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March 27, 2023  
EDU6319: How People Learn  
A4: Case Study

## **Walls of Digits: On Motivation, Self-Determination, and Learning**

### **Part Ia: Case Study Introduction.**

The human relationship to learning involves a fascinating interplay between resources of new information with contexts of motivation and existing fields of knowledge. Much like travel, it is often a journey. In this case study, I explore the ways in which an individual adult learner navigates an online learning and skillbuilding resource in tandem with his sense of understanding, of various proximities across a plethora of personal histories and interests, all while navigating the sparks of insight, motivation, and confusion that typically stretch across a learning process towards a larger goal of transformation. Through an observation and interview process, I elucidate on his methodology around learning to reveal insights on these components and how they lend to an epistemological feedback loop: figuring out what one knows and how to fill in the rest.

### **Part I: Video Introduction Script.**

[URL for virtual Case Study: <https://montanor0.wixsite.com/website-10>]

Walls of Digits: On Motivation, Self-Determination, & Learning.

A Case Study by Jake Montano for EDU6319: How People Learn.

When it comes to learning, there is a constantly shifting interplay between content, experiences, and people. Though the content may be what we are after, it is through experience that factors like motivation and frustration play out. And it is within people, both learners and facilitators, that personal histories also surface, sometimes leading to profound connections and other times to dead ends.

This case study follows Firo, a 31-year old lifelong learner and resident physician who lives in the Bay Area, and who has been learning to speak the language of code, not simply as a form of creative and enjoyable skillbuilding, but also as a potential pathway in his professional life. For Firo, this coding language, called Python, has been a longtime subject of curiosity, and he's been learning it through use of a massive open online course, or MOOC, an emergent form of instruction and learning in the digital age. Courses like the one Firo has been taking are dynamic and multimedia productions that live on the web, often full of visuals, sounds, and interactive sections. But they are also entirely digital creations, with human contact existing only through the conduit of the screen or chatbox. In learning experiences like these, self-determination and mindfulness are key factors for maintaining focus and synthesizing information in ways that are meaningful. Throughout this collaboration with Firo, we uncover his approach to many of these elements, and how intentional design to a learning environment can contribute just as much as the format of the content itself.

Firo also brings many assets to the table, as most people do in situations of learning, whether its past or related experiences, as well as skills and insights that can be employed to make learning dialogic. Continue on with this case study and you will find many of these factors revealed, and how even just one line of code can be rife and brimming with connections beyond the screen and beyond the walls of digits.

## Part II: Learner.



*Meet Firo: multidisciplinary learner, auto-didact.*

Firo is a 31-year old resident physician with a concentration in ophthalmology, whose career-driven life path has brought him to the Bay Area from his studies and schooling in Baltimore, Boston, and Washington, DC, though he is originally from Atlanta. In addition to his in-progress physicians and surgical license, he also has a Master's of Science degree in Public Health. He is currently working with UCSF and completing a rotation in oral surgery. Firo is also a talented artist and self-identified linguist and has spent time building a body of work in illustration, photography and photo editing, and painting. He loves to learn languages and has amassed conversational fluency in four: English, Spanish, Portuguese, and French. A modern-day Renaissance Man, Firo is also fascinated by technology, and also “speaks” languages present in machine learning, web design, and AI, though is amidst his learning of them.

Because his work in medicine is grueling and very technical, Firo has relied on these other interests to keep himself balanced. Some of these supplemental pursuits began when he was an undergraduate, but many - including two of the four total languages he speaks - he acquired on his own. At one point in his residency, Firo also worked to turn his artistry into a business, spending his time off from work creating digital artworks that he sold on the website Etsy. Now

that he is nearing completion of his residency upon which he will possess his necessary licenses to practice in the clinical setting, Firo has started to wonder if his professional pathway could be more inclusive of his other interests. He is currently learning Python to build upon his existing knowledge of statistical program languages; Python being a generalized language for machine learning in the field of technology and web. His hope is to somehow merge his various interests, especially in the interaction between health and tech, to address larger issues in the world, and hopefully to synthesize his personal interests in skills that for him feels satisfying and stimulating.

