Process Improvement Project

Miles Walked per Day

Raya Young
2019 1212

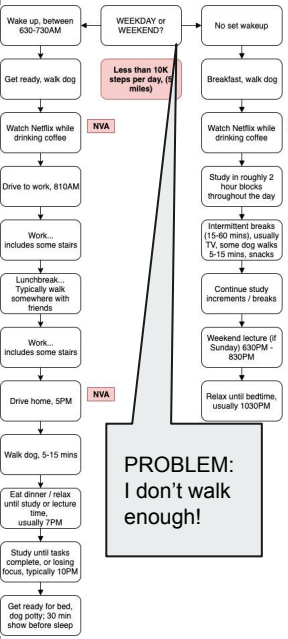
Miles Walked per Day

Process Owner: Raya Young

BIZ IMPACT: Low activity leads to less focus and health problems - netted value $22k+ per year!

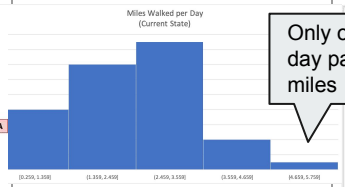
Key Dates → Te… Launch	Define	Measure	Analyze	Improve	Control
	10/10/2019	10/11/2019-11/22/2019	11/23/2019	11/23/2019-12/11/2019	12/12/2019

DEFINE



PROBLEM: I don't walk enough!

MEASURE

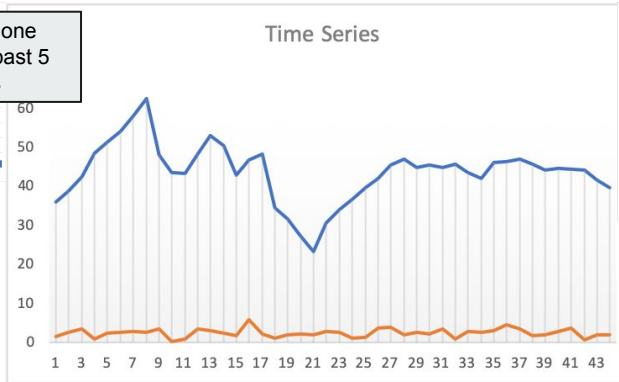


Only one day past 5 miles

Baseline data confirms little activity, average of 2.5 - 3.4 miles per day. Data also collected on dog walks, study and work time, and temperature.

Sample sizes met for all x's and y criteria!

ANALYZE

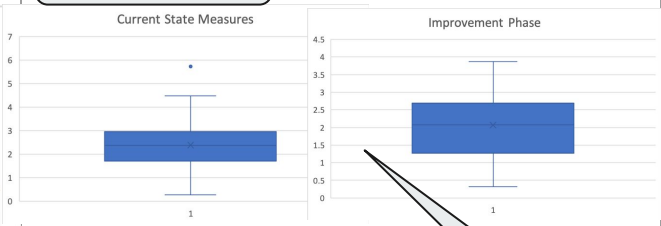


Time series showing potential relationship mirroring in distance and temperature.

DPMO = 43 million; SQL = 0!

DPMO = 19 million; SQL = still 0!

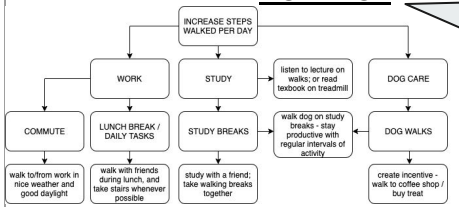
IMPROVE



Actions taken to improve included stairs at work, and walking during lunch. Weather, less daylight, and increased study load proved to be challenges. Improvement phase does not show considerable change - unable to improve by 10%

Mean lowers! 2.38 to 2.07

CONTROL



Create rewards for movement, and social incentive

TEAM MEMBERS:
Raya Young, Maggie (dog)

DEFINE (1 of 3)

- **Problem Statement**

My problem is that I do not move enough. My office job and study schedule facilitate a sedentary lifestyle. My dog deserves daily walks, but I sometimes lack the energy to take a full loop around the block. I know I have a problem because this lack of movement can affect my mood, make me more tired (affecting focus), and encourages weight gain. I often feel refreshed and energized after walking, and that my dog would be happier with more walks as well.

