program, I found myself fussing up because of invalid input, and really just tweaking the way input and output was handled seemed a real time consumer. Where other languages might have a quick method solution for a problem of iteration or data manipulation, C++ tends to have an exponentially longer process with the benefit of being able to manipulate those steps along the way, though this can prove to be a drawback.

When dealing with Python, I found one of the biggest benefits was the simplicity of the code. In its implementation in the grocery tracking program, Python was effective in its own right, though the API usage was what proved to be ineffective. It would be much more simple to just use C++ instead of dealing with embedding Python into the program. I could see the added benefit of using Python in the program would be utilizing Pythons visualization and extensive math library, using these aspects of Python would be a very effective implementation. One significant benefit I noticed, was not having to compile Python into the .exe, instead the exe used Python “on the fly” during runtime and this allowed for me to edit my Python functionality without the drawback of compile time. Python overall was very effective, and when dealing with large amounts of data, Python was paramount.

Multiple languages being used in one project is fairly new to me, but I do see the benefits. C++ and Python have the relationship of both low level and high level programming, allowing for closer to machine manipulation on C++ and very simple and effective arithmetic with Python. With future projects where data visualization may be more necessary outside of a text-based histogram, Python would definitely thrive. I believe if we substituted C++ for Nodejs, we might even be able to employ Python in web applications to easily visualize data. Javascript has CDNs for Python embedding even into HTML and this would be a very effective relationship given Python’s ability to manipulate and display data in many standards for data analytics. All in all, it was a very informative implementation with this grocery list project, using the two languages together. I’m excited to implement them in the future with my portfolio projects!