I chose Firo as the subject for my case study because he has a demonstrated love for learning, and seems to have developed a personal and effective methodology around it that he's been able to obtain such a wide variety of skills and talents, as noted above. He is also at a crossroads in his life and career, being in medicine but actively seeking the viability of his other interests as possible parts of his professional pathway. He has regularly noted that an impetus for his own exploration is in whether he wants to remain in the field of healthcare at all. I am specifically interested in this prevailing question, and how he has been navigating the learning of Python and web-based languages, towards what he hopes will be a resolution of clarity for his in-transit career as he marches towards the last major milestone and finally completes his medical training after more than a decade. And despite his interests appearing unrelated to one another, he has cited each of them in our conversations as crucial elements of his self-reflection and potential pivot. In this way, I seek to uncover how Firo's sense of motivation, and his practices of learning various skills and implementing them into a field of prior knowledge, has informed this new foray into learning Python and his hopes for transformation.

Firo had this to say about his motivation towards Python, which he has been learning on his off-days from work, and sometimes before or after shifts that sometimes has him in the hospital setting for 13 or more hours, up to 24 throughout some rotations:

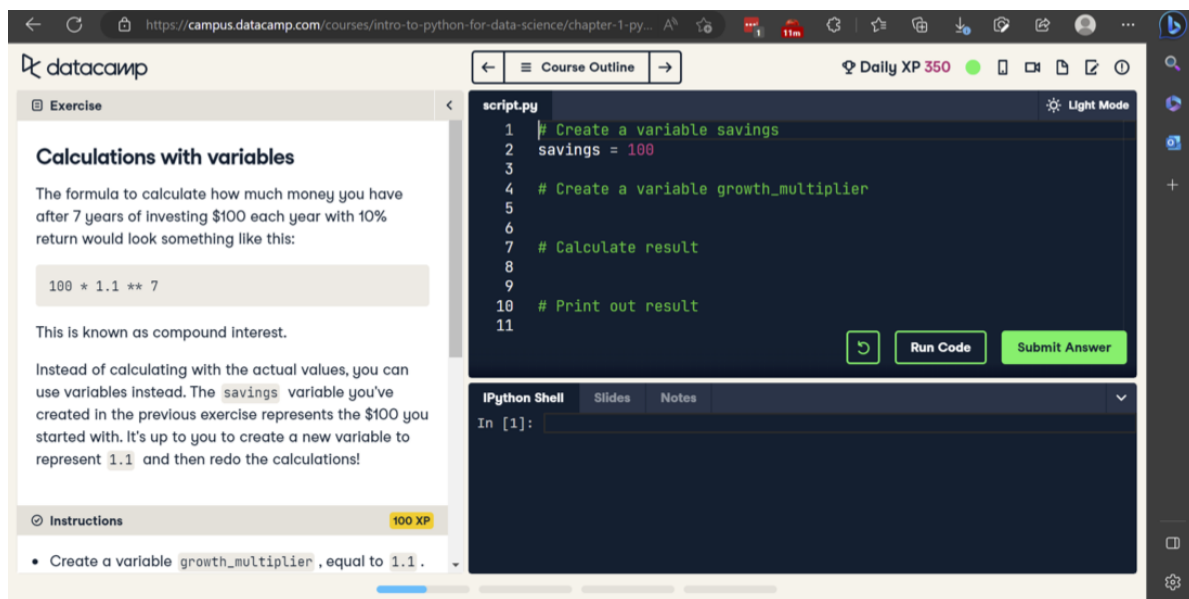
*“My motivation in learning Python is to rekindle my creativity and the certain part of my brain that relies on logical thinking, and entering this flow state of deep work that I used to access when I did statistical analyses with a different coding language. So I think that's the foundation for why I'm learning Python: it's similar but more advanced and goes back to this interest I had before. And I think it's also an important stepping stone for learning more about AI and machine learning, and then ultimately the goal is to see if I can pivot into working in a more AI space” (F. Cole, personal communication, March 16, 2023).*