- **Business Impact**

I should fix this problem because it will be better for my overall health. My estimated benefit for solving this problem is better energy and focus, benefiting my work and school performance. This means I will be getting the most value out of the cost of tuition at over $5,000 per semester; it may lead to recognition and bonuses at work, roughly a $50 Amazon gift card per month; impacting my overall physical health will also save money that would go to healthcare providers (roughly $40 copay per visit). Additionally, seasonal depression might cost an affected person $50/session per week, for three months, at a total of $600. (Pertaining only to people whose symptoms can be managed by exercise alone).Overall, this problem is estimated to be worth:

$$\$5000 \text{ (tuition)} + \$40 \text{ (health check-up)} + \$600 \text{ (therapy)} - \$50 \text{ (Amazon)} = \$5590 \rightarrow \$22{,}360 \text{ annually}$$

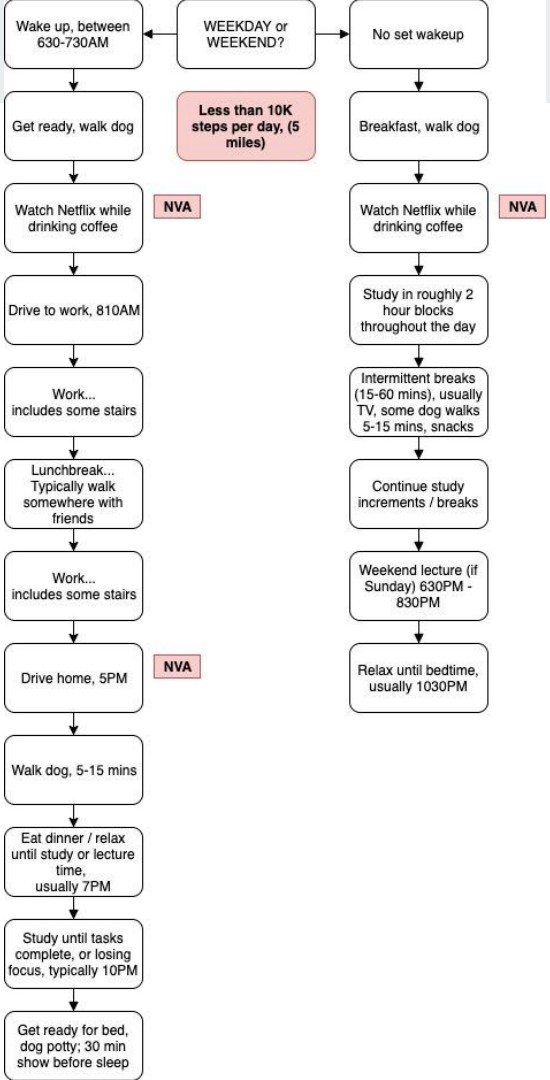
I will measure success by seeing a positive change in the number of steps taken, and my key output (y) will be daily steps taken, measured in total miles.

- My goal is to improve is the number of steps (in miles) that I walk per day. I will know I have been successful if I am able to increase the number of steps by at least 10% as compared to my current state measurements. I have defined a defect as any day less than 10k steps, or 5 miles, as is the standard recommendation of activity.

- The process I am trying to improve upon is my daily routine. I let the dog out before and after work and I rest before studying. I would like to find more opportunities for walking, like taking the stairs at work, walking during my lunch break, and walking the dog in the afternoon. The current steps of the process are detailed in the following slide.

DEFINE (2 of 3)

Flow Chart of the Work Process



DEFINE (3 of 3)

- Clear operational definitions have been defined for my inputs and outputs:
  - Miles Walked per Day (y): Steps taken / 2k = miles
  - Weekend / PTO: Yes or No, see calendar timecard (all day)
  - Walked Dog?: Yes or No, to the end of the block, or to the park. (Simple potty breaks do not count.)
  - Hours Worked: Information collected from my timecard at work.
  - Hours Studied: Information collected on paper, then updated into a spreadsheet.
  - Avg. Daily Temperature: collected from wunderground.com, according to my zip code.

