

# 1

## Scientific Knowing

*Ways of Knowing  
Science as a Way of Knowing  
The Scientific Method  
Types of Research*

Have you considered **how you know what you know**? As you sit in classes or talk with friends, have you noticed that people differ in the way they know things? Look at six students who are discussing the issue of "modern translations" of the Bible.

Student 1: "I use the King James Version because that's the translation I grew up using. **Everybody in our church back home uses it.**"

Student 2: "I use the New King James because **my pastor says** it offers the best of beauty and modern scholarship."

Student 3: "I've prayed about what version to use. I like the Amplified Version because it is so clear in its language. **It just feels right.**"

Student 4: "I've tried five or six different translations for devotional reading and for preparation for teaching in Sunday School. After evaluating each one, I've come back again and again to the New International Version. **It's the best translation for me.**"

Student 5: "The essence of Bible study is understanding the message, whatever translation we may use. Therefore, I **use different translations depending** on my study goals."

Student 6: "I use the New King James because most of my congregation is familiar with it. In a recent survey, I found that **84% of our members use the KJV or NKJV.**"

Each of these students reflect a different basis for knowing which translation to use. Which student most closely reflects your view? How did you come to know what you know?

### Ways of Knowing

As we begin our study of research design and statistical analysis, we need to understand the characteristics of scientific knowing, and how this kind of knowing differs from other ways we learn about our world. We will first look at five non-scientific ways of knowing: common sense, authority, intuition/revelation, experience, and deductive reasoning. Then we'll analyze the scientific method, which is based on inductive reasoning.

Common Sense  
Authority  
Intuition/Revelation  
Experience  
Deductive Reasoning  
Inductive Reasoning

## Common Sense

Common sense refers to knowledge we take for granted. **We learn by absorbing the customs and traditions that surround us**—from family, church, community and nation. We assume this knowledge is correct because it is familiar to us. We seldom question, or even think to question, its correctness because it just is. Unless we move to another region, or go to school and study the views of others, we have nothing to challenge our way of thinking. It's just common sense!

But common sense told us that “the earth is flat” until Columbus discovered otherwise. Common sense told us that “dunce caps and caning are effective student motivators” until educational research discovered the negative aspects of punishment. Common sense may well be wrong.

## Authority

Authoritative knowledge is an **uncritical acceptance of another's knowledge**. When we are sick, we go to the doctor to find out what to do. When we need legal help, we go to a lawyer and follow his advice. Since we can not verify the knowledge on our own, we must simply choose to accept or reject the expert's advice. It would be foolish to argue with a doctor's diagnosis, or a lawyer's perception of a case. This is the meaning of "uncritical acceptance" in the definition above. The only recourse to accepting the expert's knowledge is to get a second opinion—from another expert.

As Christians, we believe that God's Word is the authority for our life and work. The Living Word—the Lord Himself—within us confirms the Truth of the Written Word. The Written Word confirms our experiences with the Living Word. Scripture is a valid source of authoritative knowledge.

However, we spend a lot of time discussing Scriptural interpretations. Our discussions often deteriorate into conflicts about “my pastor's” interpretations. We use our own pastor's interpretation as authoritative because of the influence he has had in our own life. (We can substitute any authoritative person here, such as a father or mother, Sunday School teacher, or respected colleague.)

**But is the authority is correct?** Authoritative knowing does not question the source of knowledge. Yet differing authorities cannot be correct simultaneously. How do we test the validity of an authority's testimony?

## Intuition/Revelation

Intuitive knowledge refers to **truths which the mind grasps immediately**, without need for proof or testing or experimentation. The properly trained mind “intuits” the truth naturally. The field of geometry provides a good example of this kind of knowing. Let's say I know that Line segment A is the same length as line segment B. I also know that Line segment B is the same length as line segment C. From these two truths, I immediately recognize that Line segments A and C are equal. Or, in short hand,

**IF A=B and B=C, THEN A=C**

I do not need to draw the three lines and measure them. My mind immediately grasps the truth of the statement.

**Revelation is knowledge that God reveals about Himself.** I do not need test this knowledge, or subject it to experimentation. When Christ reveals Himself to us, we know Him in a personal way. We did not achieve this knowledge by our own efforts, but merely received the revelation of the Lord. We cannot prove this knowledge to others, but it is bedrock truth to those who've experienced it. Problems arise, however,

when we apply intuitive knowing to ministry programs. **“Well, it's obvious that regular attendance in Sunday School helps people grow in the Lord.”** Is it? We work hard at promoting Sunday School attendance. Does it actually change the lives of the attenders? Is it enough for people to think it does, whether or not real change takes place? **Answers to these questions come from clear-headed analysis, not from intuition.**

## Experience

**Experiential knowledge comes from “trial and error learning.”** We develop it when we try something and analyze the consequences. You've probably heard comments like these: “We've already tried that and it failed.” Or another: “We've found that holding Vacation Bible School during the third week of August, in the evening, is best for our church.” The first is negative. The speaker is saying there's no need to try that ministry or program again, because it was already tried. The second is positive. This church has tried several approaches to offering Vacation Bible School and found the best time for them. Their “truth” may not apply to any other church in the association, but it is true for them. They've tried it and it worked. . .or it didn't.

