

# Grad School 101

DAVID FIELD: My name's Dave Field.

I am the Associate Dean for Research,

and Graduate Studies in Engineering.

SPEAKER: Got someone online.

DAVID MAKIN: I think I scored a point.

[LAUGHTER] I base this on engineering,

but it's generally applicable for grad school.

I don't know if you've heard of these PHD Comics?

Grad students love these things,

and so they're all over the place,

and I threw a couple of there just to amuse myself.

Graduate education, typically, you have

the option of research or course only graduate degree.

Course only graduate degrees,

there is a number of them.

Typically, they are designed for working professionals, people who are working,

and then they want a master's degree to get a step up above their peers,

I listed a couple in the engineering field,

but it could be MBA or could be non-thesis masters in almost any field.

These have become pretty common because typically when you do non-thesis masters,

the money goes into the department,

and so it's a way that they can get more money into the department.

A lot of times standard tuition for

undergraduates or grad students doesn't necessarily go in,

but for these programs it does.

It's considered to be the extra work for the department so a lot of people have started these programs specifically to help offset some budget issues.

Application process are quite different if you're doing a research program or if you're doing a professional program or a course-only program.

These professional degrees, like I mentioned,

it's a way to cover budget shortfalls,

and typically you do only courses.

Sometimes they'll make you do a final experience or capstone

type experience like you would do as a senior for

your degrees but mostly it's just courses,

and if you do some culminating experience,

then usually it's pretty simple,

and probably based typically on what you would be doing in your workplace

anyway but maybe it's something you would

define specifically because there's a lot of people

also that just get a bachelor's degree,

and then they want to be more competitive against the other people with

bachelor's degrees so they'll go straight in from the bachelors into a master's program,

and do a course only.

The way you do those,

pretty much is like you would apply as an undergraduate.

A lot of times you have to take a GRE,

graduate record examination or the graduate school tests,

and then you submit your grades,

and you're selected among those.

See if there's something else.

Self-funded. Typically, it's self-funded or funded by the company.

Now depending where you are specifically,

what degree you get so research-based in engineering,

typically, the funding is coming from the department.

Either the department is paying for you either to be

a TA or you're getting paid directly by a professor as a research assistant.

Career in research, and I have some slides at the end,

we can talk about what that maybe means, career in research.

But typically if you want a career in research,

it's only going to be for if you've done research,

and sometimes you can get in after bachelor's degree

if you had a lot of research experience or sometimes,

if you do a masters or PhD,

then you're specifically targeting those careers in research.

What I state there in bullet number 2 that typically

a graduate assistantship covers tuition,

and a monthly stipend,

and that is almost universally true in

engineering for either research or teaching assistantships.

In the sciences like chemistry or physics or math,

there's so many undergraduates that are taking some of those classes,

it's almost all TA,

it's almost all of them come in for TA.

The same is true with any degree that has a large freshman or sophomore cohort.

Freshman psychology or whatever freshmen classes where there's a lot of students English, so there'd be a lot of TAs sought after for those positions.

Typically your tuition is covered, and some monthly stipend, which may or may not be enough to live on depending where you are and what the department is offering.

Obviously, you have to write a thesis so that means you're doing some research project, and then at the end you have a big thesis which you have a final test where you have to stand in front of your committee members and other colleagues and peers, other students and say, this is what I've done for my research, and then people will ask you questions, and you have to defend your research.

They say, why didn't you do it like this or why do you believe that because of these results, and then you stand up, and defend that.

A lot of times it involves publishing papers so depending on the specific field you're in, you'll be publishing in archival journals or you'll be doing a lot of presentations in conferences.

There's some fields where they feel like if you take the time to publish a paper, then it's already too old by the time it gets published, and so going and delivering it at a conference is the main means of communication of the results but that depends on the field also.

Then I put a few considerations of what you should think about either if you would like to work in a TA or an RA,

if you want to do a masters or a PhD,  
the difference between those is pretty distinct.  
Then you got to figure out what school you want to go to,  
what professor you want to work with.  
Those are all considerations that  
you can think through so that's what these next slides are talking about.

Academic reputation.

Most of us know about US News,  
and World Report but those really tell you nothing about how good a school is,  
tells you about their reputation.

