The Best and Worst College Majors

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1 Introduction

Many articles rank college majors by future income and/or social status, some in great detail[1,2]. In this article I take a more philosophical approach – instead of listing majors alongside their future income and social ranking as many articles do, I hope to provide some insight into *why* a particular field of study has value, how it fits into the future world.

1.1 Educational Conservatism

Colleges and universities normally represent a more conservative outlook than that of their students and of society. Historically this conservatism serves the purpose of curbing the more irrational and impulsive instincts of young people, while preparing them for an adult world that runs at a much slower biological clock rate. But when the world outside academia is rapidly changing, students may be ill-served by the instincts and choices of their educators, who may simply not know what society wants and needs. It's my view that we're living in such times – times when even captains of industry don't know the true direction of their field.

1.2 Future-Proofing

When choosing a college major, students should ask how their choice will stand up over time. Some careers are expanding in both size and importance, while others are being phased out by scientific and technical advances.

At the time of writing automation and robotics are replacing entire categories of employment. Students should remember that if a computer can do a job more efficiently than a person, eventually it will. Therefore a profession that relies on fixed rules and behaviors is not necessarily a wise or future-proof choice.

1.3 STEM

Another way to look at this is to ask which professions have the most growth potential and unfilled positions, and the answer is that the STEM – Science, Technology, Engineering and Mathematics[3] – professions have unfilled positions and great present and future potential. STEM fields encompass areas of human activity that represent our future, both in terms of social good and professional advancement. These fields also represent activities that are the most future-proof – they're least likely to be automated or declared obsolete.

By contrast, the least attractive, least future-proof career choices are those farthest removed from the STEM fields, professions that require the smallest understanding of science and mathematics. In fact, some non-STEM fields are being replaced by new fields that do rely on science and technology. One example is psychology's ongoing replacement by neuroscience[15], which is why psychology is a particularly bad career choice.

1.4 Nerds versus Nurses

Let me address what may seem at first glance to be a legitimate objection to a focus on STEM fields. Some argue that such fields attract uncaring drones, nerdy types who have no measurable emotional life or compassion for those in suffering. The inevitable contrast is made with those in the "caring professions[4]" such as nursing, teaching, or social work – fields that involve looking after other people.

This contrast between nerds and nurses makes good fiction, but it overlooks important issues. One is that, confronted by a life-threatening illness, a nerd may be able to design a vaccine to either control or eradicate an illness, as is true for polio[5] and smallpox[6], while a nurse may only be able to find the patient a more comfortable pillow before he expires.

Another issue is that good, high-quality science – the kind of science that produces vaccines – must be conducted with perfect dispassion. This means while exploring nature, a good scientist cannot care where the evidence leads – emotional attachment to a particular result undermines the entire process. This is the source of the stereotype of the emotionless scientist, the "nerd," who in everyday life may be a passionate and empathetic person, but who understands that her science requires perfect objectivity and a complete absence of emotional bias.

1.5 Philanthropy

Strictly speaking and concisely, *philanthropy*[7] means "love of mankind". In modern times and in general it refers to activities meant to promote human welfare. To a student choosing a college major, philanthropy may be the farthest thing from his or her mind, but over decades of time, how one's choices affect the world – for better or worse – becomes more important. To some extent the issues and choices I describe below address philanthropy as well as

simple economic self-betterment. Fortunately, in many cases career choices that benefit the individual also benefit the world.

2 Best Choices

In this section I describe positive career choices. I do this by describing important social problems and issues, then list professions most likely to contribute to them.

2.1 Batteries

Figure 1: Cell phone with overheated battery

(I lead this section with the battery problem because it represents "low-hanging fruit" – an immediate and practical problem that cries out for a practical solution, as well as being a potentially rewarding field for people able to think creatively.)

In a recent interview I was asked for an example of a serious technical problem with far-reaching social implications. That's a no-brainer – right now the dismal state of storage batteries is at the top of a short list of obstacles to technical progress.

2.1.1 Definition

A battery[8] is a convenient way to store electrical energy. A modern battery can receive and store electrical energy (charging) and later provide most of that energy, perhaps at a different location or time (discharging).

2.1.2 Applications

Today, batteries play a key role in:

- **Portable electronic devices.** Cell phones and other kinds of portable electronics rely for their existence on rechargeable batteries, but aggressive efforts to increase battery performance sometimes create widespread failures and recalls[9].
- **Electric cars and other vehicles.** The auto industry is in the midst of a revolution, with all major manufacturers either planning or building electric cars. Britain, France and China have set deadlines for a ban on the sale of gasoline and diesel powered vehicles, in aggressive programs meant to replace fossil-fueled cars and trucks with electrics.
- **Off-peak storage of wind and solar energy.** In modern electric power generation, replacement of coal-fired plants by renewable sources such as solar and wind requires a means of energy storage, because times of peak generating capacity (daylight hours for solar) aren't synchronized with times of peak power usage (evening and nighttime hours). There are a number of ways to store generated electric power until it's needed[10], and one solution to this problem relies on banks of rechargeable batteries, with advantages over other approaches like no moving parts and a simpler overall design.

