Introduction

What is research? Research is defined as the systematic application of the scientific method to the study of problems (Gay, Mills, & Airasian, 2009). The scientific method is an orderly process. Most research, including educational research, follows the five main steps of the scientific method.

![Image of the scientific method diagram]

**Figure 1. The Scientific Method**

The advanced professional in either education or healthcare understands not only how to answer questions through the application of research by posing questions and collecting and analyzing data to answer those questions, but also critically consumes the research of others. The advanced professional distinguishes good research that deserves attention from inappropriate and irresponsible material. Furthermore, the advanced professional's practice is improved not only through this consumption but by applying research techniques to problems faced every day. In this course of study you will learn a number of approaches to conducting research: qualitative, quantitative, and action research. You will learn about several different research techniques, their advantages and disadvantages, and when it is appropriate to use them.

Throughout this course of study, questions are posted for each week to guide your reading of the learning resources. Even though they may look quite boring, each question highlights an important concept that you need to know in order to prepare for the objective assessment. Use the questions to guide your readings. The course of study builds on prior knowledge you have obtained or tasks you have completed in Literature Reviews for Educational Research. References are made where
appropriate. In many activities, resources such as chapters and PowerPoint presentations are often repeated because many concepts appear in the same chapter or PowerPoint presentation, and you will just need to focus on the concepts being studied.

The following are the 12 competencies covered in this course of study:

**Competency: Quantitative Research Paradigms**
The graduate understands the components of quantitative research.

**Competency: Qualitative Research Paradigms**
The graduate understands the components of qualitative research.

**Competency: Action Research Paradigms**
The graduate understands the components of action research.

**Competency: Purpose of Literature Review**
The graduate understands the purpose of conducting a literature review and understands its relationship to educational or healthcare research and practice.

**Competency: Topic Selection**
The graduate understands how to select appropriate research topics and research paradigms.

**Competency: Resource Identification, Evaluation, and Selection**
The graduate identifies, evaluates, and utilizes information resources in order to investigate specific research topics.

**Competency: Research Study Critique**
The graduate critiques the data analysis, results, and conclusions in a research study.

**Competency: Research Questions**
The graduate understands how to develop measurable research questions.

**Competency: Hypothesis Development**
The graduate interprets the results of a literature review and generates a hypothesis supported by those findings when appropriate.

**Competency: Types of Variables and Data**
The graduate understands and uses different types of variables and data that can be collected during a research study.

**Competency: Data Collection**
The graduate evaluates the relative merits of instruments for measuring specific motivation, performance, and learning style variables.

**Competency: Basic Data Evaluation Concepts**
The graduate understands basic concepts involved in the evaluation of data.

**Required Learning Resources**

Textbooks:

RFC1/NRC1 - Foundations of Research Fundamentals
Course of Study

E-Reserves:


How to access the library Ereserves for the research fundamentals domain

1. From the student portal, click on Resources
2. Click Library on the left menu
3. You will see log in information on the first page of the library. Make a note of the password for Docutek E-Reserves, the first one at the top of the list.
4. Click on Enter the library at the end of the screen.
5. Select E-reserves.
6. Select Teacher Education for department.
7. Select TE_MEDprograms_GraduateCore.
8. You will be prompted to enter course page password. Enter the password you noted at the first page of the library and click Accept.
10. Click on an item to view or download.

Web Resources

- Educational Research
  [http://www.southalabama.edu/coe/bset/johnson/2textbook.htm](http://www.southalabama.edu/coe/bset/johnson/2textbook.htm)
- Research Concept Map
- Research Methods Knowledge Base: Levels of Measurement
  [http://www.socialresearchmethods.net/kb/measlevl.php](http://www.socialresearchmethods.net/kb/measlevl.php)

Assessment

The assessment for this course of study is RFC1/NRC1: Foundations of Research Fundamentals, which is a scheduled proctored objective assessment at a secure assessment center.

Preparing for Success

To successfully complete the objective assessment, you need the appropriate resources to help with your learning. You should also prepare a calendar to schedule time devoted to your studies. Share your calendar with family and friends so they are aware of your obligations.

Topics

**Acquire Learning Resources**

Arrange to obtain the learning resources listed below so there will be no delays in your studies. These items are essential for you, as this document will guide you week by week in the use of these
materials. Some of these items must be shipped to you, so be sure that your mailing address information is current. If you click your name on your AAP, you can check your contact information.

Resources

Download WGU Library E-Reserve Readings

The WGU library has an electronic reserve or e-reserve of selected articles available for this course of study. Access the library from your portal resource tab, select "E-Reserves" and search by author for the chapters in each activity below:


Locating/Using the Message Board

On the right-hand side of the course of study screen there is a message board area. Throughout your studies, you will want to follow the questions, observations, and responses of the other students and the expert advice of the course mentor. If you have questions of your own, do not hesitate to use this resource to get those answered as you develop your competencies.