### **Part III: Setting & Learning Experience.**

At the time that Firo and I began to collaborate on capturing his learning experience with Python, and when we recorded our interview, he was only a few weeks into a 35-week course that he has enrolled into on a website called Datacamp, a learning platform designed specifically for those seeking data skills that has courses ranging from data visualization, to probability and statistics, to applied finance. Though slated to unfold over 35 weeks, Firo's

intention is to “get it done in three months, or like half or a third of the total supposed time to complete [the course]” (F. Cole, personal communication, March 16, 2023). This lines up with the expected completion of his residency. The course overall will end after Firo has passed each module with a sufficient score, which will earn him a certificate that should allow him to work within the AI and machine learning space.

Though he is formally enrolled in this paid course on Datacamp, Firo’s participation is informal overall - and part of his own personal development that occurs outside of his usual work. It is a prefabricated course: entirely digital, asynchronous, with video recordings by a human facilitator (who is pictured in the instructional videos) who uses the video format to visualize the code that makes up Python as well as the various types and common problems that this code is suited to address (and when other coding languages are necessary). Enrollees in the course do not interact with one another or even necessarily to the facilitator, except optionally, rather they devote time outside of watching the facilitation videos to worksheets and text fields in which they work out named problems by generating lines of code to solve or translate them. Students submit their code within any given module and receive grades on them, retaking if needed in order to advance into subsequent modules.



*A screen capture of the Datacamp platform and one of the homework problems needed to advance to a later module in the course.*

#### **Part IV: Interview & Observation.**

My interview and observation of Firo were held on different days and in different settings, the interview occurring first to help contextualize the Observation and to prepare us both for a seamless recording experience that was held at his home, the environment in which he usually takes the Datacamp course. This proved useful, because in the interview Firo shared many parts of his approach to learning and his design of his twice-weekly study sessions that would have remained unclarified without the necessary elucidation. When we convened for our recorded Observation, Firo first brewed us tea then gathered himself at his desk and

maneuvered through his computer to access YouTube as well as Datacamp. We sat together for a little more than one hour altogether as he navigated through the course before he felt his focus had elapsed, though his usual duration for these sessions is 2-3 hours twice a week.



*Firo seated at his desk watching the Datacamp facilitator introduce the topics for the current module.*

We watched an initial video clip of the course’s facilitator introducing the major topics for the module, and a collection of examples before the first set of problems appeared for Firo to work out and solve. His experience with the platform oscillates between inactive portions of watching the video and the explanations therein, and much more involved portions where he must take the scenarios, equations, or outcomes and fill in the remaining code, sometimes converting the text into lines of functional commands in syntax and other times solving the riddle of how a pre-generated set of code was worked out. Firo and his peers in the class also devote ample time to simply experimenting with the code itself, drafting it in iterations and “running it” to find out if their equations are functional and accomplish the question or task at hand. Firo mentioned that sometimes he needs to rewatch the facilitation clips a handful of times, and other times only once. He sometimes consults other books or websites as well, as this course in Datacamp supplements a book he previously read on the subject of Python coding.