Those are usually ranked according to,  
they send department heads a survey,  
and they list all the schools,  
all the universities that have departments.

Go back, I know.

They list all the schools that have departments in your specific area, and they say,  
how good is this one list from one to five, and you click a button,  
and what about Alabama,  
and Auburn, it goes down through the list.

You're ranking about 300,  
and probably you only know about 50 of them but you just guess, and click.  
That's how you actually use the World Report,  
that's how those rankings are done.

This group, The Center for Measuring University performance,  
CMUP or just MUP,

started at Arizona State,

and it's now at University of Massachusetts,

and you can go, and look at the latest reports.

You can just google majoring university performance,

and it'll take you to this website that I've got listed here,

and it will go through a list what the metrics are for your specific department.

You can choose one that's got high metrics

or wherever you think you fit if you want to be in the top tier.

The other thing, and what I tell students usually that is most

important is who you're working with rather than how good the university is,

it's who specifically you're working with.

If there's somebody in particular that does

research in an area that you're interested in,

sleep in stressful situations,

something like that, you could go to this.

Google Scholar is one but there's a lot of search engines

where you can look specifically at how productive certain faculty members are,

and you want to see that they've published

a lot of papers or given a lot of presentations,

and that people are citing their work.

If you want to see, if you want to work in my area, you would look under me.

You would say, how many papers has he published in 2019/2020,

and what citations is he getting during those years?

That's a good way to say,

I'm getting in with a good faculty member,

even though maybe they're not in the top institution.

Sometimes you could choose the faculty member before you get there,  
and sometimes you choose,  
and you're admitted to the department,  
and then you choose a faculty member after a year or so,  
depending on the university.

Any questions yet, yeah, I'm really clear.

I talk really clear about things.

[LAUGHTER]Just kidding. Okay.

Let's go back and talk about master's versus PhD.

I didn't do that yet, but I wanted to.

When you go to grad school, a lot of times,  
a lot of programs,  
you can go directly into a PhD or you can do a master's and  
then later a PhD or just a master's without doing a PhD.

There's some advantages or disadvantages to both.

One is that the government agencies,  
the government is saying we need more PhDs,  
and so it's more likely that you have money for research if you're doing a PhD.

You go and you talk to a faculty member or a specific department and say,  
I want to go to grad school then sometimes for a master's degree,  
there's not funding available,  
but for a PhD there is.

Typically, it's going to take you between 4-6 years to complete  
a PhD if you're coming straight out with a Bachelor's.

Sometimes less than that,

but typically four, five,

six years is about where you expect it.

To do a master's,

2-3 years is pretty standard to do a research master's, I mean.

Usually, of course, only master's is one year, maybe three semesters,

but doing a research it's

two years to three years because you have to write the thesis as well.

If you're looking for a specific type

of training where you become the world expert in something,

then PhD is what you want to be doing because you have more time to develop your ideas.

If you're not sure, then doing a master's first is probably a good move.

Doing a master's first and then going

on and finishing a PhD if it's something you enjoyed.

So that was my experience.

I went into graduate school thinking,

"Graduate degree might be fun",

but I wasn't quite sure,

so I said let's do a master's.

I didn't have research experience as an undergraduate,

which is something Shelly's going to talk about as well.

I went in, I immediately enjoyed it way better than I enjoyed my undergrad.

Undergrad, you have a lot of pressure,

you have six tests on the same day or three tests and two papers due,

and you're just grinding through to get everything done and running as fast as you can,

and in graduate school it's much more focused.

Even though the work is difficult,



it's much more focused and you don't have  
all these demands from 20 different professors all at the same time.  
For me, the first semester I was burned out after a bachelor's frankly,  
but I was curious and interested in a master's degree,  
so I immediately really loved what I was doing.  
Finished that, and I actually went to a different school,  
so I went to three different schools for my three degrees.  
The only other things that I have to talk about is the kind of  
careers that you get once you go into research.  
Again, these companies that I've put here,  
are companies that hire all kinds of different people,  
but I chose them specifically because of Engineering Computer Science,  
which is the college I work in,  
and so our students will work in these kind of companies.  
They have large research labs,  
and you can get hired indirectly as a researcher into these labs.  
But there's a lot of large companies that will hire in.  
Like Arconic, which used to be Alcoa research,  
Alcoa Technical Center it was called,  
that's where I started my career.  
After I left after I got my PhD, I started there,  
worked there for about four years and it had about  
2,000 people and all they did was research,  
though a lot of these kind of facilities are like this.  
The application.