Develop a Notebook or Computerized Journal

You know from your education and your experience that you do not just learn from passively reading material. To help you make your learning deeper, more thorough, and more meaningful, you will on occasion be prompted to reflect on topics or questions in this course of study. You might chose to do this in a notebook, text editor, or any other means you think are appropriate. These are assignments that are not collected nor scored. Instead, they are provided to help you learn and succeed.

Take the Pre-Assessment

As noted above, your competence in this area will be determined through an objective assessment (RFC1/NRC1). You should plan to complete the work contained in the subdomains prior to attempting the assessment. However, there is a pre-assessment available to help you prepare for that examination:

1. On the AAP under the "Pre-assessment Available" column RFC1/NRC1, click "Yes."
2. Click on the request to take the PAFU pre-assessment. Please set aside approximately two hours to take the pre-assessment.

Do **not** use any notes, textbooks, or other learning resources. Remember that the purpose of the pre-assessment is to determine if you are ready to take the assessment and what specific areas you need to spend additional time studying.

If you take longer than the recommended amount of time, or if you utilize resources that will not be permitted during the actual examination, the purpose of taking a pre-assessment is defeated.
Moreover, taking the pre-assessment more than two or three times significantly dilutes the value that can be gained from this tool, so do not attempt to take the pre-assessment until you honestly feel that you are ready to proceed. Once you have taken the pre-assessment, ask your mentor to review with you the pre-assessment detail. The two of you can analyze the results by looking at the topic sections and percentage scores, and your mentor can guide you with regard to what specific areas to concentrate on, when you will be ready to attempt the competency examination, and so on.

Order Your Textbooks

The textbooks that you will need to order for this course are listed below. You will need to order these early in order to avoid any delays in getting them when required throughout this course.


*Note: The WGU Bookstore has these books available for immediate purchase and delivery. You may shop at other online bookstores, but be sure to order early and use the correct ISBN to get the correct edition.*

Participate in the Message Board

Message boards are an important part of the WGU experience. If you have questions of your own, do not hesitate to use this resource to get those answered as you develop your competencies. The Research Fundamentals Message Board complements this course of study and will be the gathering place to communicate with your course of study mentor and peers during the next 10 weeks. You will also be participating in activities throughout this course of study that will require you to post and comment on selected topics as well as receive assistance as you prepare for the objective assessment.

Research Paradigms and Research Methods

This subject gives you a brief overview of how research is classified. It will then focus on the three types of research: quantitative research, qualitative research, and mixed method research/action research. It will introduce you to differences and characteristics of each as well as advantages and disadvantages. A good understanding of the differences among these three paradigms is critical to understanding of the topics discussed later in the course of study. The design of each component for a research study hinges on these differences.

A thorough understanding of research fundamentals and the ability to apply them as a powerful tool kit is one of the keys to becoming an advanced professional. You will be better equipped to read research, know what good research is, and understand how to apply it. You will be able to look at situations in your own professional practice and derive strategies to fix them and use these skills to understand their impact. Research fundamentals are one of the skill sets that separate the advanced professional from the beginning professional.

Research is classified in three ways:

1. Classifying research into three paradigms according to the following:
   - Types of data they collect (numerical or categorical)
   - The fundamental differences in research designs (such as experimental design for
quantitative research, ethnography for qualitative research, and action research for mixed method

- Data analysis (categorical or statistical): quantitative, qualitative, mixed method

2. Classifying research by method (See Figure 2)

3. Classifying research by purpose:
   - Basic and applied research
   - Evaluation research
   - Action research
   - Research and development (also known as "R and D") (see Figure 3).
This introduction gives you an overview of types of research and different research methods. You will learn components of a research study and how each of the research paradigms determines the nature of each component.

**Topics**

**Characteristics and Benefits of Research Paradigms**

Three research paradigms are presented in your assigned readings: quantitative, qualitative, and action research. The benefits of each will be discussed, and one or more will be more attractive to you than the others. However, the choice of paradigms is not a matter of personal preferences; rather, it is a matter of the research question that is being answered.

**Resources**

**Choice of Paradigm Journaling**

Look back at the instructional problem you identified in Literature Reviews for Educational Research. If you were going to conduct research to investigate this further, which paradigm would be best? For your learning to have meaning, to have depth, and to best prepare you for the assessment, it is to your advantage to thoughtfully complete these journal activities.

**Introduction to Research Reading**

**URL:** [https://web5.wgu.edu/aap/content/educational_research_%20chapter_1.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_1.pdf)

Read chapter 1 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 1 at the link above.

**All Majors:**

**URLs:**

**Lecture Notes on the Different Approaches**
[http://www.southalabama.edu/coe/bset/johnson/lectures/lec2.htm](http://www.southalabama.edu/coe/bset/johnson/lectures/lec2.htm)

**Concept Map on the Different Approaches**

Review the two websites above, which provide good descriptions of the differences between different research approaches.

*Note: The textbooks refer to research designs as either approaches or methods. In addition, research paradigms may also be referred to as research approaches.*

While doing your reading, take notes on the following:

- What are the purposes of each research paradigm?
- What situation is each paradigm most appropriate for?
- What are the differences between traditional research and action research?
- What type of data does quantitative research collect for analysis?
- What type of data does qualitative research collect for analysis?
- Which research paradigm states the hypothesis before the study begins?
- Which research paradigm employs an inductive strategy (i.e., problems and methods evolve
as understanding of the subjects and the context deepens)?

