QUANTITATIVE METHODOLOGY IN RESEARCH DESIGN: A PROCESS OF ACQUIRING KNOWLEDGE
Adjunct Professor: Joseph W. Dorsey, Ph.D.

Welcome. Welcome to the second session of research methods in the Patel College of Global Sustainability. As you know, I'm Dr. Joseph Dorsey. I'm an adjunct professor. And we started this series because we wanted to make sure that, with the internships that you're going to be conducting, that you have a good background in research methodology, both are quantitative and qualitative.

Last time we met, I talked about qualitative research methods. Today I'm going to focus on quantitative methodology in research design, process of acquiring knowledge. Today's agenda will cover quantitative research, a scientific process of research, quality of research, a quick review. So I'm going to go back and talk about qualitative a little bit. Combining qualitative and quantitative methods in evaluative research, and significance of community and university interaction.

So quantitative research, it asks why something is the way it is. Or it might ask how much. Or, what will happen if I do this. It usually entails many cases and a few variables. And I'll get more into the details of that later. It's about numbers, using statistics and measurement. It's representative of a population. And we use the sampling to do that. And it also normally looks at relationships and associations or causality between variables. And we also test hypothesis. So if you have some sort of hypothesis of what you expect out of something, quantitative tests that.

The scientific process of research. So we're going to have some basic assumptions about science and scientific research. Science is built upon assumptions. And here's a definition of what assumption is. It's ideas that are tentatively accepted as being true without further examination. But science makes few assumptions, preferring to subject most ideas to rational and empirical challenges. So we all have assumptions. But science tries to test those assumptions.

So in order to do that, what you need to do is pose a question. Now with any type of research, it comes with a question. That's pretty much what life is about, questioning the things that happen around us. And so you pose a question. And then you develop procedures to answer that question. You plan for and make appropriate empirical observations, rationally interpret empirical observations. And use those interpretations to predict other events. So really, research is an ongoing process. It doesn't necessarily stop with the first thing that you do. You're constantly getting more information. And from that information you may move forward to do more research.

So right now I'm going to touch on the concept of facts and constructs. Now facts are those events that we can observe directly and repeatedly. So it's something that, you'll notice that this structure, here, is always here. We call it a table. So it's a fact that if you see it here in the classroom, and it has legs and it has some surface, this is a table. So you could say, maybe, that's a fact.

Constructs are rational ideas constructed by the research to explain observable events. So if you look at constructs, it's constructing. It's like when you say, if I want to explain something, you have

to use several ways of talking about it. And each way that you talk about it is a construct. You're constructing an argument. You're constructing something that others can observe. It's, pretty much, giving it a name.

Observation and inference. So observation is something we do all the time every day. In the context of research, it's an empirical process using one's senses to recognize and record facts. So you have to trust your judgments that when you're doing research and observation, you're seeing what you want to see. And then you have to figure out how to record what you're observing.

Inference is an intellectual process in which we derive conclusions from observed facts and ideas. So once you've looked at facts and created constructs and did observation, now you can get closer to saying that you think you know what you're looking at. And that's what we call an inference. But you can't just have an inference unless you spend some time gathering a certain amount of information to give you that inference.

Now part of research has to do with different types of thinking. And there are two basic types. There is the inductive reasoning. And that's reasoning going from the particular to the general. A researcher that begins with empirical observation, then infers constructs, is engaged in inductive reasoning. But I'd like to use, maybe, another example to make it a little more simple.

For example, if you say something has a bushy tail and it eat nuts. And it goes up into trees. And it chirps. Well, they maybe don't chirp that much. You don't hear them too often. But sometimes you hear them. Well, what do you think I'm talking about?

Squirrels.

OK, so I took certain clues, certain pieces, of what that creature is. And then once I told you those, that was enough information to say, oh that's a squirrel. So you took the specific and went to the general. Now let's go to deductive reasoning, which is taking abstract or general ideas to specific, taking the large to the specific. And within that you're using constructs as a basis for making predictions about new specific observation. And this is deductive reasoning.

So let's get away from this technical stuff and go back to the squirrel. If I show you a picture of a squirrel, you're going to assume that there's certain things that squirrel does, that it eats nuts. And it runs around and climbs trees and has a tail. So this is the difference. Now I'm showing you a picture. And now you've taken the general. And now you can pull out specifics from that one picture. And so that's kind of the difference between the inductive, taking pieces and creating something out of that. Where the others have the general observation and then you can find pieces out of that. And those are two different ways of reasoning that takes place in research.

Other aspects of research are things called theories and models. A theory is a formalized set of concepts that summarizes and organizes observations and inferences, provides tentative explanation of phenomenon, and provides a basis for making predictions. So it takes a lot of what

we've already talked about. And once you have enough of that information, you can form a theory around that.

Theories are the glue that holds science together, and the framework that enables researchers to build on the work of others. So when theories are there, you can build upon a theory. Because someone else has done the work to create the theory. And you know the pieces of that theory. And so you can create new theories based upon old theories. So theories are constantly being built upon.