MEASURE (1 of 3)

- The type of data I collected was distance, (miles walked per day); day of the week / weekend or PTO (Y/N); whether or not I walked the dog (Y/N); time, hours worked and hours studied; and average daily temperature. I defined a defect as anything less than 10k steps or 5 miles per day.
- For the most part, I collected my own data. Existing data came from wunderground.com for temperature readings, and the timesheet data could be considered existing, as it already being tracked through work.
- Overall, I collected 63 days worth of data, 44 days were current-state. I chose a 95% confidence interval and a 0.25 mile margin of error. Standard deviation for current state data = 1.09. My ideal sample size for miles walked per day, using the sample size formula for continuous data is as follows:

(1.96 * 1.09)/0.25 = 8.5 rounded = sample size 9

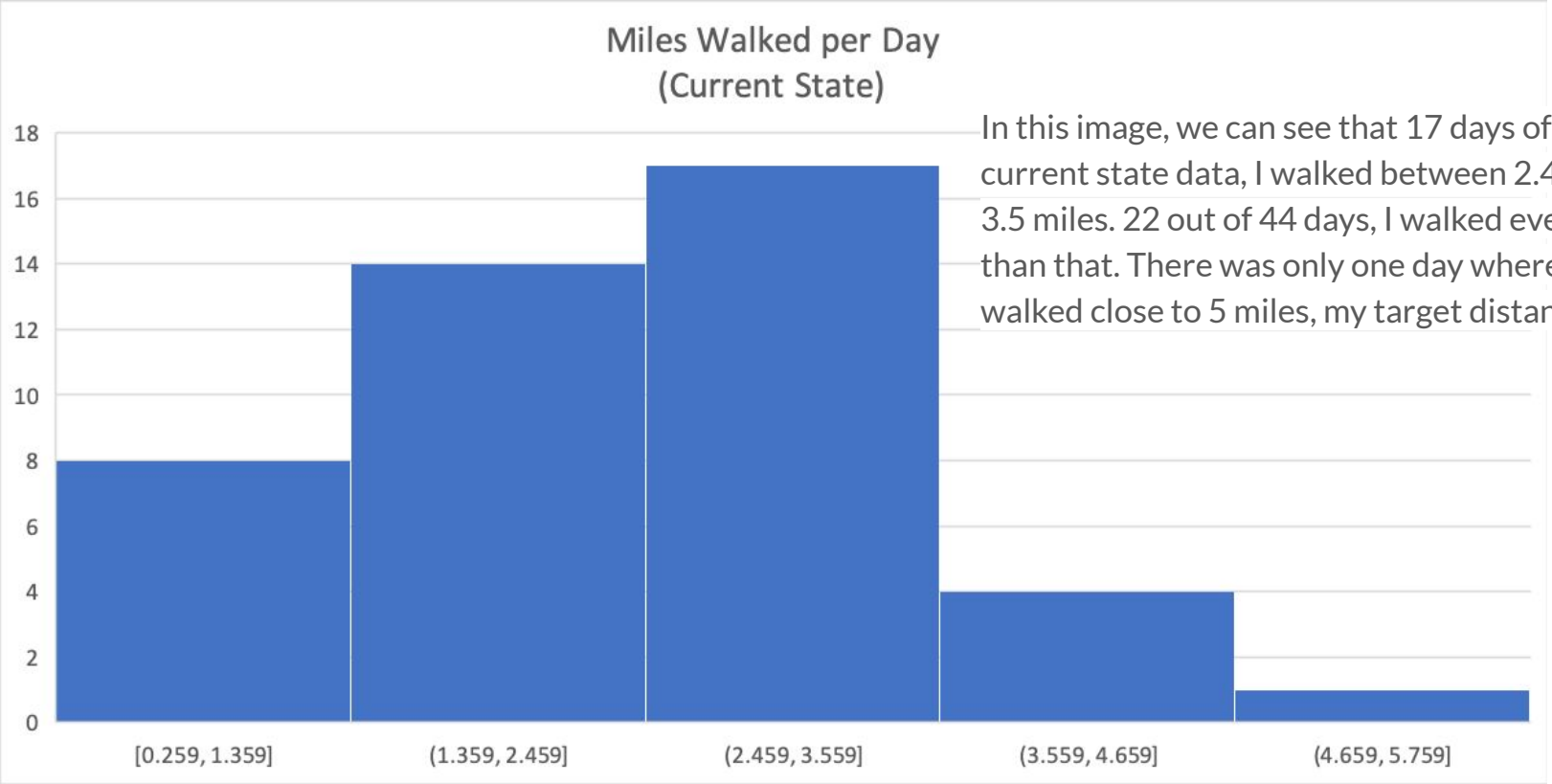
Data Measurement Plan					
Performance Measure	**Data Source and Location**	**How will data be collected?**	**Who will collect data?**	**When will data be collected?**	**Target Sample Size**
Miles Walked per Day (Continuous)	iPhone Health app > Steps	iPhone Health app > Steps	Raya Young	10/10/2019 - 11/22/2019	**9 samples**
Weekend / PTO (Discrete)	Calendar	Calendar	Raya Young	10/10/2019 - 11/22/2019	**N/A (no margin of error - source from calendar)**
Walked Dog? (Discrete)	Notes, notebook	handwritten	Raya Young	10/10/2019 - 11/22/2019	**2.576^2 * (0.523(1-0.5230))/0.25 = 2.57 = 3 samples**
Hours Worked (Continuous)	Work, Timesheet	handwritten	Raya Young	10/10/2019 - 11/22/2019	**(1.96 * 3.56)/0.5 = 13.9 = 14 samples**
Hours Studied (Continuous)	Notes, notebook	handwritten	Raya Young	10/10/2019 - 11/22/2019	**(1.96 * 1.64)/0.5 = 6.4 = 7 samples**
Avg. Daily Temperature (Continuous)	Wunderground.com	Wunderground data	Raya Young	10/10/2019 - 11/22/2019	**(1.96 * 7.42)/3 = 4.8 = 5 samples**