- Which research paradigm tends to involve more subjects?
- Which type of research uses categorical data analysis?
- Which type of research uses statistical methods for data analysis?

**Quantitative Research**

Quantitative research is the oldest of the research paradigms; therefore, most research concepts are related to quantitative research. It is important that you spend time studying all aspects of quantitative research. You will learn the underlying assumptions of quantitative research, the type of data it collects, the various fundamental designs that fall under this category, and the sampling techniques used in quantitative research.

**Topics**

**Characteristics and Benefits of Quantitative Research**

Quantitative research is the paradigm that is most likely to use numerical data in order to accept or reject a hypothesis. In quantitative research, the researcher typically works with a sample of data and manipulates an independent variable to look for changes in the dependent variable.

**Resources**

**Quantitative Research Reading**

URL: [https://web5.wgu.edu/aap/content/educational_research_%20chapter_1.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_1.pdf)

Read chapter 1 (pp. 7-11) in the Gay, Mills, and Airasian textbook. View the associated PowerPoint slides on quantitative research for chapter 1 at the link above.

**URLs:**

**Lecture Notes on the Different Approaches**
[http://www.southalabama.edu/coe/bset/johnson/lectures/lec2.htm](http://www.southalabama.edu/coe/bset/johnson/lectures/lec2.htm)

**Concept Map on the Different Approaches**

Revisit the websites for quantitative research. Review carefully the pages in chapter 1, the web lecture, and the PowerPoint slides on different quantitative approaches. While reading, take notes on the following:

- What are the advantages and disadvantages of quantitative research paradigm?
- What are the assumptions about quantitative research paradigm?
- Which scientific method does quantitative research employ, inductive (bottom up) or deductive (top down)?
- What situation is each quantitative research method most appropriate for?
- What type of data does quantitative research collect for analysis?
- When does quantitative research state the hypothesis?
- Which type of quantitative research controls the setting and manipulates one or more variables?
- How does quantitative research analyze data?
- Which research designs fall under the category of quantitative research?
Quantitative Research Journaling

Do your best to answer each of the preceding questions in your journal. Do not quit or become frustrated if you are unable to. Ask for help from either the course of study message board or the course mentor, Dr. Jiang. Getting these beginning concepts down is very important for continued success through this course of study.

Quantitative Research Methods

There are a number of quantitative research methods from which to choose. The one that is best depends on the research question. There are methods that examine how much data or results are alike, such as correlational studies. Then there are methods that examine the extent to which data or results differ such as a t-test or an ANOVA.

Resources

Quantitative Research Sample Questions

Consider the questions in the previous reading activity. Did you make an attempt to answer them? You can make the learning more meaningful by creating exam questions. Do not just repeat the question, but consider how the question might be posed in a multiple-choice item type, or as a matching, or a multiple-response (more than one correct answer) item type. Share your proposed questions with your peers in the course of study message board.

While reading, study and define the following terminologies:

- Descriptive research
- Correlational research
- Causal-comparative research
- Experimental research
- Correlation coefficient
- Pearson r
- Prediction study
- Interaction
- Group design
- Inferential statistics
- Independent variable
- Dependent variable
- Control
- Treatment
- Internal validity
- External validity
- Pretest-posttest control group design
- Posttest only control group design
- Solomon four group design
- Quasi-experimental design
- Factorial design

You can also use Table 1 to take notes to compare various research methods.
Qualitative Research

Professionals in the education and healthcare areas know that data are not always neat and problems are not always simply formulated. Sometimes they are quite messy and amorphous. For these, it seems that traditional research and quantitative methods simply will not do. However, many external agencies are asking for research-based answers to these problems. So then, what do accomplished professionals do? Ideally, they know and apply qualitative research techniques! You will learn the underlying assumptions of qualitative research, types of data it collects, the various fundamental designs that fall under this category, and the sampling techniques you can use for qualitative research.

Topics

Characteristics and Benefits of Qualitative Research

In qualitative research, the researcher is interested in making non-numerical, non-statistical conclusions about the data that they gather. Researchers are interested in more impressionistic understanding of the data as opposed to measures of correlation or association.

Resources

Benefits of Qualitative and Quantitative Research

Create a list of five benefits for both qualitative and quantitative research and share it with your peers through the message board.

Qualitative Research Reading

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_1.pdf

Read chapter 1 (pp. 8, 12-16) in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 1 at the link above. Carefully read the pages in chapter 1 about qualitative research and the various qualitative approaches. Also view the PowerPoint presentation and the lecture on the different approaches.

All Majors:
While reading, take notes on the following:

- What are the advantages and disadvantages of qualitative research paradigm?
- What are the assumptions about qualitative research paradigm?
- Which situation is each of the qualitative research methods most appropriate for?
- What type of data does qualitative research collect for analysis?
- What is the function of hypothesis in qualitative research?
- What is inductive strategy in qualitative research?
- Which scientific method does qualitative research employ, inductive (bottom up) or deductive (top down)?
- How does qualitative research analyze data?
- Which research designs fall under the category of qualitative research?