2.1.3 Problems

All the above applications are burdened by the present dismal state of rechargeable batteries – their energy density (energy per unit of mass) is low, their service lifetime is short, they waste substantial power while being charged and discharged, and they sometimes catch fire.

2.1.4 College Training

The battery problem will be solved by people trained in the STEM professions. *One or more of those people will become fabulously wealthy* by inventing and marketing far better batteries than we have now. As to the announced plans to replace all gas and diesel powered vehicles with electrics, carrying out that plan will also require people trained in the STEM fields, engineering in particular.

2.2 Power Generation and Distribution

Figure 2: Conventional Power Distribution

Within the lifetimes of today's students and their children, the present electrical power system will be entirely replaced, end to end – how power is generated, how it is transmitted from place to place, and how it is used:

- The power-generating end of the system will phase out coal and petrochemical generating methods in favor of renewable sources like solar, wind, geothermal and (on a longer time line) fusion power.
- The present high-voltage alternating-current power distribution system will be replaced by one based on more efficient, more reliable and less environmentally burdensome direct current superconductors[11].
- The consumer end of the power equation will change as well. More efficient uses of electricity will reduce loads, while grid-connected schemes[12] – where a consumer's local generation sources sometimes feed power back to the system – will become more common.

2.2.1 Problems and Remedies

The present power system is enormous, inefficient and unreliable, and its problems will become worse as its environmental impact increases and its required consumables become less accessible and more expensive. For this system, it's not a question of *whether* it will be replaced, but *when*, because we will either volunteer to replace it in advance of necessity, or the increasing cost of coal and other consumables will force a replacement.

2.2.2 College Training

As before, those trained in the STEM professions will lead the way. Scientists and engineers will design and build more efficient, less environmentally harmful replacements for each phase of the present power system. This revolution will be marked by two key developments – practical fusion power and room-temperature superconductors. Both developments will require the kind of advanced thinking that STEM training prepares us for, thinking that isn't susceptible to automation.

2.3 Artificial Intelligence and Robotics

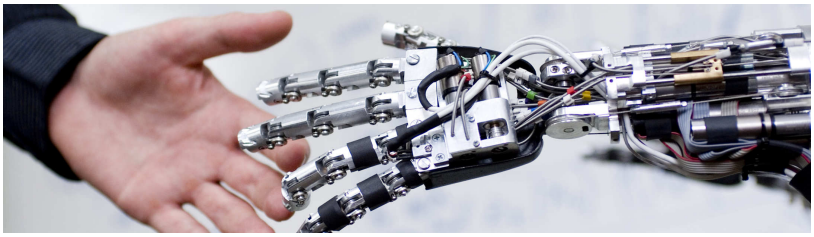

Figure 3: Robotic Hand

Artificial Intelligence (AI)[13] is an important social opportunity/problem that will completely reshape society in the next few decades:

- Most jobs that rely on fixed rules and behaviors will be replaced by robots, machines that understand fixed rules, don't get tired, don't have coffee breaks, and don't demand raises.
- Most machine operators, vehicle drivers and aircraft pilots will be replaced by robots – in fact, the advent of self-driving cars is nearly upon us.
- Many jobs now seen as intellectual endeavors – accounting, sales, inventory as just a few examples – will be replaced by robots, semi-intelligent agents that talk to each other at the speed of light.*

2.3.1 College Training

The coming AI revolution will completely change the structure of society. Within a short time we will see a transition from "a computer could do your job" to "a computer *is doing* your job." So a future-proof strategy is to choose a profession that cannot easily be automated, such as one that requires creative thought and advanced reasoning. Again, as before, the STEM professions are the least susceptible to automation, because most of them require a level of creativity computers cannot yet imitate.

3 Worst Choices

In many cases the career choices that most benefit a student, also benefit the world. This is because in a free market people pay for beneficial activities, but refuse to pay for pointless or wasteful activities. This means one way to measure the value of a college major is to list postgraduate unemployment rates.

3.1 Highest Unemployment Rates

Here's a list of the 15 least desirable professions and their unemployment rates[14]:

1. Clinical psychology 19.5% †
2. Miscellaneous fine arts 16.2%
3. United States history 15.1%
4. Library science 15.0% ‡
5. (tie) Military technologies; educational psychology 10.9%
6. Architecture 10.6%
7. Industrial & organizational psychology 10.4%
8. Miscellaneous psychology 10.3%
9. Linguistics & comparative literature 10.2%
10. (tie) Visual & performing arts; engineering & industrial management 9.2%
11. Engineering & industrial management 9.2%
12. Social psychology 8.8%

*The reason? These seemingly creative endeavors apply fixed rules, so they can be automated.