Assuming no error from website, but calculated here anyway

MEASURE (2 of 3)

- My data was collected in an excel sheet, and was a consolidation of handwritten notes, tracking apps on my phone, weather data from the web, and timesheets from work.
- I could have measurement error in miles walked, if I didn't have my phone with me; I could have measurement error in time studied, if I did not record this accurately; I could also have error in recording dog walks, if I didn't remember to write this down every day.
- Calculated measurement error is based on repeatability and reproducibility. This could be done using a control chart. I would need multiple sets of data to compare in order to calculate measurement error. Since my project was mostly time-based and there was one measurement per day for each category, I don't think this calculation can apply.

MEASURE (3 of 3)



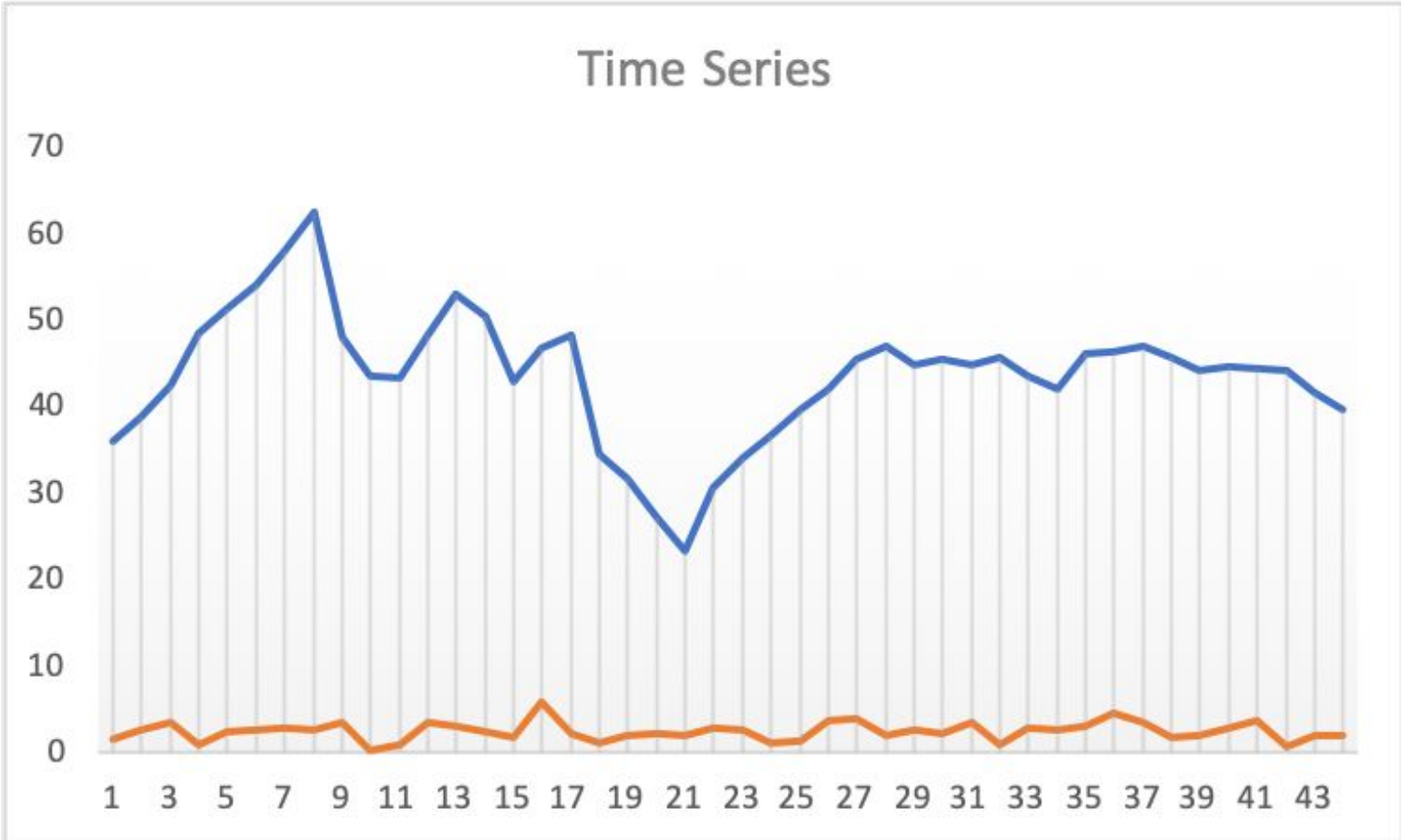
In this image, we can see that 17 days of my current state data, I walked between 2.4 and 3.5 miles. 22 out of 44 days, I walked even less than that. There was only one day where I walked close to 5 miles, my target distance.