Qualitative Research Methods

While there are a large number of qualitative research methods, typical ones includes surveys, interviews, observation, and ethnographies. In qualitative research, hypotheses emerge from the
data instead of being formed prior to the investigation.

Resources

Qualitative Research Methods Readings

URLs:

Chapter 14 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_14.pdf

Chapter 15 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_15.pdf

Chapter 16 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_16.pdf

Chapter 17 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_17.pdf

Chapter 18 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_18.pdf

Read chapters 14-18 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentations.

Take notes on the following questions as you read:

- What are the main data collection methods for qualitative research?
- What is the purpose of narrative research?
- What are the major steps involved in designing and conducting a narrative research study?
- What are the key characteristics of narrative research?
- What is the purpose of ethnographic research?
- What are the major steps involved in designing and conducting an ethnographic research study?
- What are the key characteristics of ethnographic research?
- What is the purpose of case study research?
- What are the major steps involved in designing and conducting a case study?
- What are the key characteristics of case study research?
- What is triangulation in qualitative research?

Qualitative Research Sample Questions

In preparation for the objective assessment that accompanies this course of study, try to think of at least one test item for each of the questions in the previous section. Do your best to draft these as they might appear on the assessment. You should try to do this for most, if not all, of the topics in this course of study. As you do this, help your peers out by sharing them through the course of study message board.

Sampling Techniques for Qualitative Research

For this topic, you will learn various sampling techniques available for qualitative research. These methods include convenience sampling, judgment sampling, and theoretical sampling.

Resources
Qualitative Research Sampling Techniques Readings

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_5.pdf

Read chapter 5 in the Gay, Mills, and Airasian textbook. Also review the associated PowerPoint presentation for chapter 5 at the link above.

URL: http://www.southalabama.edu/coe/bset/johnson/lectures/lec7.pdf

Review the Lecture Notes on Sampling at the link above. While reading, take notes on and define the following techniques:

- Criterion/purposeful
- Maximum variation sampling
- Intensity
- Homogeneous
- Snowball
- Random purposive
- Critical-case
- Typical-case
- Extreme-case
- Negative-case
- Opportunistic

Action Research Mixed Method

Imagine you are a professional in the education or healthcare field and are experiencing that students are not learning or patients are not getting better (and possibly are not following your advice). How best will you handle this problem. You might talk with your colleagues at lunch or perhaps have a meeting with your supervisor. You brainstorm some solutions and agree to implement them. Are there ways that you can implement research principles without going through the detail or requirements of a formal study? Yes, there likely are, and you will learn about that as you explore action research methods. You will learn the purpose of action research and how it differs from other research paradigms, types of data it collects, and its fundamental design.

Topics

Characteristics and Benefits of Action Research

For this topic, you will learn about action research techniques.

Resources

Action Research Reading

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_20.pdf

Read chapters 1 (pp. 18-19) and 20 in the Gay, Mills, and Airasian textbook. Also review the associated PowerPoint presentation for chapter 20 at the link above. Carefully read the pages in chapter 1 and chapter 20 on action research. Understand how action research differs from other traditional research.

While reading, take notes on the following:
What are the advantages and disadvantages of action research paradigm?
What is the purpose for action research?
What situation is action research most appropriate for?
Which types of data does action research collect for analysis?
How does action research differ from other research?
Who conducts action research?
What are the steps for conducting action research?

Action Research Journaling

Most educational practitioners conduct some aspects of action research in their practice. Reflect in your journal on how you have applied aspects of action research in your professional practice. If nothing comes to mind, consider the opportunities where you might have employed it but did not.

Literature Review

As a researcher, you will want to build on rather than duplicate the research of others. Likely you will not want to do what others did that did not work. You should have an interest in what is going on in your field, be able to write about it effectively, synthesize that information, and apply it to your efforts. To do that, you will write a literature review for your study.

In Literature Reviews for Educational Research, you learned the purpose of literature reviews and the steps for conducting a literature review. You have also learned where to search for sources and how to evaluate sources. Now you need to go back to Literature Reviews for Educational Research and review those two areas for this course of study. In addition, review the types of sources to consider when conducting a literature review.

Topics

Purpose and Function of Literature Review

Research is the gathering and analysis of data to add to the body of knowledge in a given field. As a researcher, you will know about the research in your field and use this to guide your practice. Research is reported on through literature reviews to help readers of the research understand why it was conducted and what it might add.

Resources

Literature Review Message Board Activity

Share with your peers how you feel the literature review better prepared you to investigate your research.

Literature Review Reading

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_3.pdf

Read chapters 3 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 3 at the link above.

Read chapter 3 (pp. 65-66) in the Johnson and Christensen text on e-reserves. While reading, take notes on the following:

• What is the purpose of a literature review?
How can a literature review help clarify the relationship between research and practice?
How might literature review results influence the research process?
What are the steps for conducting a literature review?