And theories don't necessarily mean that something's true. It's just that you have enough information and observation to come to some conclusions. And that's why you use a hypothesis to test those theories. And sometimes a hypothesis may come up not supporting the theory.

And so one thing I learned when I took research methods and stuff when I was in school before, is that you can't prove a hypothesis. A lot people say, I want to prove a hypothesis. You can't prove it. You can only support it or reject it. And that's a very important component of the idea of a hypothesis. Because ultimately we don't really know what's true. And so we always come close. That's why when you're looking at research, they tend to come to this 99.9% probability of accuracy. You can never get 100% because there's always a margin of error, because we're imperfect. And so our measurements are imperfect as well. We can come very close, but we can never get 100%.

So when you're looking at a hypothesis, it's something that you can support or reject, but you can't really prove that your hypothesis is right.

Modeling is derived from the word modulus, meaning a small measure of something. A model is a description of, or analogy, that helps scientists to understand something usually unseen and complex. So models represent reality, but they do not duplicate it. So models are symbolic. They visually represent something. But a model is just a model. It's never the actual thing itself. But in research we use models often to help people visually see things that maybe don't exist yet, or something that exists, but you want to replicate it for some reason.

So there are several phases of research. And this is something that you'll be going through anyway with your internship. Maybe it's said differently in the guidelines. But all phases of research pretty much go through this. One is the idea generating. So you have an idea and you want to do something with it. You identify a topic that you want to study.

And then you define the problem. Now you may have some vague ideas. But you know that there's a problem that you want to address. As I said in the last lecture that I did, that reason that we're all here is that we want to solve problems. You may want to get information and education. But ultimately that has to be applied to some problem solving. And research is about that as well.

Is there always a problem? Or we can make up, not a problem but say we could be more efficient if--

Yeah, when I say problem, it doesn't have to be a major catastrophe problem. It could be just something that needs some observation. But I think life is always solving something. Problems can be large and small. Even adjusting your seat. You feel uncomfortable in your seat. And you adjusted your seat so you can feel more comfortable. You had a problem of being uncomfortable. And you did something about it.

So it's almost, I think, life in general is problems. And when you look at the magnitude of problems, that's where research comes in, because we generally want to know something. And just wanting to know, itself, is somewhat of a problem. Do you get what I'm saying? I know it sounds a little abstract.

So there are procedures in design. So with that, now that you've generated an idea and you've defined what the problem is, now you have to design some way of dealing with it. So decide on specific procedures for gathering and analyzing data. And it's very important if you go in the root of quantitative research that you know how you're going to analyze your data, because if you just think about gathering, you don't know what you're going to do with it. It's kind of like you have to figure out when you get it, what are you going to do it. You don't want to just go down a blind path. And you get this data and you're standing there going, now I got the stuff. What do I do?

So in a way when you design your study, you have to design the whole study. You have to know what you're starting off with and how you're going to end. Once again, observations are there. You collect your observations. And you think about it as looking at something with your eyes. But I think you can almost interpret it as well as maybe instruments, surveys, and things like that. There are observations there too. You're getting information. And so don't think about observations as just visually looking at something happening, but also getting information that you can look at.

So I think if you look at observations you can take a more generalized understanding of what that means. And data analysis, of course, using appropriate statistical measures. And come back to this concept of interpretation. So you have to interpret what you have. It's almost like when I talked earlier about us having incomplete knowledge, never quite knowing. And so even when you get data, you really have to figure out well, what am I looking at? And that takes some time to figure out what you're really looking at.

And then once you've come to some conclusion that you found something that you think people should know about, then you prepare a report or something written or oral report that can go into a publication or presentation. But communication is really important. That's how we build on other people's work.

So there are several levels of constraint in research scientific research. Now I think I have to explain the word constraint. The way it's said here is that when you're doing research, you can only do so much with any type of methodology. And there's a reason why there's certain constraints. Now the lightest constraint would, say, be the naturalistic observation, or low constraint. When you're

observing participants in a natural environment, say you're watching people play in a field or you're watching animals doing something in the woods or something, and you're just observing, there's not much going on. You're not constrained. You know, it's very low. You're not controlling much of what's going on. So observation is a very low constraint.

The next, maybe, higher constraint would be a case study research where you're putting a participant in a moderately limited environment, slight intervention, and observe response. Now even though this terminology is that you are doing something with the person. It may be just as simple as asking someone to sit in a room and fill out a questionnaire for you. And you're looking at them as a case study. So there's some limiting of the environment, meaning that instead of them running through the field doing the survey, they've got to sit down. And so you've limited part of that naturalistic observation.

Then there's a cor-relational research, which is a quantifying of the strength of a relationship between two variables. So now when you're looking at two things or something like that, there's a little more control here. You're not just looking at, say, one person or one event. But now you're looking at several things. So now you're increasing your constraint. A differential research compares to a more preexisting group of participants. So we've gone from just looking at things to actually comparing groups of people, which means there's attitudes and there's information that is going to cause a lot more engagement in the process.

And then, of course, there's experimental research, where you assign participants randomly to groups, then test each group under a different condition. Now you're thinking about maybe people in the laboratory and you've set up the conditions and it's very controlled. So this would be a high level of constraint. Because there's a lot of conditions that you've brought into the process.