This requires transcripts and a statement of purpose obviously,  
grades and GRE scores are important if you're doing a research.  
Graduate degrees specifically,  
that statement of purpose is where people can judge you the best.  
They can determine what your enthusiasm is,  
why you chose your specific area, what your drive is,  
what your motivation is,  
and to be able to express that in a statement of purpose is really  
important because most of the times we have no other way to judge you.  
Usually, grades are reasonably good,  
people are applying to grad school and GRE scores.  
If they do bad, they'll take it again until they get a good score.  
So that's the easiest way to judge you.  
It's important to show that you have intellectual curiosity,  
enthusiasm and you want to work hard,  
so that's the things we look for. I like this comic.  
Just shows somebody who got in because of their statement of  
purpose and then just laughed at  
their adviser because I'm not going to really do this, of course.  
I appreciated that one.  
Let me see what else I have here.  
Other place, small companies.  
There's a lot of small companies that hire researchers because they  
develop some kind of niche specialty area.  
They'll hire instant PhDs or some master's who know how to do research,  
specifically focused on a given problem.

So if you can land in one of these,

it's pretty interesting work to do.

A lot of times they're located near where their customers are,

and I used it as an same example in Washington State.

If you look at the list of aerospace companies,

there's over 1300 that consider themselves aerospace companies,

and if you tried to list all your aerospace companies,

you would say, "Well, there's Boeing and maybe there's Aerojet Rocketdayen,

which is aerospace, and maybe there's the Origin.

You're in and out pretty quick but a lot of

people are support companies to these big companies.

There's a lot of small companies that are designated as

aerospace and that's because we have a big aerospace company here.

One of the other places that a lot of people work is in large research consortia,

which is groups of companies

or somebody who's focused on

a specific problem that's of interest to a lot of different companies,

and so, there'll be looking.

I've listed a few here, Semiconductor Research Corporation,

so they're obviously focused on semiconductor research and they'll hire in.

They have staff on permanent.

Semiconductor research corporation staff they have about four or 500 people,

but the large semiconductor companies

will come in and loan 10 or 20 employees from each of the companies,

work maybe two years at that place.

Or you're working side-by-side with people in industry,  
but your position at some specific location.

It just shows you a list of a few that I put down there,  
but there's a lot of these types.

Then state and regional labs,  
which there's also quite a few of these,  
and national labs, which I'll do a lot of research.

Richland, Washington, Pacific Northwest National Lab.

That's the closest one and biggest one to us.

Then this is the last thing I put when I talk about research  
usually and this is from graduating seniors. You guys are seniors?

AUDIENCE: I'm freshman.

DAVE FIELD: Freshman?

AUDIENCE: [? Sophomore ?].

DAVE FIELD: I didn't know what audience I'm talking to.

But the graduating seniors,  
they said this is the best advice that they get.

That's the question I asked,  
what's the best advice?

[NOISE] Find people to work with. Find your people.

That's one of the guys said to me,  
you got to find your people.

Find who your group is that you're working with.

Join some society club that's in your area.

Do research with a professor.

There's a lot of professors that hire undergraduates,

I have eight working in my lab right now.

I have six grad students and eight undergrads that are working in my research lab right now.

Then I always say never just do the minimum.

I mean, you got to make sure you're doing well in courses.

But once you're doing well in courses, do something extra because when people are looking to hire you or to bring you into graduate school, they're going to say, okay, you got your grades and you got your degree, what else?

Were you in a club? Did you do something cool with part of a club or part of a presentation group or competition group?

Did you do some research?

Did you publish something as an undergrad?

How did you set yourself apart?

That's all I have besides my final EHD comic for schools like kindergarten. I like them too.

SHELLY PRESSLEY: Hi, I'm Shelly Pressley.

Sorry. [LAUGHTER] Introduce myself.

I'm Associate Dean in College of Engineering for Student Success, but I'm also the Director of Undergrad Research here at WSU.