ANALYZE

- I only reached my goal once during the baseline process, so with 43 defects and a DPMO value of 43,000,000 (off the charts) the SQL for old process is 0.
- I did not reach my goal at all during the improvement phase, but this span of time was shorter. This meant I had a DPMO value of 19,000,000 which is still off the charts and means my SQL remained at 0.

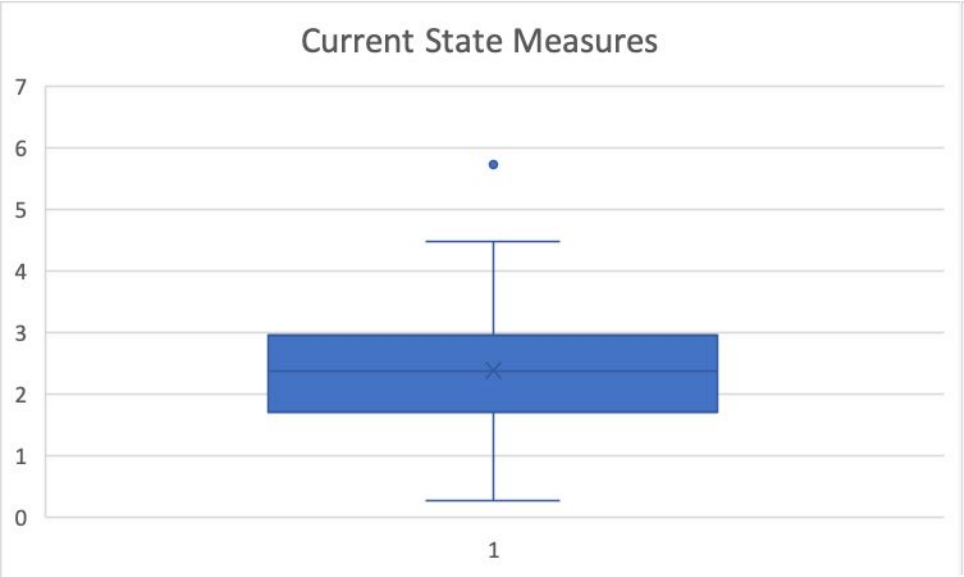
OLD PROCESS	NEW PROCESS
Defect opportunities per unit D = 1	Defect opportunities per unit D = 1
Units produced per day U = 1	Units produced per day U = 1
Total possible defects per day D x U = 1	Total possible defects per day D x U = 1
Total actual defects = 43	Total actual defects = 19
Defect per opportunity rate = 43	Defect per opportunity rate = 19
Defects per million opportunities (DPMO) = 43,000,000	Defects per million opportunities (DPMO) = 19,000,000
SQL value from table = 0	SQL value from table = 0