Literature Review Journaling

Consider what you are learning is and is not research. Is a literature review by itself research? Ponder this and write your reflections in your journal. For guidance and direction, consult with your course mentor.

Resource Identification, Evaluation, and Selection

When conducting a literature review, you will need to distinguish between primary and secondary sources. Credible researchers know appropriate resources such as journal articles and papers presented at conferences. They also are expected to make judgment about the credibility of sources.

Resources

Literature Review Journaling

For the Literature Reviews for Educational Research you created a literature review. Now that you have studied literature reviews further, do you think it is adequate? Why or why not? Write your response in your journal. Check with your course mentor to determine how you might improve it.

Resource Reading

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_3.pdf

Read chapter 3 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 3 at the link above.

Read chapter 3 (pp. 67-69) in the Johnson and Christensen text on e-reserves. While reading, take notes on the following:

- What factors help establish source reliability?
- What are the differences between primary and secondary sources?
- What sources are available for examination of literature on a given research topic?
- What are the rules and regulations related to copyright and plagiarism?

Selecting Topics and Measuring Instruments

Two things may be on your mind as you have progressed through this course of study: how to select a topic for your research and, once you do, how to ensure that you have the right measuring instruments. Measuring instruments refer to your data collection tools. Your data collection tools might be a test, a survey, field observation, demographic data, or combination of measurement instruments. This subject introduces you to the characteristics of good research topics, research questions, and types of instruments for both quantitative and qualitative research. You will also learn hypothesis, null hypothesis, and the related concepts of type I and type II errors.

Topics

Selecting Topics
There are several sources (theories, experience, library, etc.) you can rely on for identifying a problem for research. Which source is best for you will depend on what research design you plan to use. A well-stated topic will very likely reveal whether the study is qualitative or quantitative research. As a result, you can sometimes judge from a topic what type of research study it is. In order to do that, you will need to be very familiar with characteristics of research paradigms.

There are, however, some commonly used words that relate to a certain type of research. For example, if a topic investigates opinions or attitudes, it is very likely a survey or descriptive research. If it is investigating the relation between two variables, it is a correlational study. If it is investigating the effect of a method or type of instruction, it is most likely an experimental research. If the purpose of a study is to investigate if a method or type of instruction would fix a daily classroom problem, it is action research. Knowledge of those special words or phrases helps identify whether a topic is appropriate for qualitative research, quantitative research, or action research.

Resources
Selecting Topics Reading
URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_2.pdf

Read chapter 2 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 2 at the link above.

Read chapter 3 (pp. 74-80) in the Johnson and Christensen text on e-reserves. While reading, take notes on the following:

- What are the characteristics of a good research topic?
- How are qualitative topics different from quantitative topics?
- What is a research question?
- What is meant by measurable? measurability?
- How are qualitative research questions different from quantitative research questions?

Selecting Topics Journaling

It is to your advantage to answer each of the five questions posed above in your journal. Answering each of these in your own words will help you acquire the competence needed to pass this assessment.

Hypothesis

A hypothesis is the best estimate (or an educated guess) of the outcome of a research study. For this topic, you will learn the definition of hypothesis and null hypothesis and understand the role of hypothesis in different research paradigms. You will also learn type I and type II errors and how they relate to the null hypothesis.

Resources
Hypothesis Reading
URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_2.pdf

Read chapter 2 (pp. 71-77) in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 2 at the link above.
When reading, take notes on the following questions:

- What is a hypothesis?
- Types of hypothesis?
- What is meant by operational definition of variables?
- What is a null hypothesis?
- What are type I and type II errors?
- How do you determine if you should reject or accept the null hypothesis?
- How is a hypothesis used in a specified research paradigm?
- How is the hypothesis related to the null hypothesis?
- How do type I and type II errors relate to the null hypothesis?

**Hypothesis Message Board Activity**

Now that you have read about hypothesis, consider your instructional problem. If you were to evaluate the effectiveness of an instructional intervention, consider what your dependent variable would be and draft one or more hypothesis. To get feedback, share your results in the course of study message board.

**Types of Variables and Data**

As discussed previously, one of the main differences between the two research paradigms, quantitative and qualitative research, is the type of data each collects for analysis. Also, when you pose your research questions or formulate your hypothesis (if your design requires), you are actually defining two very important concepts, independent and dependent variables. You will learn these important concepts in research.

**Topics**

**Independent and Dependent**

The concepts of independent and dependent variables are most important in experimental design as well as other designs like causal-comparative research and correlational research. They must be defined accurately and precisely and used throughout a research study. Once the variables are defined, they should not be randomly changed.

**Resources**

**Variables Reading**

**URL:** [https://web5.wgu.edu/aap/content/educational_research_%20chapter_6.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_6.pdf)

Read chapter 6 (p.147) in the Gay, Mills, and Airasian textbook. View the associated PowerPoint presentation for chapter 6 at the link above.

While reading, take notes on the following:

- What is an independent variable?
- What is a dependent variable?
- Which variable is the effect (outcome) variable, the independent or the dependent variable?
- Which is the cause (treatment) variable, the independent or the dependent variable?