We have an Office of Undergraduate Research.

The mission or the goal for that office is to help students just like you find if research is for you and to get started and figure out how to get started in research.

But I want to start with a story just like Dave was saying.

I finished my undergraduate degree,

was really burnt out.

Took me five years to get my degree because I had to switch majors in the middle.

When I left, I was like, "I'm done with school.

No more of that.

I'm out of here." I got a job,

did consulting work for four or five years in an environmental consulting company.

Big company, lot of clean up for hazardous waste sites, things like that.

The company had a design team

that was the ones that got to make the decisions on how to do the cleanup,

not just implement it.

I really wanted to be on that team and I couldn't without an advanced degree.

I was like, all right,

I'll go back and get my master's degree and I'll come back and I'll work.

I knew I would be able to do that,

go back to grad school because I had done research when I was an undergrad.

I had spent a summer doing research and it showed me that I enjoyed it,

I liked it, it was exciting.

But I was done with undergrad, I needed to get out.

I went back and got my master's degree,

I had my foot out the door ready to go back to that consulting company.

A PhD program that I was really excited about came up,

and so I stayed for PhD.

I was about ready to leave and then a post-doc opportunity.

It changed my career basically.

The opportunity to go back to grad school changed my direction,

my focus, where I was headed.

That happens and life happens.

Don't think that you have to know right

now what you're going to do for the rest of your life,

it changes and that's okay.

Well, I'm glad to see that you guys are here as freshman and sophomore.

That's great because you've got time to think about these things,

and get involved, and join the clubs or do research, do an internship.

Maybe that would answer your question.

You do an internship with someone who has

a CPA and you spend a summer shadowing them and seeing if you like it.

Then you do an internship with somebody else doing the other part of

accounting and that might answer

your question about which way you go. Or you do research.

That's another way too. This presentation

really just focuses on what kind of research goes on in our university.

Undergraduates are engaged in all kinds of research.

I'm not just going to talk about engineering.

But when I talk about research,

I really mean research,

scholarship, and creative activities.

It's everything not just stem search.

Understanding what's been done and

then taking that to the next step is what research is all about.

Looking to what we don't know,

what we don't understand,

what we can't explain and trying to understand it and explain it in any field.

In scholarship and creative activities,

here's an example of a student in

apparel merchandising designing a fabric or a material to create a dress.

That's her research and scholarship activity.

We've got students that are looking herpes virus,

biological threats to security, national security.

This is Emily who does criminal justice.

She's a Criminal Justice major and her research

focuses on the body camera that a police officer wears,

and when the police officer has an interaction with a perpetrator, the bad guy.

How does that body cam affect the interaction between the police officer and the suspect?

Does it escalate or de-escalate the interaction?

She does a lot of research that's more on the social science.

Looking at facial expression and other keys of anxiety,

or stress, or fear, or happy,

or whatever in those body cam images.

Really neat research and there's research in all areas, all disciplines.

Since we have a shorter period,

I usually give this talk in about 45 minutes to an hour,

I'm going to spare you the opportunity to think about this on your own,

just going to give you the answers.

But one of the reasons is future career options, graduate school.

See that one, two-thirds of the way down?

Research can really help you figure out if grad school is for you.



If you try it here as an undergrad and you really enjoy it,  
then you're going to do well in grad school.

If you get into it and this happens,  
you get into undergrad research and you realize this is not for me,  
I can't handle this,  
the uncertainty or the lack of direction or focus or whatever,  
then maybe grad school isn't for you.

That's okay too. But along the way,  
you're going to develop experience,  
you get some good experience.

It's going to look great on your resume,  
it gives you something to talk about when you go for those interviews,  
whether it's for a job or for grad school,  
you have something that sets you apart.

Just like being in a club or being in a leadership position,  
sets you apart from everybody else here on campus.

Having a research opportunity sets you apart and gives  
you a talking point in those interviews.

You can do research for money.

Some professors have funding to pay you.

You can do it for credit,  
you can register for a course and get academic credit,  
and then it shows up on your transcript,  
you can volunteer in a research lab.

Those are all very viable ways to get engaged with research.

We'll also talk a little bit about summer research opportunities as well.

