

Combined Degree Scholarship Program. A Great Opportunity Which Can Come with Hard Choices

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I have spent 24 years as an electrical engineer in both the telecom industry aerospace industry. Before joining the School of Engineering here at GVSU, I worked for Teradyne and Tellabs in Chicago and at Eaton Aerospace, GE aviation and Parker Aerospace. I have spent the last 6 years teaching embedded systems, power supply, signal and sensor design.

GVSU Combined Degree Program.

A Great Opportunity Which Can Come with Hard Choices

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abstract --- Grand Valley State University (GVSU) offers high performing students the choice to continue their education past undergraduate studies and “fast track” into a graduate degree. Students who choose this route early in their academic career can complete their master’s degree in about a year, less time than it would take had the student pursued a graduate degree independently. GVSU was awarded a grant to help high performing students who might not be able to afford graduate school the choice to participate in the combined degree program. This helps students from diverse, underrepresented backgrounds have a choice where there were no options before. Many of these students are the first generation in their family to attend a university, and never considered the option of an advanced degree. This paper investigates the options a student in West Michigan should consider when making such a commitment. This includes important decisions on financial gains and losses, committing to a master’s topic that fits the student’s overall interests, and overall perspective from West Michigan’s employers.

The combined Degree Program was offered to students ranging from sophomore to junior year standings. Students were selected based on their grades and financial need by Grand Valley State engineering faculty. Some selected students were apprehensive to receive this award as there were many things to consider. Continuing straight to a combined degree meant that the student would not receive any degree until completing the requirements for both the undergrad and graduate requirement, with a bonus of applying some undergraduate credits to their graduate degree. This paper reviews important aspects learned by the Grand Valley faculty of this scholarship program after completing three rounds of scholarships to three groups of talented students.

Introduction

There are very few reasons not to get a master’s degree in engineering at some point in a student’s career. These reasons might include a change in career direction out of engineering, or time or money limitations. Once a decision is made to pursue a higher educational degree, students in engineering are presented with a variety of challenges and options. Getting accepted and obtaining the resources to attend a university is difficult and requires commitment. The same reasoning can be applied to excelling at undergraduate classes as engineering is known as

one of the most difficult curriculums [1]. Next, venturing out into the world to apply the training and knowledge is usually very rewarding for engineers, but also intimidating and stressful as former students are now expected to contribute to productivity at higher salaries than many are used to. Some students consider an alternative to this final academic leap into industry, and that is to continue directly into a master's degree. Grand Valley even offers an opportunity to prepare for this degree before completing an undergraduate degree, saving the student some time and money while acquiring two levels of degrees. It is important to consider all the ramifications and rewards of either path. These include financial gains and losses, time commitments, experience, and industry needs. New engineers are good at math, but not always good at finance, especially when suddenly presented with a large increase in salary. Students should consider long term engineering career options as many aren't privy to the many routes they can take once their careers begin. A master's degree can help direct a student down one or more specific routes, which may or may not be the optimum path for their career. Finally, a master's degree may open many more job opportunities, but also close others. Weighing all these decisions should be considered when pursuing a master's degree.

Point 1: Compensation for a master's degree

There are many majors where students are highly encouraged to get a master's degree soon or directly after graduation. These include speech/physical therapy, education administrators, psychologist and many others [2]. Without a master's in these majors, students would be hard-pressed to find employment. Recent polls have shown that almost 74% of employers have raised educational standards. This is not the case with engineering. For West Michigan technical companies, this number is a bit lower, closer to 50%.

Many companies are looking for engineers with basic skill provided by universities and limited work experience. These companies can then continue the applicants training through mentorship or on-boarding to help the engineers become productive employees.