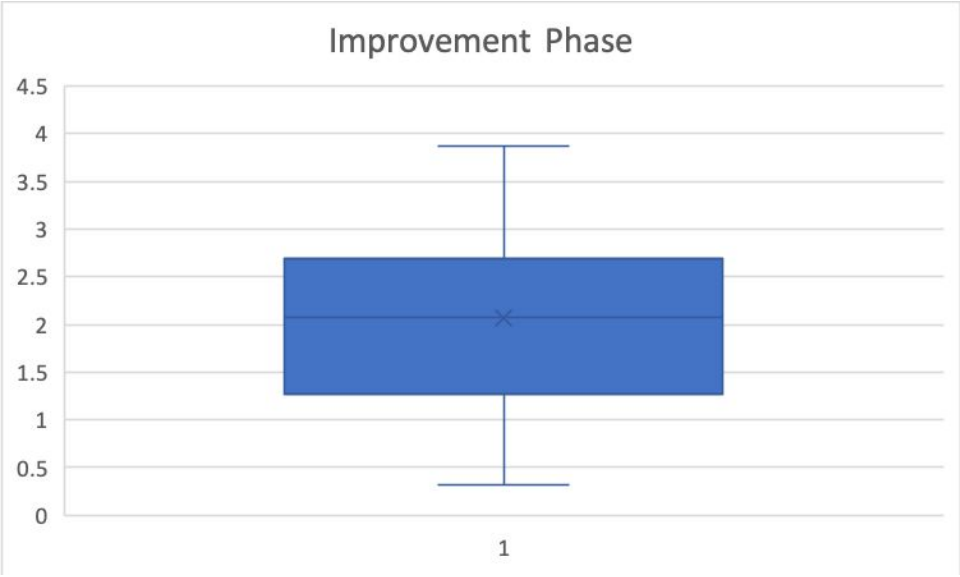
ANALYZE



In this time series plot, I wanted to see if the number of steps (orange) appeared to reflect the outside temperature (blue). While my level of activity did not vary much, there does seem to be some mild reflection in days 1-17. For example, see a dip in both temperature and activity on days 9-11. On my highest performing day (16), the temperature was an average of 46 degrees F.

IMPROVE





In the current state measures, the mean is 2.38, and the min and max are 0.26 and 4.46 respectively. The value of 5.73 is shown as a dot above the max as an outlier.

In the improvement data, we can see at first glance that the spread of data is larger. The mean is 2.07 and the min and max are 0.32 and and 3.86, respectively.