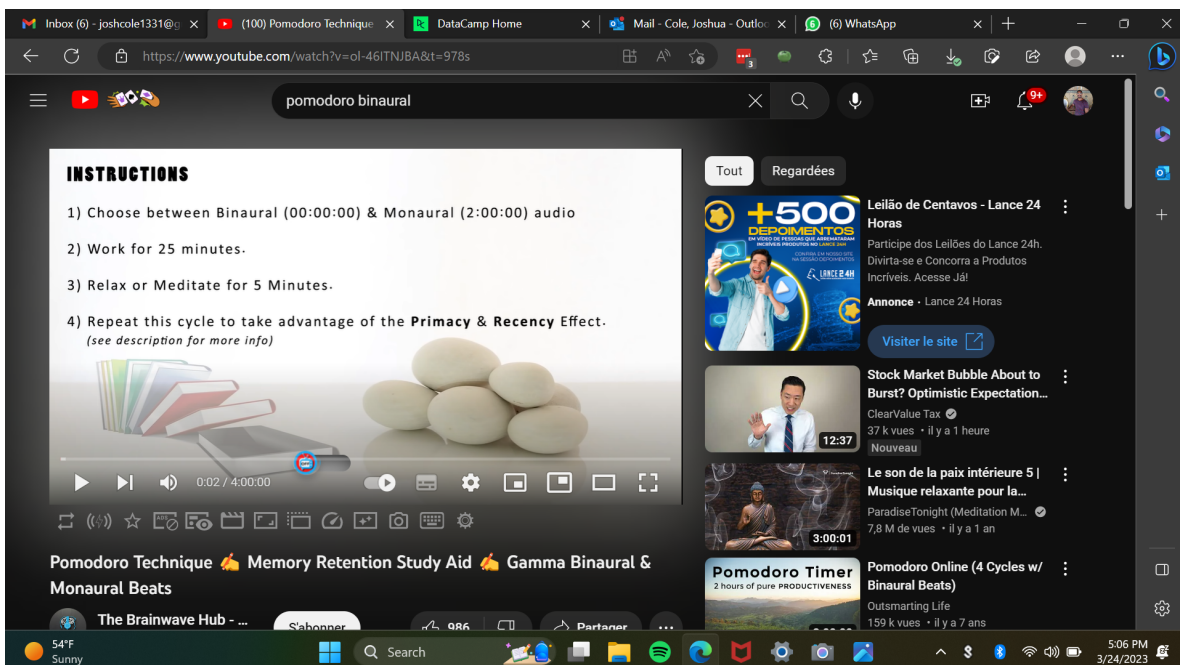
In 25-minute chunks of time Firo would sit at his laptop and interact with the course. Then, his laptop would send a sound signal, and he would rise from his chair, and spend five minutes doing other things: stretching, talking with me, staring out the window opposite the room, interacting with his plants, or stopping into his kitchen for more tea or to snack. After five minutes, his laptop would sound off again, and he would sit down again at his desk and resume with the Datacamp course. I observed him move through this cycle of 25-minute segments of work and 5-minute long breaks for a few revolutions before the end of our Observation. In one of those 25-minute stretches of study time, Firo sat with a question asking him to relay the



necessary parts of a narrativized scenario into an algorithmic equation that could process inputs into usable data, and tweaked its wording and punctuation down to placement by single spaces.

There was also a chatbox that Firo could access in the web platform, and a more broad community forum of other enrollees and facilitators, that could be utilized for support purposes or tech or logistical questions. Firo wasn't sure if the responses generated in the chatbox to his questions came from a live person or from an AI or algorithm, but he also mentioned that he has only used it a handful of times since beginning the course. He showed me what it looked like, but did not refer to it outside of that during our Observation.

Keeping time for him was a video on YouTube based on the Pomodoro Technique, that Firo kept open in his browser alongside Datacamp. He mentioned during our interview that he has been a devoted practitioner of this Technique for many years and that it was instrumental not only for his studies in medicine but also for his acquisition of languages, and that he learned of it when he was an undergraduate in those foreign language courses but really found its value as he's learned other languages on his own and through medical school. He mentioned during our Observation that the way he utilizes the time - and the duration he sets of the segments themselves - varies, and that my presence altered some of his usual practices. Some of his study sessions see him spending 15 minutes on studying/watching facilitation with 10 minutes for break, and he noted that these choices reflect his level of motivation or energy for that day. He simply searches "Pomodoro Technique" on YouTube and then decides on the version and its segmentation of time before each of his study sessions.



*Keeping time: a Pomodoro Technique video from YouTube that Firo used to segment his study session.*

When I asked what other things he does during his breaks that I was not able to witness during our recording, he named a few that reanimated some of the things he mentioned only in our

interview up to that point. Some of these I have identified in previous sections of this Case Study. Firo has traveled a lot, which he's noted has been useful for his learning of languages, and one of his favorite ways to spend his breaks is to message friends in other countries - in the languages he's cultivated or still learning - which he does through WhatsApp or email. He'll talk with those same friends on the phone, too. He named a few others as well: dancing or stretching, organizing, painting, or jumping into other programs on his computer like his photo editing software or his Etsy page.