**Variable Journaling**
Consider the questions asked in the preceding reading activity. In your journal draft one or more research questions and for that question(s), answer each of the four bulleted items. If you need assistance, clarification or better understanding, you can either ask the course mentor or post to the course of study message board.

**Measurement Scales**

**URL:** Levels of Measurement  
http://www.socialresearchmethods.net/kb/measlevl.php

There are four measurement scales/variables: nominal, ordinal, interval, and ratio variables (see the link above). These four scales have levels, like steps going upward. Understanding these scales is important for the selection of appropriate techniques for data analysis, especially when selecting certain statistical techniques. Most statistical techniques have assumptions that require certain data type, such as a t-test which requires that your data need to be at interval or ratio level.

**Resources**

**Measurement Scales Reading**

**URL:** https://web5.wgu.edu/aap/content/educational_research_%20chapter_6.pdf

Read chapter 6 (pp. 144-147) in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 6 at the link above.

Read chapter 2 (pp. 38-41) in the Johnson and Christensen text on e-reserves. While reading, take notes on the following:

- What are nominal, ordinal, interval, and ratio variables?
- Which of the four variables are quantitative variables?
- Which of the four variables is a qualitative variable?
- What are the benefits of quantitative versus qualitative data for research?
- How do you determine if a variable is measurable or nonmeasurable?

**Data Collection**

A really easy and expeditious way to make your study meaningless, invalid, or nonconclusive is by not paying attention to your data collection. Inasmuch as these are outcomes you want to avoid, you will want to develop competence in data collection. For this subject, you will learn the following:

- Types of measuring instruments of cognitive and affective tests, projective and nonprojective tests, and their relative merits of validity and reliability
- Instruments and methods for collecting qualitative data
- Sources of instruments
- Types of validity: content, criterion-related, construct, and consequential
- Forms of reliability: stability, equivalence, internal consistency, etc.
- Factors affecting validity and reliability

**Topics**

**Measuring Instruments**
You have already learned that data is classified according to measurement levels (nominal, ordinal, interval, and ratio variables) and quantitative variables (ordinal, interval, and ratio data) and qualitative variable (nominal data). How do we collect these different types of data? In this week, you will learn various measuring instruments and sources of instruments. There are numerous instruments available, but they fall into two main categories.

Non-Projective Tests:

1. Cognitive tests
   a. Achievement tests
   b. Aptitude tests
2. Affective tests
   a. Attitude scales
   b. Likert scales
   c. Semantic differential scales
   d. Thurstone scale
   e. Guttman scale
   f. Interest inventories
   g. Personality inventories
   h. Value tests

Most educational tests are nonprojective tests which typically collect numerical data. For qualitative research, two data collection methods are commonly used: observations and interviews.

Resources
Measurement Reading

URLs:

Chapter 6 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_6.pdf

Chapter 14 PowerPoint
https://web5.wgu.edu/aap/content/educational_research_%20chapter_14.pdf

Read chapters 6 (pp. 149-171) and chapter 14 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentations for chapters 6 and 14.

URLs:

Lecture Notes on Standardized Measurement and Assessment
http://www.southalabama.edu/coe/bset/johnson/lectures/lec5.pdf

Lecture Notes on Methods of Data Collection

While reading, take notes on the following:

- What are the purposes of cognitive and affective tests?
- What instruments do you use to collect qualitative data?
- What is the difference between a data collection instrument and a data collection method?
- What types of scales are used to collect data for affective variables?
- Where would you look for published or unpublished measurement instruments?
Also study and define the following terminologies:

- Data
- Norm-referenced data
- Criterion-referenced data
- Affective instruments
- Mental measurement yearbook
- Test
- Assessment
- Measurement
- Performance assessment
- Constructs
- Cognitive tests
- Standardized tests
- Cognitive instruments
- Aptitude instruments
- Tests in print
- Observation
- Interview
- Questionnaire
- Survey
- Variable
- Affective tests
- Raw score
- Standardized score
- Achievement instruments
- ETS
- Buros

**Criteria for Good Measuring Instruments**

Only when you have good instruments can you produce useful data. Validity and reliability are criteria for determining good measuring instruments. There are various types of validity and different methods for establishing reliability.

**Resources**

**Instrument Reading**

Read chapter 6 (pp. 154-162) in the Gay, Mills, and Airasian textbook.

Read chapter 3 (pp. 53-93) in the Gallagher text on e-reserves.

While reading, take notes of the definitions and how evidence can be established for the following types of validity:

- Content validity
- Criterion-related validity: concurrent and predictive
- Construct validity
- Consequential validity

Take notes of the definitions and how evidence can be established for the following forms of reliability:

- Stability-test-retest
Equivalence: equivalent-forms
Equivalence and stability
Internal consistency
Split-half
Scorer/rater reliability

Also consider the following questions:

- If a test is reliable, does it mean that it is also valid?
- If a test is valid, does it mean that it is also reliable?
- What factors affect validity?