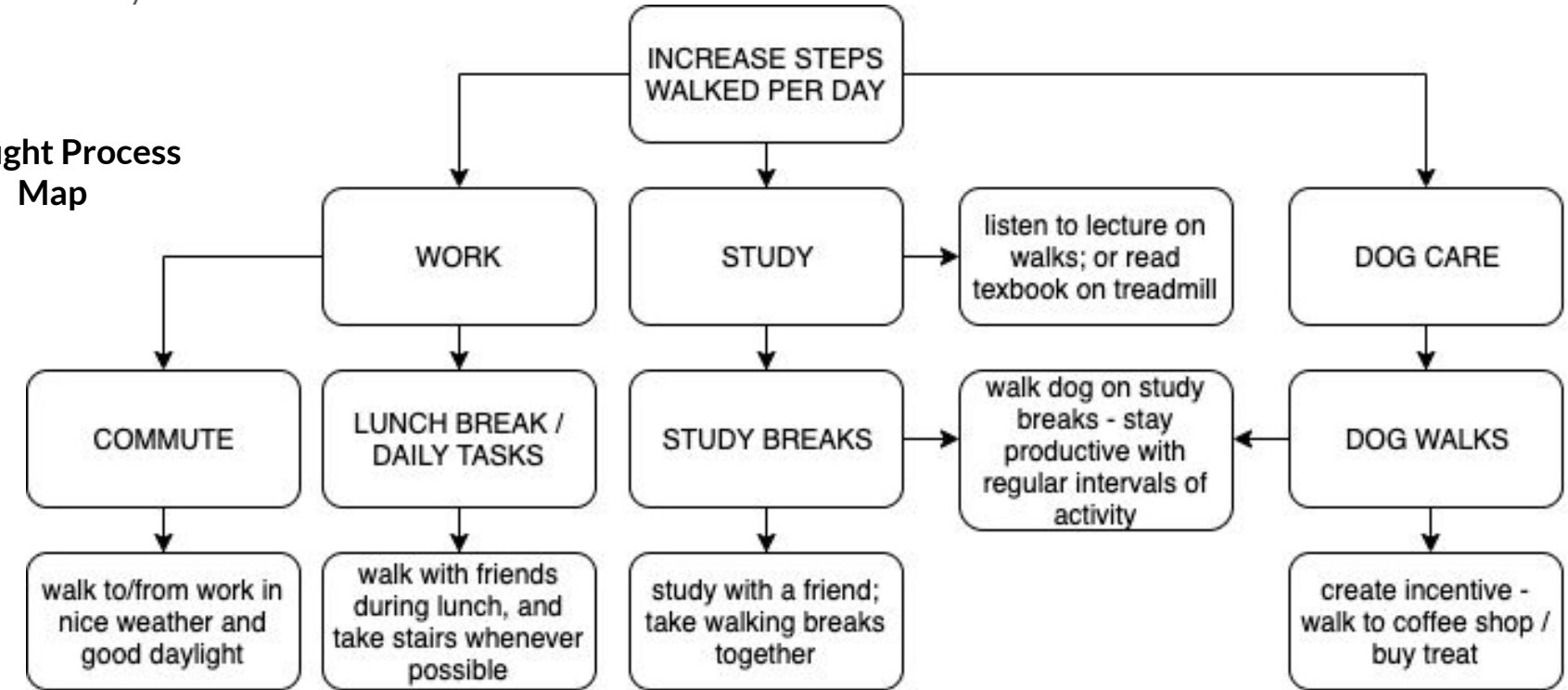
IMPROVE

- By measure of the mean, min, and max of the two processes, I did not improve by 10%, nor did I meet my goal of 5 miles per day more than once throughout the baseline and improvement measurement periods.
- The solutions I proposed and implemented from the improvement phase were to find opportunities to walk while I was at work. I continued to walk during my lunch break, but I also made a point to take the stairs when possible. In addition, I made more of an effort to take the dog for walks during the weekends. I did not successfully improve my process by achieving 5 miles per day, nor did I improve by 10%. What I learned about my process is that the amount I studied (general), in combination with daylight savings, seasonal change (colder weather) and studying for finals greatly impacted the time and energy I had available to take walks.

CONTROL

I will use the information to make the next round of improvement in my process: I think being aware of these ebbs and flows of scheduling, weather, and daylight is my greatest takeaway, and that I should continue to search for ways to include more movement despite these factors. Perhaps bringing my course reading to a treadmill would be a good solution going forward. Including a friend or social time in the process, as referenced in a study break or lunch break would also create incentive and personal accountability.

Thought Process Map



CONCLUSION

In conclusion, I found that my baseline data was much, much, lower than I would have guessed. My original definition of a defect (less than 5 miles) was probably too far reaching, so perhaps 5k steps per day, or 2.5 miles would be a better have been a better benchmark. In addition, I found the improvement process to be an equal challenge. Though I only aimed to improve by 10%, academic and environmental factors (daylight savings, changing seasons) became barriers to take a leisurely walk. My biggest lesson is that measurement is important - I knew I had a problem, but didn't realize the size until I started to observe it. From there, formulas and strategies can be applied in an iterative fashion to continually improve and optimize any process.