Career Exploration Report

Mechanical Engineer

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ABSTRACT

This document provides a template for students at the Dayton Regional STEM School to complete extensive independent research focused on career exploration and to report their process in a professional technical-style report. Reports are key forms of communication in the workplace, especially in STEM fields, so the purpose of this task is to provide students with the experience of creating a similar report after conducting independent research on potential future careers fields, internships, jobs, etc.

TABLE OF CONTENTS

CAREER EXPLORATION REPORT

OVERVIEW

The purpose of this document is to report the research process of Nick during(his career exploration in Technical Reading and Writing at the Dayton Regional STEM School during the 2020-21 school year. The following sections document essential questions used to begin the career exploration process, potential career(s) and rationale(s) for choosing those career(s), an overview of the research process used during Nick's career exploration, resources found and used during the process, a resolution, and a reflection of the process as well as a daily logbook of all tasks completed.

The following Driving Question was used to guide this career exploration process: How can I locate a potential internship site, college, potential career by conducting extensive independent research?

ESSENTIAL QUESTIONS

Throughout the career exploration research process, the following questions were asked

- WHAT IS A POSSIBLE CAREER I'M INTERESTED IN EXPLORING?
- WHAT ARE THE SKILLS AND DEGREES REQUIRED FOR THIS CAREER?
- WHAT TYPE OF INTERNSHIP COULD PROVIDE ME WITH SOME OF THE SKILLS NECESSARY FOR THIS CAREER?
- WHAT DOES THE TYPICAL WORKDAY LOOK LIKE?
- HOW STRESSFUL IS THIS CAREER?
- IS THIS CAREER DANGEROUS?
- WHAT DOES THIS CAREER LOOK LIKE IN OTHER COUNTRIES?

POTENTIAL CAREER & RATIONALE

This section provides a comprehensive exploration of a future career as well as rationale for choosing that career.

MECHANICAL ENGINEERING

"Mechanical Engineer" is a pretty vague term. Saying that you want to be a mechanical engineer is the verbal equivalent of gesturing vaguely in the direction of technology. The reason I did exactly that is because I'm not entirely sure what subcategory of Mechanical Engineering I would like to go into yet. However, let me make a gesture that narrows things down a bit. I am most interested in the additive manufacturing, small electronics, and autonomous navigation industries, just to name a few.

With the exception of additive manufacturing, all of these industries have notoriously high standards for the education of their employees, with most of them requiring an engineering degree, as well as proof that the applicant is already proficient in skills required by the given industry. Some employers have different standards for these prior skills. For example, if a company just got a bunch of new equipment, an applicant showing prior experience with similar equipment might positively influence that applicant's chances of getting a job there.

The wages a mechanical engineer can expect to receive, however, do not vary nearly as much. Only 10% of mechanical engineers work for anything less than $57k, with most engineers working for almost double that. (Bureau of Labor Statistics)

The process of iteration is consistent throughout engineering industries: design and build a prototype, analyze the effective/ineffective aspects of that prototype, and improve it based on the observations. An engineer's daily tasks are very dependent on which phase of the process they are in, and they will spend anywhere from a few days to a few years in any given phase of this cycle. So, when talking about an engineer's workday, it's best to talk about them on a monthly or weekly basis, rather than detailing every task they perform on every day. Some engineers can specialize in a particular phase, meaning that their workdays remain mostly the same.

Starting with designing a prototype, the vast majority of this work is done in CAD. That means a lot of time spent in an office on a computer, having meetings & brainstorming sessions with colleagues, etc. When someone says, "back to the drawing board", this is the phase they are referring to. This process can sometimes be done simultaneously with the building phase, but It is usually impractical for larger projects. This phase usually takes upwards of 6 months.

Then there is the process of building the prototype. For the industries I'm interested in, this usually doesn't take more than 8 months. This phase will have engineers either working with 3rd parties to get materials/parts, or using in-house manufacturing equipment to make components themselves. Any major oversights in the initial design phase are usually ironed out before this phase is complete.

Moving on to the testing phase. This phase will have engineers developing specialized equipment, pouring over test data, and writing papers on how to improve the design. There are a lot of engineers that specialize in this phase. These engineers have a small iteration cycle of their own, as every different prototype requires different testing solutions that must be improved upon periodically. The time spent in this phase can vary depending on the nature of the tests, and how well the prototype performs. For the industries I'm interested in, this could take anywhere between a month to the better part of a year. However, it is practical to iterate on the prototype while running tests on it.