One factor to consider when pursuing a master's degree is compensation. An applicant with a higher degree in engineering can expect on average an extra 14% when starting a new job in Michigan [3]. The largest gains from a master's degree can be obtained when switching jobs and not from promotion at a current job [4]. From a recent poll in west Michigan, even though 70% of technical companies with engineering openings said they would hire someone with a master's degree even with no real experience, only 50% said they would compensate that person for having a higher degree. These polls were taken directly with recruiters from the companies at a career fair or over the phone. Not all respondents were members of human resources. No one would give a number for the actual amount of compensation because this depended on a number of circumstances, level of any experience and type of job. Half of all companies offering extra compensation isn't insignificant, but the number of companies increases if the applicants also bring in experience.

So how much compensation would make this effort easier to decide? It depends on a number of factors, but typically there is a net gain by the time retirement hits, but it may not be significant.

Grand Valley has received a grant from the National Science Foundation to compensate several high performing engineers to give them the chance at a master’s degree with a full ride scholarship. With this opportunity, students can get a bachelor’s and a master’s in as little as one year longer than just a bachelor’s alone. So, if tuition isn’t an issue, what’s the cost?

Assuming an average salary [4] of \$60,000 for a new engineering graduate (this average number varies based on type of engineering degree), a continuing education student would obviously be down at least \$60,000 when graduating compared to a fellow student who got a job after graduating with just an undergraduate degree. Assuming up to 20% increase in salary, the student would ideally have to work 5 years to make up the losses from staying in school at least an extra year. This is not realistic, as each student would expect a raise in compensation each year. To illustrate a more realistic example, the figure 1 compares two students. One who graduates with an undergraduate degree and earns \$60,000. The second student graduates with a master’s degree one year later, earning 20% more (or \$72,000). Each earns 4% raises/year. The chart shows the results after 10 years.

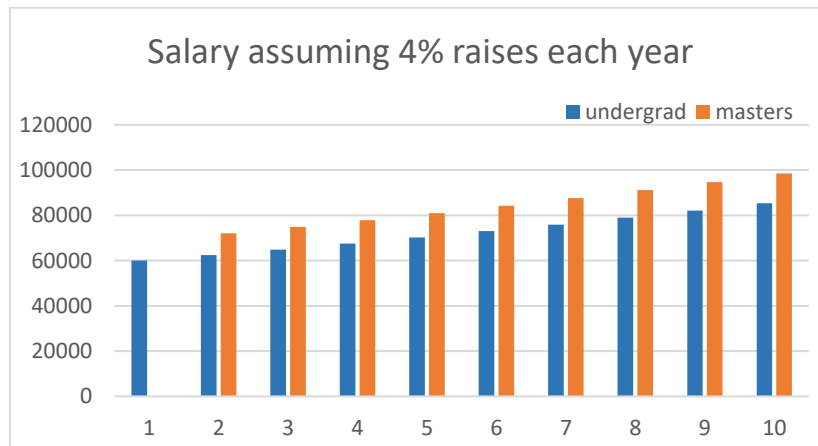


Figure 1

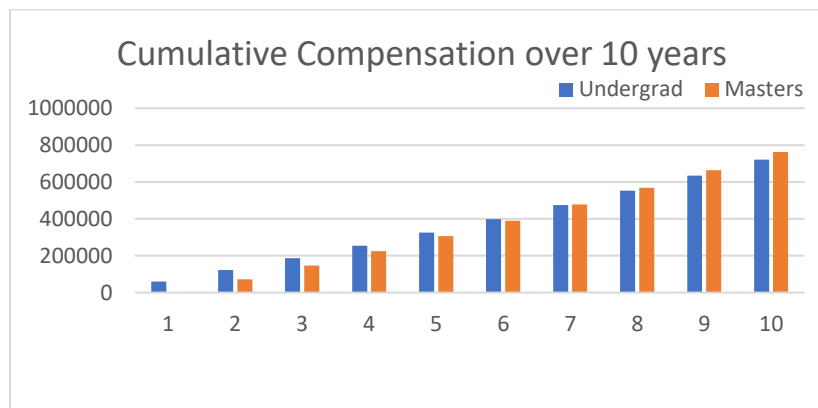


Figure 2

After 10 years, the engineer with the undergrad earns \$85,400/year, the engineer with the master’s degree earns \$98,500/year

After 10 years, the engineer with the undergrad has earned a total of \$720,300

After the same amount of time, the engineer with the master's has earned a total of \$762,000. This is just under \$42,000 more over 10 years in favor of obtaining a master's degree under this scenario.