But along the way doing it,

you'll see what it's like to be in grad school,

you'll probably work in a lab maybe with graduate students and you can talk to them.

What's it like being in grad school?

What's it like working for Dr. Fields.

There's lots of opportunities to network with

graduate students as well as faculty when you're engaged in research.

You're also going to have letters of

recommendation that are going to be a little bit more meaningful.

When you apply for that job or grad school,

you've got somebody, faculty member,

that can write you a strong letter of recommendation,

because you've interacted with them over the course of

a semester or two or three doing research.

If you get to the point where you are presenting

your research at these conferences and meetings,

you have that opportunity as an undergraduate to

present and travel where you're going to meet

potential other faculty that are

leaders in that field that could be a graduate mentor for you at another school.

That gives you an opportunity to get recruited essentially by

other graduate schools that might be looking for grad students.

The skills that you develop doing research,

very similar to a lot of the other skills that you

might see in your classes when you do some hands-on activities in the classroom,

the critical creative thinking, teamwork, communication skills.

This is Dr. Von Walden in the Atmospheric Research Group working with Christian who just received a Fulbright scholar because of his research experience.

He was competitive for a competitive distinguished scholarship.

Here's a student that's communicating her research at Circa.

I'll talk about Circa.

Communication, both written and oral,

you're going to develop the skills and the ability

to talk about your research to a wide audience.

You're going to be able to explain it to your faculty mentor,

but you'll also be able to explain it to

your grandmother and maybe your sister or brother.

These are students that attended the meeting and presented their research.

They went to ABRCMS,

Annual Biomedical Research Conference for Minority Students,

and they came back award winners.

This is Collin on the left,

who was best poster,

best in show, I don't know what the award was,

but he came back with a scholarship and a certificate and something to put

on his resume for his communication of his research at that meeting.

The Office of Undergraduate Research helps in a lot of ways.

The first thing I want to talk about is our website,

and a lot of information here.

In particular, if you go to the part of our website that's talking about getting started,

we have peer mentors.

I think of them as a tutor.

You have tutors for Chem 101,  
or stats, or whatever classes you're taking.

You can come in and meet with a tutor and talk about research.

These are students that have been around the block a few years here at WSU,  
and they are experienced researchers and they can help you.

You can schedule an appointment to meet with them,  
and talk to them,

ask them any question you want.

How did you find your mentor?

How many hours a week do you do research?

How long have you been doing research here at WSU?

What do you like about it?

What's your advice about finding research opportunities?

These are some of our mentors.

We have about 10.

They have different majors.

You can pick which mentor you want to meet with;  
psychology, bioengineering, biochemistry, mathematics.

They're available at anytime to schedule a meeting and talk with them.

SURCA, I'm going to talk about that because it's coming up in a few weeks,  
the Showcase for Undergraduate Research and Creative Activity is what SURCA stands for,  
and it is March 30th.

This is a campus-wide symposium only for undergrads to talk about their research.

This is our ninth annual SURCA.

We have over 250 students that'll be presenting research at SURCA.

It's in the senior ballroom,

and you're welcome to come.

The door is open to the public at 3:30-5:00.

Come, see what the students are doing,

look at their posters,

talk to them, ask them questions,

find out how they found their mentor.

You can even search the abstract book and see are

there any students doing research in your area of interest,

and then target onto those posters,

say, "This is exactly the kind of research I want to do.

Who are you working for? How did you find your mentor?

Can I come see your lab, or whatever?"

Sometimes that's one of the best ways to get noticed or to get in,

is to find a student that's working in the lab.

They may be graduating in May,

and here you come and say,

can I take your place?

Then they can talk to the faculty mentor and say, "Hey,

I'm graduating in May, but I've got a friend that wants to do this too.

Maybe they can step right in."

March 30th, Monday, it's not Monday,

we get back from spring break, following.

But come on up to the senior ballroom and check it out.

I talk about, if you are interested in getting started,

how do you find a mentor?

Similar to what Dave was saying with finding graduate schools that interest you,

you can do the same thing on the WSU website.

Search faculty websites and look

for what kind of research they're doing and what interests you.

I call it stalking faculty.

It's like your Facebook friends.

You can stalk faculty on their website.

You can search keywords at the WSU search engine,

but find a website and read about their particular research.