So like I said before, research is about questions, asking and refining questions. There's two ways we can look at this process of questioning. One is the heuristic influence. And this is where theories and research findings generate interest. And so it could be things such as the disbelief or outright antagonism. But it suggests further research questions. So what it's basically saying here, these are questions that come from what's being told, what's being seen, what's observed. And it creates more questions. It generates more things that you want to know.

The systematic influence is theories of research to provide testable propositions for future research. So here we're talking about-- I guess the operative word is testable-- where you can perform tests. With the heuristic, you don't necessarily have tests there. You're doing observations. You're gathering data, but you're not trying to replicate something. So those are two ways of focusing on questions.

Research begins with questions that gradually refine until they become specific enough to give research a clear direction for answering them. So it's kind of saying here that questions start off broad in general, and then eventually you can get them much more specific to what you're trying to find out.

Developing an initial question is critical, because it determines how we will conduct the research. So you have to make sure you're asking the right question. You don't want to spend time going down a pathway and then you realize, man, that wasn't what I wanted to know. This is not the kind of question that's going to get me where I want to be. So even though a question sounds like a simple thing, it's really a big deal in research. Because that question, you build all your research on the questions that you want to ask.

The more that is known about a particular area, the more refined the questions will be, and the more likely high constraint research methods will be used. This is basically saying that when you are a specialist in your field, you tend to ask more specific, poignant questions, because you know enough about what you want to know to ask very concise. You're very concise in what you're asking.

If you're in an area where you don't know very much about what you want to know, or what you're looking at, the initial question may be undefined, less specific. And so this is more like when we talked about when you're clutching or you're fishing. You're just trying to get some information, but you're not quite sure what you want. And so there's two ways of looking at questions.

Now research variables are any set of events that may have different values. So a variable is pretty much anything that can change over time, based upon whatever it is. I know it's kind of general, but I'll explain here. There are several types of variables. One is a behavioral variable, which is the observable response of an organism. So, like I said, let's go back to our squirrel again. If you want to watch the squirrel, what they do, you're basically looking it's behavior. You're watching how it eats or what it does, how it grooms itself, what it runs away from, or whatever. So the behavioural is whatever variables are there based upon the behavior of the organism.

Stimulus is environmental factors that affect the organism's response. So if you were just observing the behavior, that's fine. But if you started to move towards the squirrel, then you might see that squirrel dart up a tree. So you've created, now, a stimulus. When you're looking at other aspects of research and you introduce something that's going to cause some kind of reaction, then that's a stimulus variable, which creates some kind of response in the organism.

Organism's characteristics are used for classifying the organism for research purposes. What is it? So now you could say well, the squirrel has these variables. But if we put a monkey there, you could say well, monkeys climb trees. Monkeys have tails. Monkeys eat nuts. So you get the sense that just because you say certain characteristics normally apply to a squirrel, they may apply to a monkey as well. So you have to now say well, we're talking about monkeys. We're not talking about squirrels. You've got to start, now, classifying the organism. And so make sure people don't get mixed up.

Independent variables are those variables that you can manipulate yourself, that you can change the variable. You could say, if you were doing a study on, maybe, coffee and tea, you get one group coffee and you get one group tea. They're still drinks. But you just want to find out how they react to two different types of drinks. So that independent variable is something that you manipulate.

The dependent variable is affected by the independent manipulation. So the dependent variable might be the person has a preference for one drink or another. And so now you're introducing some manipulation. But the dependent is the individual. They don't change other than what their opinion changes to and so forth. But that's where you're using manipulation on that dependent variable.

And, of course, there is what they call the extraneous, which is any variable other than the independent variable affecting the dependent measure of the study. So it could be, now if I'm thinking about this example, if you didn't tell the person to not drink anything before they came to the research, they may have drank so much of something else that now that they're at the research, they can't drink as much of the tea or the coffee that you want them to. Give them the drink. So that was the extraneous variable, something that you didn't really put in to it and didn't control, but just happens to be there.

Now a constant is any event that is prevented from varying. A constant is something that doesn't change. So if you always did your research in the same building all the time for 20, 30 years, research is always there, then maybe you could say that's a constant. Unless you change buildings where you do the research, the constant, maybe it's the same building that we always do the research in.

So I think this kind of helps to explain a little bit about what research variables are. They're also scales of measurement. And you probably are familiar with these. One is the nominal, naming scales only property is identity. So nominal is when you say well, what's your political affiliation? You say, well, I'm a Republican. I'm a Democrat. Or that you're a Christian or you're Jewish or Muslim. And that's it. That's the nominal measurement. It just labels. It identifies you as something. Your mother, your father, sister, brother, whatever, they say it's nominal.

Ordinal measures a variable in order of magnitude. So there's a ranking system here. I'm the professor. You guys are the students. So there's some sort of ordinal aspect to that. It's just a measure of order. Some things are larger than other things, just proportions and so forth.