As we wrapped up our Observation session, I noted that his usage of Pomodoro worked well with his cadence of 2-3 hour allotments twice a week, and that otherwise it might feel exhausting especially considering his rotations during his residence often have him in 24-hour shifts at the hospital. He then referred back to something else mentioned in the Interview: that he tries to be intentional about his study sessions and works to address all his major needs before even sitting down at his laptop. He does this generally by showering, eating, and napping (if needed) before each of these sessions, and making sure he does not have any appointment or obligations that might interrupt or distract him. His having brewed us tea before beginning our recording was his demonstration of that, and he noted that he's now collected many teas he also likes to choose between depending on mood and energy level.

On that topic, this is what Firo had to share:

*"I address all my needs [before sitting down with Datacamp]: I eat, I take a shower. I address everything that my body needs, and then enter a study mood. I use the Pomodoro Technique and most of the time do 25 minutes of focus and then take a break for five, and do that in alternating cycles. But over time I've learned that my brain works best when doing 15 minutes of focus, ten minutes off, so a lot of the time I will do that. My phone is always on silent, so distraction from that isn't really a thing. And I live solo so I don't have many distractions that I can't account for, and I can make sure that my sound and my physical environments are clear" (F. Cole, personal communication, March 16, 2023).*

## **Part V: Analysis.**

In observing and collaborating with Firo for this Case Study, it became immediately clear that he employs a wide range of practices, techniques, and tools to aid in his learning, and that he remains as aware of his *approach* to learning as he does to the content itself. His thoughtful ability around that has allowed him to meet his learning goals with intentional design of the environments, timing, and even breaktime activities so that he can maximize them. This demonstrates some of the qualities researchers have long identified as valuable for effective learning, namely self-determination and motivation.

When it comes to the former, self-determination, Tschofen and Mackness highlight three essential components needed for this "way of being" that I believe Firo displays readily: autonomy, competence, and relatedness; all three and the theory of self-determination lend to an understanding of Connectivism as a useful theory on learning especially in the digital age

(Tschofen & Mackness, 2012, p128). Autonomy is arguably the clearest trait one can see in Firo as he makes his way through his use of Datacamp's website, from the way he utilizes the Pomodoro Technique to structure his time to the way he's even adopted a personal goal of completing the course in less time than it was intended, as well as to the growing library of resources he has consulted to support Datacamp. According to Tschofen and Mackness, too, autonomy is a design feature of this type of e-learning, as sites like Datacamp, Coursera, and others all belong to an emergent form of learning called MOOCs, or massive open online courses (Tschofen & Mackness, 2012). This type of instructional content demands independence of its participants, as beyond the initial enrollment or payment, learners are asked to self-guide their own navigation of the materials and are not scaffolded along by anyone except in the flow of the instruction or material itself. This is no accident for Firo, and part of his attraction to this learning is that it was flexible enough for him to superimpose his own sets of techniques that he has cultivated over time:

*"I like learning. I feel like I've always been a person that likes seeking new information. And I like learning on my own terms, which is something that I have definitely learned by now: I like learning what I want to learn and when I want to learn it, and I like to learn it how I want to learn it. And this course is very much like that: I choose when I open my laptop, I choose when I go to the webpage. And there's flexibility in how I can do that, which is very much aligned with how I'm going about it" (F. Cole, personal communication, March 16, 2023).*