Does it interest you? If so,

think about contacting that faculty about opportunities to do research in their lab.

I teach a class called University 199,

I don't think I have it in here,

but I teach a class which is a basic research prep class.

It's a one-credit class,

I teach at both fall and spring,

and that class we go through this process very methodically one step at a time.

We talk about the research culture,

talk about what are the different faculty roles here at WSU,

and what are their titles.

Because if you reach out to somebody that is just a teacher,

they don't do research,

they're probably not going to be interested in mentoring you in

research because their focus is primarily teaching.

Then, who are the research faculty that are doing research,  
and how do you find out who they are?

How do you identify them?

Then, how do you e-mail them?

How do you make a resume that will  
exemplify your skills and your abilities in order to do the research?

We talk about it in the class.

We also cover basic research skills.

When I say basic, it's not how do you do this experiment in this particular lab,  
it's how do you find journal articles and read them  
efficiently for understanding what's been done before.

How do you work in a team?

How do you keep log books and notebooks regarding research?

How do you create a poster?

What is funding look like for research?

How do you find funding?

All those things that every student that does research  
would benefit from learning not specific to just engineering or science.

Other opportunities to find faculty on campus,  
looking at research seminars on campus,  
finding events where there's speakers,  
attend those things, get involved,  
get engaged, and see who is presenting and talking about their research.

But find something that you're passionate about,  
or you're interested in because that's going to be

something that really motivates you to do it.

Is it something that you're interested in?

If you're interested in doing research,

but you're thinking, gosh,

I already got a full load.

I've got five, six classes.

I can't take on more, think about summer.

Summer opportunities are another great place to do research.

The Pathways to Science website is,

I think one of the best for identifying summer research programs.

If you go to Pathways to Science,

you'll see listings similar to this where you can search for programs around research.

You'll notice at the top it's K-12,

undergrads, grads, post-docs, faculty.

Obviously, go to the undergrad section and then

search for programs that have research opportunities.

Many programs across the country will list their opportunities there.

One of the most common opportunities is called NSF REU,

National Science Foundation is NSF and REU stands for Research Experience for Undergrads.

These are specifically STEM-only.

There is a social science component.

NSF consider social science a STEM major,

but you're not going to find accounting or other counting-like things.

But these programs are for faculty or universities to host on their campus.

They provide funding to bring a student to the campus full-time for the summer,

usually about nine weeks during the summer to do research full-time,



and they'll grant or the program will cover housing, travel, and stipend.

Typical stipends, actually, they're getting bumped up.

They're more like \$5,000-6,000 for a summer,

but this is a great way to try research in a real focused intensive period of time.

It's nine weeks. You'll be immersed in it.

You'll be working side-by-side with 8-10 other students all doing research in that area,

different projects, but all similar themes or topics.

You get to travel to another university and see what it's

like to spend the summer doing research somewhere else.

These programs, I will say,

many of their deadlines are now or yesterday,

so if you're interested in this or thinking about it,

definitely take a look at that and maybe start thinking about this for next summer.

Again, NSF REU also has a search bar or search location.

They have a really nice system for searching just NSF REU sites.

Here you can see the list of key topics that they have REU programs in,

but you can also enter key search words and search for a specific topic.

This is our WSU summer research page.

I point that out because under the button for current WSU students,

all of these things I just listed are there,

the Pathways of Science,

the link to the NSF REU,

all of those programs as well as other suggestions like the NASA program is listed there.

Other internal ADARP, or Drug and Alcohol Research Program here at WSU is listed.

The SURF program, which is for

pharmaceutical students in Spokane campus is listed on that.

Lots of other discipline-specific programs are listed on our website.

Then, like I said,

WSU also runs REU programs.

We have about nine or 10 REU programs that

will happen this summer here on the WSU campus.

If you spend the summer here at WSU, you may see that.

You might see 100 or so students that come to WSU from

other universities that are here to do our summer research intensive experience.

They are part of WSU's research culture.

They will spend nine weeks.

We put them up in housing here.

At the end of the summer,

it's usually about August 1st or 2nd,

they'll do a poster symposium and have

a poster session to present what they did over the summer.

So many of the faculty within our college and within

the university will be mentoring students as part of that program.