Now the interval scale of measurement is where we have equal intervals between consecutive values of a scale. For example, a thermometer. We're all familiar with a thermometer, where between temperatures there's numbers and lines between various temperatures. And it's evenly spread out.

Test scores. I know you guys are thinking about taking a test today. It's probably out of 100 points or 200. I don't know how many points this exam will be. But everyone understands the ordinal scale. The A, B, C, D, F as we do with grading. This is intervals. There's a certain distance that should be equal. There should be an equal number between an A grade and a B grade, and so forth. So that's kind of the interval stuff.

The ratio takes into consideration all of these properties. And it also has the true value of zero point. Where these others don't have a zero point, you can have zero point in a ratio. So we talk about things like weight and length and reaction time, and number of responses in research. A lot of times it's the ratio that you're looking at.

Now I mentioned before about error. So when you're looking at research, measurement error is anything that distorts the scores so that the observations are not accurately reflecting reality. I was reading a book to prep for this. A measurement error could be, say you want to weigh somebody. But they decide that they're going to lean against the wall while they're being weighed. Well, is that going to give you the true weight of that person? Some of that weight will be taken way or even added, I don't know, by leaning against the wall.

And so you can look at any time you're doing research, there's going to be, maybe, some error in measurement. Because there are things that you may not be able to see or control, that's taking place. That creates some error in the measurement.

Response set bias is a tendency to respond in a specific way, regardless of the situation or experiences. So that could be a person who's really stubborn about something. And you could give them all the information about why they're wrong. And they just are still going to continue to believe or do what they want to do. And so there's a bias that's there, that doesn't change for whatever reason.

A little similar to that is a notion of social desirability, which is a tendency to respond in a socially acceptable manner. That's when the respondent will tell you what they think you want them to tell you. If they think that you want to hear a certain type of answer, because if they answer differently, they would look like a bad person, they're going to tell you only the good stuff. And that's another bias in measurement error that, just because you ask a person a question in research doesn't mean that they're actually giving you the correct answer. It could be a little lie going on there for whatever reason. They don't want to be embarrassed. They don't want you to think badly of them, or whatever. And so these can create measurement errors.

So any time you see polling and any type of study, that's why there's these points, plus or negative, because there may be some error that's in that. And they give a little space for error.

Operational definitions. Now an operational definition, as it says here, is a definition of a variable in terms of procedures used to measure or manipulate. Well, let me just put it in more simple terms. If you're going to talk about anything, you have

To define what it is. So when people are reading it they can understand what you're talking about. So an operational definition is not just a definition. But it's a definition that helps the reader understand what you're trying to get to, where this is going. So it's like operationalizing. Let me think of an example of, maybe, a operationalized definition.

Well, let's do something really easy to understand, the university. So if someone says well, I'm at a university because universities educate, they provide services to communities, they help uplift people and get them jobs. So that's what a university is. So any time someone says well, what are you studying? I'm studying in university.

And they might ask why. Well, then you know why. You gave me an operational definition, because it does this. It does that. So the definition is that it helps you, during your research, to be able to explain why you're doing something. People don't have to ask the question because the definition itself justifies why you're doing it.

So an operational definition brings theoretical abstractions to an empirical level and describes exactly how to measure the theoretical abstraction. So it's a little different than my analogy. But it's helping you to be able to explain the measurement, why you're doing it. Because a lot of these, like it says here, are abstract concepts. And you have to bring it down to a practical level. And operational defining things makes it more practical.

Now evaluating these measures, there is the notion of reliability. Now this is a big concept in research in general. But particularly in quantitative research is a notion of something being reliable. Meaning that if you ask someone else to do it with the same information or same tools or measurements, they should be able to get the same thing that you got. Research would mean nothing if it wasn't reliable, meaning that you couldn't trust it. And so with the inter-rater reliability, at least two independent observers rate the same thing.

This is an example. Recently, students were talking about the papers, because I'm teaching this course with another professor. And there's a paper assignment that he assigned. And then I'm doing one. And we're grading them independently. Now what would the inter-rater reliability be if we both looked at the same paper, read it over, and then gave a mutual grade? You see what I'm saying? I read it. He reads it. And then we both decide on what grade that one paper gets. Then you have two independent observers rating the same thing.

So that would be reliable, because you could say that between the two people, they would come to some middle ground about what this grade should be. If they did it independently, one might say, oh this is an A paper. The other might say well, this is a C paper. But when they read it together, they may come up and say well, this is actually a B paper. And that gives you a more accurate understanding of what that paper, maybe, is.

Now a test and retest reliability is variables that remain stable over time, and should produce similar scores if we test participants at two different times. And we did that starting orientation week by giving a pretest about what people know. And then if we give you a test later on, the same test, we can kind of see whether you changed your scores or not.

Now That's one way of doing the test and retest. But I guess in the way it's mentioned here is that you could give the person the same test twice, and just see what the scores are. Now maybe the

person will take the test the first time and they get an 80 on it. And then you give them the same test a second time, and they get a 90. So you could almost say, well, the average score is 85. That's where you get this test and retest.