But that's only part of the financial story. The undergrad can invest in a 401K. Assuming they invested 5% of their income (with 100% matching), this engineer banks \$3,000 of their own money, and receives another \$3000 from the company. This is just a hypothetical example, but a fairly standard one. Some companies don't match at all, while the average was 4.5% according to Vanguards/ annual report [5] 401K's have averaged 5-8% return per year.

The first-year investment of \$6,000 at age 21 will result in about \$44,000 when the engineer reaches age 62. If the second engineer with the masters' does the same starting at age 22, they will end up with about \$50,000 at age 62 just from that first year (assuming they started with an income 20% higher).

So the difference in investment income from just the first year is about \$6,000, in favor of the master's student. If the engineer with the master's made the same wage as the undergrad, they would end up with about \$42,000 more at age 62, or a loss of \$2000 in interest from the first year investment alone.

Point 2: Master's topic

A nice feature in many engineering curriculums is a general engineering course where students can experience different engineering fields in their first year of study. Many students think they like the idea of engineering, but don't really know what an engineer does or what the different disciplines are. Many can identify Computer and Mechanical engineering don't know about chemical, aerospace, industrial or Product Design and Manufacturing engineering. After the second year of study, students must commit to an area of engineering they prefer. Even after this, students change their mind as they learn more about each program.

In the 3rd or 4th year, as graduation gets closer, is a student ready to select an area to master? What is the basis except for internship/co-op experience or maybe on classes they enjoyed?

Master's topic may or may not be in line with career goals.

- 1) Engineering experience preferred.
- 2) May have more options/ responsibilities with a master's degree.

Point 3: What do employers expect?

It seems reasonable to expect that having a master's degree in one's portfolio would make that person more attractive to employers. Many employers know that engineering programs are rigorous. Only about three in ten make it through a typical undergraduate program [5]. Obtaining a recent graduate gives the employer a chance to mold that engineer with the

company's processes and tools. Having a master's degree or even too much experience can reduce an applicant's chances- especially at an entry level position.

Seventeen West Michigan companies were surveyed. All had hired or considered hiring engineering graduates in the year 2023. The first question asked was:

- 1) Does your company consider hiring new engineering candidates with both a BS (bachelors) and an MS (masters) degree (earned back/back)?

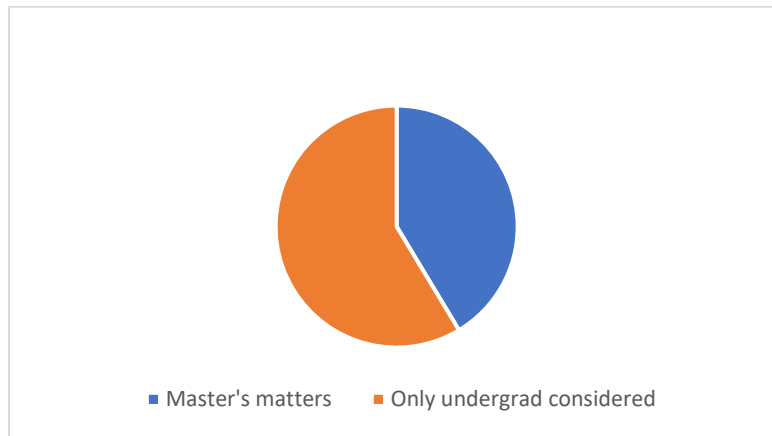


Figure 3:

The answer came back as 12/17 answered YES (70%) as shown in Figure 3. Digging a little deeper into the survey, many answers contained a caveat. Of the 12 who answered yes, 5 of the respondents added one of the following:

- a) Experience trumps having a master's degree.
- b) We do accept those without a master's but prefer without
- c) Depends on the role they will fill.
- d) Yes, but prefer work experience.
- e) Yes, after a formal assessment of their abilities.