Data Analysis

In a major research activity you have likely spent weeks reviewing the literature, designing the study, and collecting data, all to answer your research questions. When you get to the data analysis, you are near completion, and this is a critical milestone. After data is collected, it must be organized and analyzed before being presented in a meaningful way to answer research questions. You will learn various ways to analyze both quantitative and qualitative data using statistics and categorical analysis. There are two types of statistics: descriptive and inferential statistics. Simply put, descriptive statistics describe a set of data, and inferential statistics are used to infer the results for the larger population based on a small sample and to see if the results are indeed caused by the treatment.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Meaningfully describe a set of data</th>
<th>Purposes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Test significance of the differences between or among two or more mean scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Allow generalization</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Topics

Descriptive Statistics

There are various types of descriptive statistics. There are measures that tell one what a set of numbers tend to be. These are measures of central tendency such as mean, median, and mode. Then there are measures that tell you how a set of data tends to vary or be dispersed. These are measures such as range, variance, and standard deviation.

Resources

Descriptive Statistics Reading

URL: https://web5.wgu.edu/aap/content/educational_research_%20chapter_12.pdf
Read chapter 12 in the Gay, Mills, and Airasian textbook. Review the associated PowerPoint presentation for chapter 12 at the link above.

When reading, take notes and be able to define the following types of descriptive statistics:

- Frequencies
- Measures of central tendency: mean, mode, median
- Measures of variability (the spread): range, quartile deviation, variance, standard deviation, the normal curve, and skewed distributions
- Measures of relative position: percentile ranks, and standard scores (z scores, t scores, and stanines)
- Measures of relationship: correlation and correlation coefficient

Take notes on the two main methods for calculating correlation coefficient:

- The Spearman Rho coefficient (for ranked data)
- The Pearson r coefficient (for interval and ratio data)

Figure 4 is a graphic representation of the major types of descriptive statistics.

**Figure 4. Types of Descriptive Statistics**

**Inferential Statistics**

For this course of study, you do not really need to know how an inferential statistics is calculated. Your focus should be on understanding the basic concepts, not on the calculation. All inferential statistics are called tests of significance. A test of significance is a statistical test used to determine whether or not there is a significant difference between or among two or more group means at a selected probability level. The purpose is to generalize the results from a small sample to its larger population. The probability level is a level of significance, a criterion used to determine whether to accept or reject the null hypothesis based on the analysis.

There are two commonly accepted levels of significance:

1. p < .05 (alpha = .05), which means there are 5 times in 100 that you could expect a difference by chance.
2. p < .01 (alpha = .01), which means there is 1 in 100 that you could expect a difference by chance. This is a higher confidence level.
The probability level determines the probability of committing Type I error (rejecting a null hypothesis that is really true). At a (alpha) = .05, you have a 5% probability of making a Type I error. Or in other words, there is a 95% chance that the difference resulted from the independent variable, not random error. If you select a (alpha) = .01, then you only have 1% probability of making Type I error, however, you do increase the chance of committing Type II error (not rejecting a null hypothesis when you should). (Gay et al, pp. 332-333).

Resources

Deeper Understanding

Create a table in which the rows consist of t-test, ANOVA, factor analysis, chi-square, and regression analysis. Create a separate column for type of data, analysis of difference or correlation, and required number of participants. For each analysis for which you created a row, do the following (you will learn important points about when to apply what analysis and for what reasons):

1. Indicate if the data used is nominal, categorical, ordinal, or interval.
2. Determine if the analysis examined measures the difference between groups or the extent to which they are associated (correlated).
3. Record the required number of participants.

The following is a graphic representation of some commonly used tests of significance.

![Figure 5. Commonly Used Tests of Significance](image)

Inferential Statistics Reading

**URL:** [https://web5.wgu.edu/aap/content/educational_research_%20chapter_13.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_13.pdf)

Read chapter 13 in the Gay, Mills, and Airasian textbook. Also review the associated PowerPoint presentation for chapter 13 at the link above.
While reading, take notes on the following:

- What factors determine the choice of statistical procedures?
- What are the two assumptions for using a t-test and ANOVA?
- What is the purpose of t-test?
- What is the purpose of ANOVA?
- What is the difference between t-test and ANOVA?
- What is the purpose of factor analysis?
- What is the purpose of chi square?
- How is chi square different from t-test and ANOVA?
- What is the function of multiple regression?
- What is the purpose of analysis of covariance (ANCOVA)?
- What is standard error?
- What are two-tailed and one-tailed tests?

**Qualitative Data Analysis**

The analytic concepts for qualitative data analysis are relatively easy when compared to those for quantitative analysis, although the actual process of the analysis is more complex and time consuming. The main technique for qualitative data analysis is categorical analysis, a process of categorizing and coding pieces of data and grouping them into themes (classifying counting responses, looking for patterns, etc.). Qualitative data analysis consists of two phases: data analysis during data collection and data analysis after data collection.