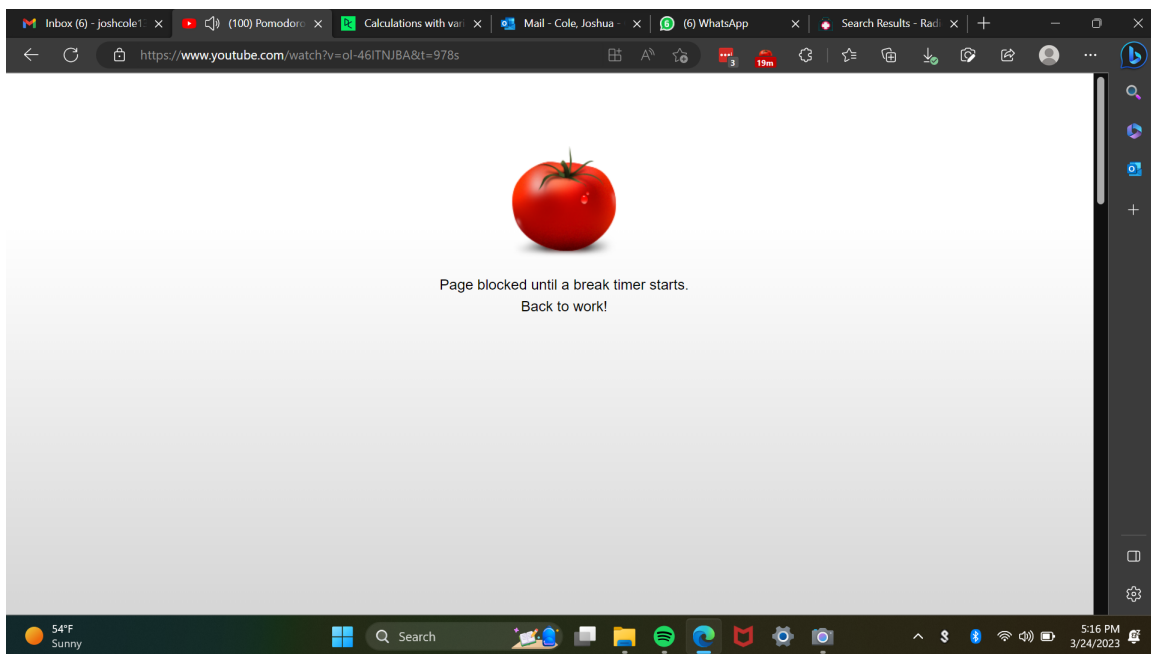
A second trait of self-determination and for Connectivism is relatedness. And for us, another way to think about this as it has applied to Firo's learning experience has to do with how he activates on his prior knowledge to learn Python's heavy focus on syntax, grammar, word choice, and definitions. As Mayer states, "meaningful learning involves assimilating new incoming information into existing schemas" with a schema being the "organizing structure that connects knowledge elements into a coherent mental representation (Mayer, 2011, p29). Because I have known Firo for some time, I had been aware of his love for languages, and he has in the past helped me with learning Spanish and with challenging translations. But it wasn't until our interview that I learned how much Python, and coding languages in general, also share in types of rule-following that human-generated languages exhibit very clearly:

*"But the commonality between all of these languages for them to even be languages is that they all have a syntax that exists within their world. There's a syntax for French, there's a syntax for Python. And that makes it easier to learn them, because you can find they have a grammar and syntax and a word order and then put them together to get a command with Python, or something else. So with grammar for Romance languages... say, for instance, in English we say "Jake's house" but in Romance languages we say "the house of Jake," and with that you know that the object of interest is the house and then the qualifying information is that it is "of Jake". Most important information first, then secondary information follows it. And that framework is helpful. So in coding languages, the most important thing is also first. For example, like jump, as a command. Or print,*



*as a command. And then the second thing I need to type is what is getting printed, like this magazine. There's a similar structure or scaffold to both" (F. Cole, personal communication, March 16, 2023).*

Firo's cleverness in noticing these similarities between human- and web-based languages is in no way new, but no doubt has played a profound role in his ability to navigate learning it. Mayer remarks that possession of prior knowledge allows for a more substantial amount of incoming information to be held in working memory, and de Jong notes that this is crucial in warding off an experience of cognitive overload (Mayer, 2011; de Jong, 2010). I believe this is what allows Firo to spend time on his 5- or 10-minute breaks chatting with friends on WhatsApp or spending time speaking in other languages with those same friends, rather than devoting those breaks to meditation as suggested on the Pomodoro Technique videos Firo uses on YouTube. Those conversations may even insulate or empower the learning process on Datacamp, because Firo's neurological corridors handling that information are already warmed and primed.