Let's think of it another way. If I gave the test to that person a third time, the same test, you would assume they would get a better grade, hopefully. Because they've seen the answers before, unless you don't tell them whether they were right or wrong. And maybe if you never tell them if the answers are right or wrong and you just keep giving them the same test, that person will probably get an 85 the third time they take the test.

So now you're starting to see that no matter what you do, they're going to stay within that same range. And I think that's what the test retest reliability is showing, that anytime you ask that person to test, they'll probably get around the same grade.

Now internal consistency reliability, several observations are made to obtain a score for each participant. So internal consistency is testing the test itself. Where the second one, the test retest, you're testing the individual to see whether they're going to be doing the same thing or not. With the internal reliability, you want to see if different people take that test, will they all, somehow, get around the same score?

So you're kind of showing that the test itself is fair, that there's nothing crazy about the test, where one person's taking it and they're getting a 20 and another person's getting a 90, if they're equally prepared. You see what I'm saying? If everyone's equally prepared, then they all should be getting around the same thing on the test.

And that's testing the test itself, and making sure that test has internal consistency. It's a reliable test. So you could take that same test, and take it to another school where students are equally prepared. They should all be getting around the same type of grades. So you're testing the test at this point. And this is how we look at making sure that things are reliable.

Another concept is the effective range, appropriate and significant scaling. And the best way to mention that is, one of the examples in the book I was using, was weight. If you wanted to measure the weight of a mouse, and you wanted to measure the weight of an elephant, would you use the same scales? No, because any scale that you would put a mouse on to get its weight, the elephant would pretty much crush that scale.

Or if you have a scale that measures tons and you drop a mouse on it, you probably wouldn't even see the scale move at all. And so what this is saying is that you have to have the appropriate scaling arrangement when you're measuring something. So anytime you're measuring something, you're making sure that it's appropriate and the scaling is sufficient for what you're trying to measure. Because if you're trying to measure, like I said, something extremely large with a measurement tool that's too small, you're not going to get what you're looking for, and vice versa.

Another major concept for evaluating is validity. This is sort of the sister concept with reliability. The scale measures what it's supposed to measure. So validity, within that, is that, are you really getting what you're looking for? If it's not telling you what you're looking for then it's not valid. And so why would you use it? So you have to make sure that the scaling is giving you what you're looking for, and of course, doing different things to test it. And I think reliability kind of goes hand in hand with validity. When something's reliable it helps it become more valid, and vice versa.

Now objective measurement, measurements that give the same result no matter who's doing the measuring. So that's the important thing about quantitative research, is that it's objective. It's not biased. Anyone could get the same results. If you give them the same format, the same proposal and say, here's a proposal I did. And they take it and they go line by line, and they do exactly everything that you said that they need to do, they should be able to get the same results that you got, because it's objective and that's an important principle.

Now environmental. I talked about this in the last session about ethics. And I'm going to talk about it again, because this is an important cornerstone of research, ethical principles of human research. And it has two great obligations for research. One is we're looking out for the well being of the participants. And we're seeking truth.

So once again, when you're doing research, you have to avoid deception. And the definition of deception is deliberately misleading the participants. You don't want to deliberately mislead people in research. It could be something that's not good for them. It could ruin your reputation.

And so I guess it's something you don't want to really tell people what you're doing. You want to get information. And you say, if I get too much information, then they may not want to do it. But in research, you really have to be pretty much honest about what you're doing and give people an opportunity to decide for themselves whether they want to be a part of it.

Because you can have invasions of privacy when researchers examine very sensitive issues. And people have recourse to sue. They can decide that this wasn't done fairly and may want to sue the university or sue you, and so forth. And so remember, you're dealing with the public. You know you're asking people to assist you. And so you don't want to mess up that trust.

A lot of times you have to maintain strict confidentiality of information because a lot of times people say well, they'll participate. But they don't want, necessarily, people to know who they are. That's why in quantitative research, you see mostly only numbers. You don't really know who the people are. A certain percent of people said this, or whatever. And so it's aggregated into a pot of numbers and information. And so the confidentiality of individuals is not at risk.

And like we said before, it should be voluntary. Nobody wants to be forced to do anything. You wouldn't want somebody to walk up to you and grab you by the arm and throw you in a chair, and say, sit down and take this questionnaire. You know, you'd be like, are you kidding? What's wrong with you? Are you crazy?

Well, that's the point. People who participate in research, to a certain degree, should have informed consent. That's why you very rarely-- well, you never really should ethically see children being interviewed unless with consent of the parents. You just can't ask a child questions for an interview because that's ethically--- because they're considered minors.

And so informed consent is very important. Meaning that, it's not just that you ask a person. Generally, you have to have a form that they read. And then you ask, do you understand everything? And then they actually sign off. Because this is a way of protecting yourself in the future. Because a person may change their mind at some point, and say, well I don't want to be part of the study.

And you go, you already did it. And you signed the informed consent. So there's nothing you can do. But if you don't have informed consent, and someone decides they want to take action, then you can get in trouble.

So you can either provide enough information on research for them to make reasonable informed decisions for participation. So the key to the matter of this is that you want people to give you their true feelings. And so if you come, kind of, at them shady and with deception, then you may get deception back. And so this whole process is supposed to be one where everybody's above board. Everyone's honest and there's a certain amount of trust there.