![Qualitative Data Analysis during Data Collection](image)

**Figure 6. Qualitative Data Analysis during Data Collection**

**Resources**

**Qualitative Data Analysis Reading**

**URL:** [https://web5.wgu.edu/aap/content/educational_research_%20chapter_18.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_18.pdf)

Read chapter 18 in the Gay, Mills, and Airasian textbook. Also review the associated PowerPoint presentation for chapter 18 at the link above.
While reading, take notes on the following:

- What is the main technique for analyzing qualitative data?
- What are the steps for analyzing qualitative data?
- What are some data analysis strategies?

**Research Study Critique**

You have learned most of the important concepts for the Research Fundamentals domain, and you should be able to judge the adequacy of a research study now. Therefore, it is time for you to go back and review all the components for a research study and conceptually understand how to evaluate the quality and appropriateness of each component (you will conduct the actual evaluation in Issues in Educational Research). As mentioned previously, the ability to do this is an essential component to your professional development.

**Topics**

**Evaluating a Research Report**

The savvy researcher is a keen reader of research. They understand factors that might influence their interpretation as well as potential sources of bias.

**Resources**

**Reflection**

You conducted an annotated bibliography and a literature review for the Literature Reviews for Educational Research. Now that you have studied further how to evaluate a research report, are there some that you would now consider eliminating? What issues come to mind that did not surface through the CARS analysis you conducted for the annotated bibliography.

**Evaluating a Research Report Reading**

URL: [https://web5.wgu.edu/aap/content/educational_research_%20chapter_22.pdf](https://web5.wgu.edu/aap/content/educational_research_%20chapter_22.pdf)

Read chapter 22 in the Gay, Mills, and Airasian textbook. Also review the associated PowerPoint presentation for chapter 22 at the link above.

What factors might influence the interpretation of research results? What are the criteria for evaluating the following sections of a research report? While reading, take notes on the following:

- Problem statement
- Review of the literature
- Hypotheses
- Participants
- Instruments
- Research design and procedures
- Results
- Discussion
- Abstract and summary
- Overall research approach
Conclusion

Congratulations on completing all the learning activities for the introduction to research fundamentals! As you can appreciate, research fundamentals covers a broad range of topics. Your studies included the basics of a quantitative, qualitative, and action research fundamentals; topic selection and literature reviews; resource identification; research critique; and research questions and hypothesis development. As a professional, you should comprehend how these topics are interrelated. During your research fundamentals studies, you read and viewed a great deal of pertinent resources to apply your new knowledge. Share this experience with your peers and colleagues.

Consider what learning strategies helped you learn the material. Write these down to share with your students when teaching. You now need to demonstrate your competency by passing the objective assessment and performance assessments.

Topics

Take the Pre-Assessment

Take the pre-assessment for the RFC1/NRC1 exam, available through your AAP. The results will provide a percentage for each of the topics in this course of study. You should then review your notes for topics with low scores. Your textbook will have additional online resources to check your understanding. Another way to check your understanding is to start with blank paper and write down your understanding of the topic. Pretend you are teaching this topic to a student. You can also post your understanding in the community for review.

Resources

Accessing Pre-Assessments

1. Log in to your MyWGU Student Portal.
2. Go to the "My AAP" tab.
3. In the list below "Course Details," find the assessment you are working on.
4. In the "Assessment Preparation" column, click "Pre-assessment."
5. In the window that pops up, click "Click here to refer for this pre-assessment." A request will be sent to your mentor for approval.
6. Once your mentor has approved your request, return to the "My AAP" tab and click "Pre-assessment" in the "Assessment Preparation" column.
7. In the window that pops up, click "Click here to take this pre-assessment." You will then begin the pre-assessment.

Next Step: Take the Objective Assessment

Once you have confidence with your new knowledge, take the pre-assessment again. Schedule the RFC1/NRC1 exam after passing the pre-assessment.

Resources

Accessing Objective Assessment

1. Log in to your MyWGU Student Portal.
2. Go to the "My AAP" tab.
3. In the list below "Course Details," find the assessment you are working on.
4. In the "Assessment Scheduled Date" column, click "Schedule Now."
5. In the window that pops up, click "Search."
6. A new window will come up. In this window, you can either select a previously-used site or search for a different site approved by WGU. Select the site(s) by clicking on the box beside the name. This will move your selection(s) to the "Selected Sites" box.
7. Once you have selected at least one site, click "Update."
8. You will be returned to the previous window, and the site information will now be filled in. Click "Continue."
9. Enter three different potential dates with the times you can take the assessment. \textit{Note: The dates must be at least two weeks from the day you refer for the assessment.}
10. Click "Continue" once your potential dates and times are filled in.
11. If there are other considerations you would like to inform the Assessment Delivery Team about, discuss them in the "Other Considerations" box that appears, and then click "Continue."
   If not, simply click "Continue."
12. A request will be sent to your mentor for approval.
13. Once your mentor has approved your request, our Assessment Delivery Team will begin scheduling your assessment at the proctor site that you submitted. Once your assessment has been scheduled, you will receive a confirmation e-mail with the date, time, and proctor site. The status on your AAP will then change to "Scheduled."

**Feedback**

To provide feedback on this or any other course of study, please use the [Course of Study Feedback form](#).

**ADA Requirements**

Please review the [University ADA policy](#).