†This oft-quoted statistic requires some explanation. To some extent it results from the fact that many psychology students acquire a bachelor's or master's degree without realizing they must have a Ph.D. to practice clinical psychology. This mistake renders them unemployable.

‡Library science is in crisis because of the widespread social effects of computer resources and online research.

13. International business 8.5%
14. Humanities 8.4%
15. General social sciences 8.2%

3.2 Analysis

Notice that six of the items in the above list refer directly or indirectly to psychology and/or the social sciences. The ongoing decline of psychology and the social sciences has multiple causes – no scientific theories to define the fields[15], poor study replication rates[16], and ineffective clinical practices[17]. But a much more important change is on the horizon – the gradual replacement of psychology by neuroscience.

3.3 Future-Proofing

The transition from psychology to neuroscience is better explained elsewhere[15], but suffice it to say that the best way to future-proof one's college major choice is to avoid psychology and the social sciences entirely. The irony of psychology as a college major is that its popularity among undergraduates – the fourth most popular college degree[18] – seems completely disconnected from the dismal employment prospects revealed in the above list.

4 Conclusion

Among life choices, selecting a college major ranks very high in importance, for many reasons – it represents a large investment of time and money, there's an element of inertia in the choice, and the consequences of a wrong choice cannot easily be undone.

4.1 Seeking Counsel

As unpleasant as this might sound to a young person, there are few choices in which listening to adults is so important, in particular listening to people working in the fields being considered. But there's one group of adults whose views should be treated with skepticism, and that is student counselors and others employed by the college or university in question. The reason? Higher education is a business, and student counselors often have a *conflict of interest*[19] not obvious to an inexperienced student:

- One example of a conflict of interest would be the counselor's desire to guide the student toward a major that can only serve to make the college look good – a major that's easy to acquire, that increases the likelihood of four uneventful years followed by graduation. This outcome makes the college seem effective in educating young people. The fact that the fresh graduate might not be able to find employment is not the college's problem.
- The reverse case would be a student choosing a course of study for which, regardless of its future earning potential, he or she is intellectually unqualified and unlikely to successfully complete.

The examples listed above only serve to demonstrate how difficult it can be to choose the right major, why seeking out and listening to many experienced adults is so important, and why not all advice has equal value.

4.2 Structural Problems

I personally think the present shortage of STEM graduates and unfilled positions[20] may partly result from colleges directing students away from challenging courses that might increase the dropout rate, with consequent lost income for the college. But this is not a simple problem, a just-so story. Preparing young people for a future that needs STEM-qualified graduates may require major changes in the entire education system, from kindergarten forward, with much more emphasis on analytical, mathematical and critical thinking skills than we have now.

4.3 Summary

Young people should try to imagine a world in which all repetitive and/or predictable jobs are performed by robots, cars and airplanes are guided by software rather than drivers/pilots*, printed books and libraries are a thing of the past, being able to program a computer is accepted as a basic kind of literacy shared by all educated people, and

*And the automobile death rate will fall to nearly zero.

people who have jobs do so because they possess skills computers can't imitate. Use that image to guide your choice of college major.

References

[1]10 Best College Majors for a Lucrative Career – from Kiplinger.
[2]30 Best Paying College Majors: 2017 – from ThinkAdvisor.
[3]Science, Technology, Engineering, and Mathematics (STEM) – an acronym describing fields with high present and future potential.
[4]Caring profession – such fields as nursing, teaching, or social work, that involve looking after other people.
[5]Poliomyelitis – a disease that has been nearly eradicated by way of a vaccine.
[6]Smallpox – a disease successfully and completely eradicated by application of a vaccine.
[7]Philanthropy – from the Greek *philanthropia* meaning kindliness, humanity, benevolence, love to mankind.
[8]Battery – a storage device for electrical energy.
[9]Samsung announces what caused the Galaxy Note 7 to overheat and explode
[10]Grid energy storage – methods to store generated electric energy until it's needed.
[11]Superconductivity – a special material property that allows current to flow without resistance.
[12]Grid-connected photovoltaic power system – a scheme in which locally generated wind and/or solar energy feeds the power grid.
[13]Artificial intelligence – intelligence exhibited by machines.
[14]25 college majors with the highest unemployment rates – from CBS Moneywatch.
[15]Psychology and Neuroscience – an analysis of modern psychology.
[16]Psychology's Replication Crisis Can't Be Wished Away – from The Atlantic.
[17]Why Ineffective Psychotherapies Appear to Work – from the journal Perspectives on Psychological Science.
[18]Most popular majors – from the National Center for Education Statistics.
[19]Conflict of interest – a situation in which a person has divided and possibly conflicting interests, some of which may not be apparent to those around him.
[20]Short on STEM Talent – from U.S. News and World Report.