So ethical principles of human research, what we have on this campus as well as mostly all campuses across the nation, are Institutional Review Boards, or what they call the IRB. And IRBs consist of researcher's peers and members of the community at large. Universities, research institutions, hospitals, and school systems establish IRBs to review research proposals and see if they meet ethical guidelines.

So this is the key here. They're there to review the research proposals at an institution, whether it's faculty or even graduate students or even undergraduate students. Any time you're going to be dealing with what we call human subjects, you're going to be asking people questions. Now if you're asking questions that are not going to really be sensitive, you may not necessarily need to go through the IRB approval.

But if you're asking questions where you're taking peoples' information, like their demographic information, whether they're male, female, their age. All this information is very personal and sensitive. And then you start asking them questions about their lives, about how they feel about things. You're starting to probe into their lives.

So the institution doesn't want to get in trouble for people being upset because they're asked questions that they think are offensive, may put them in jeopardy, may risk their lives in some way, may make them reveal things about them that they don't want the world to know. And so you have to be very careful. And that's what universities do.

So you, as the researcher though, are responsible for submitting your research proposals to the IRB for review and approval before you gather your data.

Now if you're not dealing with human subjects at all, you don't have to worry about any of this stuff. And we don't deal with animals here. So we don't have to. There's a whole thing for animals as well. But if you do decide you want to spend some time asking people series of questions, you really need to, at least show us first, and we can determine whether these questions are so sensitive that you need to go to the IRB.

And then you would go to apply. And I think it takes several weeks, maybe. It can be up to, maybe, six weeks, where they will review your questionnaire and decide whether they want to approve it or not. Or maybe you should change some things or take out some questions or whatever.

But it's basically to protect the three entities, to protect the university, of course, to protect you, and to protect the people that you interview, so that nobody gets in trouble.

So research is judged on its value to science. And also this is what's really important, the risks it poses to the participants. Really all this stuff comes down to risk to the participants. And I've gone through IRB approval several times. I've taken the test. And one of the things that, if you think about experiments that were done by, say, the Nazis during the Second World War, these were things that they did on people that there was no control, no review of what they did.

On an even one more close to here in the United States, was the Tuskegee study, where-- I can't remember whether it was back in the 40s or so-- where there were some black farmers in Alabama who had syphilis. And I think there was a study where they were telling them they were giving them treatments. But what they were doing was just studying the progress of syphilis in the community.

And that was the study that started this IRB thing. Because people were realizing that there was a lot of research that was taking place without any oversight, that was actually harming people. So nationally they agreed upon that any type of research that deals with human subjects has to be observed by a larger body within an institution, whether it's a hospital or school or university.

So it deals with the risk posed to the participants. Also are there potential benefits that outweigh the risk? So if it is about drugs, there may be some risk there. But if the benefits are better that the drug shows that it really works well, then that's a reason to take those risks.

And also, we want to make sure that there's safeguards that are put there to minimize risks, that you actually are doing things to guard people's privacy, that you're not trying to talk to children without the parents knowing about it, different things like that. Where are the safeguards? And if they're there, then you should get approval.

And, like I said before, it's really serious and it's really a big deal. But the research we've done here so far, I don't think many people have had to go through IRB approval for their research. But I think the more I educate you about research and the more some of you decide you want to do, maybe, more serious research.

Particularly those who, maybe, want to do a two year program, because I think because we have a one year program, a lot of what I'm talking about is just too much to do in a year. But if you do decide you're, maybe, going to do a two year program, then maybe this is something you can think about so that your thesis at the end, your proposal actually, becomes a thesis. And you have more time to work on these things.

So a big part of this is sampling. Now sampling determines which participants to observe or test. And the reason is because you can't interview everybody. You couldn't interview everybody at the university or in the city. You may want to know something. That's why when you see political polling, they ask several hundred people, or several thousand people, questions in a city.

Obviously, the most accurate thing to do would be to ask every single voter in the whole city, what they think. But that's impossible to do. So what we do in research is we sample. We get a representative sample. And representativeness refers to how close a sample represents the population in the study. So you get people across the spectrum that represent the community in the right proportions. And you're assuming that if you were to multiply across the city you would get the same results. And so that's what sampling is, getting a representative group.

The more representative the sample, the more confidence in the generalizability of findings. So the operative word is generalizing, that you can generalize and say, yeah, based upon this sample, we're assuming that this is what the larger population is thinking or what they would say.

But when a sample differs from the general population, and sometimes you may get a sample that's not like the general population, you must take care in generalizing research findings. So that's a no brainer. Well, for example, if you were just interviewing people in just a certain neighborhood, you could not say that represents the whole city.

That's why we do random sampling normally so that you get enough people that you're not selecting, necessarily, who you want. You want a certain number. You, maybe, want 1,000 . people. But you're not focusing on just 1,000 in one neighborhood, you're focusing on 1,000 across the whole city. And hopefully you'll touch on enough diversity that you can say this is representative of the city.