It is hard to predict what working environment an engineer might find themselves in. An engineer working in additive manufacturing might find themselves in a warehouse full of Milling equipment and filament production lines, or in an office full of firmware developers and designers.

An engineer working in consumer electronics might find themselves in a workshop full of circuit board making equipment and specialized testing setups.

An engineer working in autonomous navigation might find themselves in an office full of computer scientists and software engineers, on a testing ground equipped to make quick changes to prototypes, or in a large workshop filled with manufacturing equipment designed to accommodate larger designs.

So, mechanical engineers work in a variety of environments. Needless to say, some of these environments pose possible safety threats. Because of these and other reasons, some engineers prefer to spend more time working on computer drawings.

So, what makes me suited to be a mechanical engineer? In my spare time, I do things like modify small-scale devices to do something different from its intended purpose, or make a crude robot and see how well I can get it to perform with only software changes. I have a 3D printer that constantly requires maintenance, and maintaining it has given me a good insight into the kind of maintenance required by most industrial machines. These hobbies are good practice for many of the tasks that an engineer might perform, hence my interest in the field. When you look at anything man-made, be it a piece of art or a functional product, you can usually tell if the people who made it were passionate about what they were doing. No amount of skill can compete with a legitimate liking for doing something. This is why I feel it is important to pursue a career that you enjoy, you always do your best work when you enjoy doing it.

POSSIBLE INTERNSHIPS FOR MECHANICAL ENGINEER

Possible internships:

Applied optimization

Parker Hannifin

AES corporation

Skills:

Applied optimization needs someone to help with data analysis, so I would probably learn a thing or two about computer programing.

Parker Hannifin needs someone who can work with customers to make cad models meet their constraints, so I would probably get really fast with many types of CAD software.

AES corporation needs someone to help coordinate engineers, so I would probably learn a lot about team management.

RESOURCES

This section provides a list of resources found during the career exploration research process (can include resources used to explore your career fields, possible internships, etc.).

Mechanical Engineers : Occupational Outlook Handbook. (2020, September 21). Retrieved November 13, 2020, from https://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm

What is Mechanical Engineering? (2019, May 30). Retrieved November 13, 2020, from https://www.me.columbia.edu/what-mechanical-engineering

What Is Mechanical Engineering? (n.d.). Retrieved November 13, 2020, from https://www.mtu.edu/mechanical/engineering/

Noodle. (n.d.). Retrieved November 13, 2020, from https://www.noodle.com/articles/the-pros-and-cons-of-becoming-a-mechanical-engineer

17-2141 Mechanical Engineers. (2020, July 06). Retrieved December 10, 2020, from https://www.bls.gov/oes/current/oes172141.htm

REFLECTION

This section provides the reflection and resolution to Nick's career exploration.

This research process has made me consider the variety that a single career can offer, and how no two careers are identical. I learned that switching companies is something some engineers do quite frequently, and that job security isn't a huge concern for them. Personally, I like variety, but I don't like the idea of constantly getting new jobs at different companies to get it. I also learned that giving feedback on someone else's work is one of the most helpful things you can do in the engineering industry.

A lot of what I found in my research took me by surprise, I definitely see myself researching a potential career in the future. Though, I would probably document my research by keeping annotated versions of the documents, as I don't particularly enjoy writing reports.

LOGBOOK

The following logbook was kept during Nick's career exploration process. It details the tasks completed during this process including sources consulted, essential questions asked and answered, as well as any other information collected each day.

11/9	Find sources for mechanical engineering, add to career questions
11/10	Find internship opportunities, determine what skills would be improved by different internships
11/12	Answer career questions, document resources, outline report
11/18	Draft report
11/20	Start revising report intro
11/23	Fix grammatical errors and re-word based on critique
11/24	Continue adjusting based on critique
11/25	Draft reflection and add to report outro
11/26	Write examples of work environments for engineers
11/27	Report-wide word count reduction
11/30	Finish reflection
12/2	Re-write 2nd paragraph and outro
12/9	Report-wide polish and word reduction