This brings the total of solid "YES" responses down to 7 of 17 or 41. Companies set the bar high for new undergraduates in engineering- and many don't see a much gain in raising that bar even higher for a student with a Master's – especially if that Master's degree may not directly apply to that company's line of work.

The second question asked in the survey:

- 2) Are new engineers with advanced degrees (earned back/back) given higher compensation?

The answer to this question is already predicted in the results of the first question, as 5 of 17 respondents did not consider hiring students strictly because they have a master's degree. But

strangely, 9 of 17 did say they would or would consider compensating for an applicant with a master's degree. But again, there is a caveat. Some of these respondents added comments that this all depends on the position, interview or using some compensation algorithm. Some just said they would compensate, but just "a little". Five of the respondents gave a solid "yes" to this question. All respondents mentioned that experience was more important. This included internships or co-op programs where students had work experience so they could learn how to communicate and solve problems in the real world.

Employers value experience and may not value advanced education as much for entry level positions. Based on the surveys, this seems to particularly apply to entry level positions and not an applicants second job or beyond.

Point 4: Balancing time

Many students worry that if they wait too long to get a master's degree, they won't remember many of the fundamentals they learned during their time as an undergrad. Other worries include that there just won't be time after graduation. It is common for industry to sponsor employees in engineering who choose to pursue an advanced degree while working full time. GE Aerospace has a program to send employees back to school full time while employed. The stress of full-time work, learning curves, vacations, maybe family and extra-curriculars may not allow time to pursue a graduate degree. It's difficult to quantify how time can affect a decision when to go back for a Master's. In the U.S., the average age of students earning a master's degree is 33 years old, while 22% are over 40.

In 2015, 12 percent of adults over 25 years of age had earned a masters, although the completion rate for finishing a master's degree was about 61 percent. So when making the decision to pursue a Master's, there is a 39 percent chance that the degree may not materialize. This may be because so many students are pursuing their degrees while working, raising families or just lose interest. There are many reasons for delaying the completion of the final project/thesis.

Conclusion

There are many professions that require higher degrees to become employable with a reasonable salary. Engineering isn't one of those professions. A higher degree is a choice for those who are looking for more out of engineering. Some of those choices may be better made after a student has earned some experience, but this is at the risk of issues of time and responsibility. This seems true in West Michigan as the limited survey of employers have indicated. Overall, there is little doubt that a higher degree will benefit most engineers. This article specifically What requires some careful consideration is when to pursue that degree at the expense of convenience, responsibility, experience, and compensation.

Bibliography

1. University of California, Berkeley. <https://pages.github.berkeley.edu/OPA/our-berkeley/gpa-by-major.html>. Overall GPA by Major. 2017
2. Post University. <https://post.edu/blog/jobs-that-require-a-masters/> 16 jobs that require a Master's degree, Aug 27, 2021
3. Salary.com. Graduate engineering salaries in Michigan. Oct 25, 2023
4. Brown, Lex R. Promote with Pay Bump vs. Changing Jobs for Pay Increase. Linked In, April, 2023.
5. Parker, Tim. What is a Good 401(k) Match? How it Works and What's the Average., Investopedia.com. May, 2023
6. ASEE. <https://ira.asee.org/wp-content/uploads/2017/07/2017-Engineering-by-the-Numbers-3.pdf>. Engineering by the Numbers: ASEE Retention and Time-to-Graduation Benchmarks for Undergraduate Engineering Schools, Departments and Programs