So surveys, experiments, and other collection methods. Surveys allow us to collect samples from a large number of people and compare and combine them in meaningful ways. I think all of us have taken surveys. I don't think there's anybody who hasn't. People are constantly asking you to take surveys online. Or sometimes you may be walking through a mall or something, and somebody

comes up and says, can you take a survey? It's just a way of getting a sample of what they think will represent a certain group of people.

Now a longitudinal survey design involves a survey group of people over several times over, which means over a long time. Even the word there, longitudinal, means over a long time. A good example would be if you wanted to follow people to see if they got to go to college. So you may start off with this school. And you start off in kindergarten or first grade or whatever. And you follow these same kids through elementary school into middle school into high school, and see how many actually graduate and go to college.

That's a longitudinal study. You're following the same population for a certain period of time. And you could get some really rich data. Of course, it's time consuming. And it costs a lot of money. But that's what a longitudinal study would do.

Experimental design entails participants being randomly selected to groups and all appropriate controls and procedures are used. So when we say experiments, you're controlling a lot of the factors. Just think of the mad scientist in the lab with all the bubbling stuff and doing something. It's not quite that crazy looking. But experiments tend to take control, putting people in a booth or they have to stay in a room for a certain amount of time, or there's only certain people who can interact with only other types of people. So there's just a lot of control taken there.

But you really want to make sure that it's random, meaning that you're selecting just across a spectrum without really specializing. Because when you randomly select, in theory, you get a representative of a population rather than just specifically going at one specific group.

Of course, non-experimental design is any research design that does not include the manipulation of interdependent variables or having the control group that's different from your experiment group, where one gets something and the other doesn't. People have heard of placebo, when you trial a drug sometime, you'll have one group that really gets the drug, and the other group will get something that looks like the drug. But it's not the same thing. And you'll see if they react. And see if it's physically or whether it's psychologically people are reacting.

So this is probably the big question. Statistical analysis of data-- sorry, that's beyond the scope of this presentation. That's like a whole other thing. This is a statistics class. You have to take that. I'm just covering the method stuff. But statistics is a whole other animal. But once you get this information down you want to go further. And you can find a statistics book and it'll take you to the next level.

So now, let's compare. We're going to do a qualitative research and a quick review.

So qualitative inquiry, it's going from an exploration to discovery. And this is probably the most simple way of thinking about it. Qualitative is we're exploring to find something. You want to discover something. Detailed view or observation, this is about the context. We're looking for

meaning, interpretation, those types of things. You want to observe something and you want to kind of figure out, what am I looking at here?

So that comes down to the role of the researcher. The role of the researcher, you're very unobtrusive. You don't intervene that much. You're basically just trying to watch and see what's going on, meaning it takes place in a normal nationalistic environment.

And as I mentioned last time, it's time and space specific. Normally you're not generalizing, because if you're going to do qualitative research, you're usually doing it in one place over a certain time frame. And you can't say that you could replicate that. You go to another city, you may not get the same thing. So you can only talk about what you did at that one place and at that one time.

So to a large degree, it's information is narrative. With qualitative, you're telling a story. I talked about that before. The information you get is packaged in a way where you're narrating. You're the one who's telling the listener or the person who's reading what they're looking at.

Now with the research design, which we could look at qualitative methodology, you have to have a strong rationale why you're doing it. Because it's not really as normal to do the qualitative methodology. Most people are very familiar with quantitative. But if you really feel, for example, in my case, when I did my research at Flynn, I started off doing a quantitative study. The adviser I had who wanted me to-- what I was going to ask was going back to the concept of the question.

I wanted to know about environmental justice. I was looking at this concept. It was a new concept and it dealt with communities that were disproportionately exposed to hazards and so forth. And I said, well, I want to find out if they know about this and whether it's used as a mobilizing tool or whatever.

And so since this guy was a quantitative professor, he was saying you have to do a survey. And so I had to get, maybe, 3,000 people to fill out this questionnaire. And then I was trying to figure out, should I do it by mail? If I do it by mail that means I've got to have all the envelopes and all this postage. And I've got to have all these addresses to send it out.

I said, well, maybe I could do it by phone. So I thought if I do it by phone, it's just me. I've got to call all these people myself. What if they're not home, they hang up the phone, wrong numbers? And I was going crazy because I'm trying to figure out, now that I've submitted my proposal and it's approved, I've got to actually do the research I said I was going to do. And I realized it was monumental.

So I encountered this other professor who said well, have you ever heard of qualitative methods. And I'm like, no. What's that? He says well, that's when you ask a few people questions, deep interviews, and so forth. And you should be talking to the activists. And I'm thinking, yeah. He called it a purposeful sample. He said if you only want to know about environmental justice if it's used as a strategy or a tactic, why are you asking 3,000 strange people randomly across the city, who are

mostly going to respond, I have no idea what you're talking about. I have no idea what you're talking about. I have no idea what you're talking about. All that wasted time and effort.

So I dropped the other professor and picked this guy up. And I actually did a purposeful sample of about 30 activists. Where I asked them specific questions about the siting of the waste facility, what were they doing to mobilize and organize, and so forth. And actually I got a better dissertation because it was a qualitative dissertation. Because the questions I was suppose to be asking were supposed to be only to 30 people, not 3,000 people.