*How the Pomodoro Technique curbs behavior.*

The last trait, competence, entwines well with another factor in Firo's learning experience, that of motivation. For him, those things interplay with one another in ways that has allowed him to scale his time and task management so that he's been able to utilize his growing knowledge of Python almost as quickly as he is learning it. Tschofen and Mackness describe the role of competence in self-determination as the feeling of being "effective in interactions and having the opportunities to enact this effectiveness" (2012, p135). For Firo, two major forces are in play here: that he already possesses prior knowledge useful for this skillbuilding, and that the Datacamp website is arranged in modules that are themselves organized into chunked problems wherein he can practice skills at smaller scale immediately following the instructional video and before moving onto other things. This latter feature allows him to wield prior

knowledge in directly useful ways, as during our Observation when he needed to create a new function using a word or set of words, and then to implement that function into a larger whole of coded text. He was able to draw upon his knowledge of syntax and grammar to launch immediately into the exercise rather than needing to reflect and internalize, which for him elapsed in mere seconds.

His competence and feeling of effectiveness motivates his motivation, and allows him to witness his growth in real-time. "Motivation is important not only because it apparently improves learning but also because it mediates learning and is a consequence of learning as well" (Wlodkowski, 2008, p7). This quote by Wlodkowski highlights the way motivation defines Firo's overarching goal - that of allowing him to entertain the real possibility of a pivot in his career away from healthcare into something more akin to his true interests of merging medicine with tech - and the goals he has been setting for himself along the way. An example of this is his intention to complete the course in perhaps record time, but also in the way he seeks to implement this knowledge into his existing repertoire in ways that serve his multidisciplinary nature. "Emotionally, intrinsic motivation is not static and does not remain constant during learning or work. Flow is one of the most positive states of intrinsic motivation. During this time we are fully absorbed, emotionally positive, and very focused. In other intrinsically motivating situations we may be less consistently involved, only mildly interested, and, at times, feel a bit worn or fatigued" (Wlodkowski, 2008, p23). Firo has acknowledged the ways he achieves his own flow state, and taken together with all of the other parts of his learning process contributes to a whole that is both insightful and impressive.

*"I hope to actually gain competency in Python. And I get amusement out of doing this, and I enjoy learning it. So I hope to continue getting that boost of endorphins, and increase creativity. But then ultimately my goal is to get a certificate in this skill so that I can apply for jobs in this space" (F. Cole, personal communication, March 16, 2023).*

## **Part VI: Conclusions & Recommendations.**

Observing Firo and working with him to situate one experience of learning within that of his larger timeline and process gives embodiment to many of the reigning theories on what happens during learning, and what is needed for learning to be meaningful. Options for personalization are critical opportunities, and even seemingly unrelated fields of knowledge can gain credence within new experiences. His perspectives and the ways he interacts with the components of his foray into Python exhibit the full-bodied nature of learning as well as its transformational abilities, and invites us to think about how we can incorporate outside elements - like Pomodoro Technique or other skills - to the ways we might learn new knowledge or abilities.

*"All problem-solving is creativity, but I think problem-solving of new territory, of unanswered questions is creativity. But problem-solving of frequently-encountered problems is just knowledge and reinforces memorization rather than creativity" (F. Cole, personal communication, March 16, 2023).*

Having explored Firo's learning experience and juxtaposed them with poignant texts and scholarship on the subject of learning, the following are my recommendations for what could be added or modified to boost their effectiveness even more:

- + For there to be challenges, self-generated or found elsewhere online, that allow Firo to apply his learnings of Python to problems or questions he anticipates seeing in the axis between healthcare and tech/AI/machine learning. What does Python look like in the context for healthcare? What kinds of considerations need to be applied to write algorithms that assist patients with understanding their health reports, or tests, for instance?
- + To consider how tech and AI approaches can be implemented into the field of healthcare in a mutually beneficial way, rather than unidirectionally. How can the industry-wide stances of tech and coding be used to improve the practice of medicine? Are there approaches to web design and machine learning that have yet to be applied to those of patient care, surgery, or triage?

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