And so that's why I say, here, with the qualitative methodology, you'd have to have a strong rationale for trying to use it and a deep commitment to time and resources. Like I said, here, you may not have that time. I was working a dissertation. So I had years to do this stuff. But here you may have to cut it down to be very short and not really too in depth.

Issue complexity. A lot of times you want to use this when you have a lot of complexity in the issue, and you want to look at it from different ways. And so you have that flexibility. You may have a lot of variables. But you may have a few cases. Like I said, I had a lot of variables but I only had 30 cases of people that I talked with. So it's a very different paradigm as far as perception, language, and goals.

OK, I've got to move this along. So I'm going to speed this up now. I'm going to do a comparison. The quantitative seeks facts and causes. It's very subjective about the states of individuals. It can be obtrusive in, like I said, controlling the measurements. It's looking at research from an outsider perspective. And they're looking for outcomes.

Where the qualitative, is concerned with the understanding of the human behavior from the actor's own frame of reference. It's naturalistic with looking at it from more of an insider perspective. And it's more about the process rather than the outcome.

With quantitative data, a lot of times it's ungrounded. It's about verifying. And, like I talked about earlier, about reduction and inferring. It's about that hard repeatable type of data. We look in something in particular. And you're really assuming that reality is stable. Like I said before, the same question there to the same people, you're going to get the same information.

Where the qualitative is much more grounded in that idea of exploring and expanding and describing. You're validating what people are feeling. When they tell you something, that's validation to them. It's rich. It's real. It's deep. It's about holistically looking at what you're doing and assuming that reality's dynamic, that it's always changing. It's not static.

Now, like I said before, the different paradigms. When I did my research, I changed the language. When I did qualitative, I didn't talk about research. I talked more about inquiry. I didn't talk about my people respondents as subjects. I called them participants. Rather than collecting data, I was constructing data. I was, kind of, building data. I was evaluating rather than analyzing. And the thing,

I think, that was most cute was the idea of instead of having findings, I had tellings. So I was saying this is what people were telling me.

So they can be complementary. Basically it's a multi-purpose approach. When you're doing this stuff, you're monitoring by using two methods. You're looking at the impact assessment and the causal explanations. Now what's going to be real interesting here is that this is how one could look at using the methods together. Where you can have a sequential process where you can, maybe, start off with a pilot study. And from that pilot study, which is qualitative, you can end up doing a survey, which is quantitative. And so the pilot study of asking people general questions can help you move towards having specific questions.

The other thing that you can do is have a survey. Because remember, we talked about surveys. They really set the kind of questions that you can ask. They're not necessarily open ended. So you may ask these questions using a Likert scale or multiple choice, true and false, or whatever. And from that data you might say well, this is limited. I need to know more. So then you start interviews where they're more open ended. So you're going beyond the survey to get more information.

So part of this process is what we call triangulation. This is when you use multiple methods. Four basic types of triangulation. Triangulating by using data by using a variety of different data sources. Triangulation by investigators by using different evaluators to look at the same thing. Triangulation through theory, where you use multi perspectives to interpret a single set of data. So looking at it from different perspectives, different theories, how one theory looks at the same thing.

And in methodological, what I did in my work, was doing multi methods of studying the same problem by using interviews and observations. And I did focus groups as well as in depth interviews, library research, and things like that. Now the obstacles in using both methods is that, obviously, it's expensive, because you've got to pay for it.

Like I said, all the paper and the time and equipment and things like that. It's time consuming, obviously, using more than one method. And also a lack of training. Most people either know quantitative real well, or qualitative. There are very few people who are trained equally well in both methods.

And it's also a part of this dialectic form of debate, where some people will think that the best way to do it is quantitative. No, no, the best way is qualitative. You're always going to have some people who are going to be thinking the best way to do it is one or the other.

So in conclusion, I think this is important that we think about this as a significance of community university interaction, or what one of my colleagues once called a notion of communiversities. And I think this is, kind of, the point I'm trying to make about doing research in the internships we do, is that we are moving into looking at community life experiences.

Wherever we go in our internship, you're part of another community. You're leaving the university and you're going into another community. And out of that you can come with a very effective research and policy.

And then, of course, you're coming with academic knowledge and theories and concepts and principles. And basically it's combining these two perspectives is what gives you the rich information that you're going to have and skills that you can take into the workforce in the future.

So these are the references. I'm not going to spend much time on them. But this one here is the book that I used. Most of the presentation came out of Research Methods, a Process of Inquiry, by Graziano and Raulin.

You can also get some good information from this one, Evaluating Information, A Guide for Users of Social Science Research. Oppenheim, I didn't really use much of this in my presentation. But Oppenheim wrote this book on Questionnaire Design, Interviewing and Attitude Measurements. If you decide you want to see, how do you do these things, that's a good instructional book.

This one by Patton, it was in the first presentation. I brought it back again just to talk about triangulation and the qualitative methods. And then How to Conduct Your Own Survey by Salant and Dillman.