Much of the promotion of new church programs comes out of this framework. We say, “This program is being used in other churches with great success” (which means our church can have the same experience if we use this program). **How do we evaluate program effectiveness? What is success? How do we measure it?**

## Deductive Reasoning

**Deductive reasoning moves thinking from stated general principles to specific elements.** We develop general over-arching statements of intent and purpose. Then we deduce from these principles specific actions we should take. Determine “world view” first. Then make daily decisions which logically derive from this perspective.

When we take the Great Commission as our primary mandate, we have framed a world view for ministry. That is, “Whatever we do, we will connect it to reaching out and baptizing (missions and evangelism), teaching (discipleship and ministry).” Now, how do we do it? We deduce specific programs, plans, and procedures for carrying out the mandate. We eliminate programs that conflict with this mandate.

How do we arrive at this “world view?” Are our over-arching principles correct? Have we interpreted them correctly? **Correct action rises or falls on the basis of two things. First, correct action depends on the correctness of our world view. Secondly, correct action depends on our ability to translate that view into practical ministry steps.**

## Inductive Reasoning

**Inductive reasoning moves thinking from specific elements to general principles.** Inductive Bible study analyzes several passages and then synthesizes key concepts into the central truth. Science is inductive in its study of a number of specifics and its use of these results to formulate a theory. The truths derived in this way are temporary and open to adjustment when new elements are discovered. Knowledge gained in this way is usually related to probabilities of happenings. We have a high degree of confidence that combining “X” and “Y” will produce effect “Z.” Or, we learn that “B” and “C” are seldom found in combination with “D.”

I can demonstrate probability by using matches. Picture yourself at the kitchen table with 100 matches. You pick up the **first one**. What is the probability it will light when you strike it? Well, you have two possibilities: either it **will** or it **won't**. So the probability is 50% (1 event out of 2 possibilities). You strike it and it lights. Pick up the

**second match.** The probability is 0.50 that it will light: (1 event out of two possibilities: Yes or No.) But cumulatively, out of two matches (first and second), one lit. One out of two is 50%. So the probability of the second match lighting is 50%, because 1 of 2 have already lit. You strike it and it lights.

Pick up the **third match.** Again, the third match taken alone has “ $p = 0.50$ ” of lighting (read ‘probability equals point-five-oh’). However, *taking all three matches together, two of the three have lit and the probability is  $2/3$  (“ $p = 0.66$ ”) that the third match will light.* It does.

Now, pick up the **fourth match.** The probability is  $3/4$  ( $p=0.75$ ) that it will light, taking all four matches together.

What about the **100th match, given that the 99 previous matches have all lit?** The probability is **0.50 for this particular match (yes, no)**, but  $p = 0.99$  taking all matches together. The probability is very high! **Yet we cannot absolutely guarantee it will light.**

This is the nature of inductive logic, and inductive logic is the basis of scientific knowledge. By definition, science does not deal with absolute Truth. Science seeks knowledge about processes in our world. Researchers gather information through observation. They then mold this information into theories. The scientific community tests these theories under differing conditions to establish the degree to which they can be generalized. The result is **temporary, open-ended truth** (I call it *little-t truth* to distinguish it from absolute Truth). This kind of truth is open for inquiry, further testing, and probable modification. While this kind of knowing can add nothing to our faith, it is very helpful in solving ministry problems.

## Science as a Way of Knowing

Objectivity

Precision

Verification

Empiricism

Goal: Theories

Scientific knowing is based on precise data gathered from the natural world we live in. It builds a knowledge base in a neutral, unbiased manner. It seeks to measure the world precisely. It reports findings clearly so that others can duplicate the studies. It forms its conclusions on empirical data. Let’s look at these ideals more closely.

### Objectivity

Human beings are complex. Personal experiences, values, backgrounds, and beliefs make objective analysis difficult unless effort is made to remain neutral. Optimists tend to see the positive in situations. Pessimists see the negative. But scientists look for objective reality — the world as it is — uncolored by personal opinion or feelings.

Scientific knowing attempts to eliminate personal bias in data collection and analysis. Honest researchers take a **neutral position in their studies**. That is, they do not try to prove their own beliefs. They are willing to accept empirical results contrary to their own opinions or values.

### Precision

Reliable scientific knowing requires precise measurement. Researchers carry out experiments under **controlled, narrow conditions**. They carefully design instruments to be as accurate as possible. They evaluate tests for reliability and validity. They use pilot projects (trial runs of procedures) to identify sources of extraneous error in measurements. Why? Because inaccurate measurement and undefined conditions and unreliable instruments and extraneous errors produce data that is worthless. Every score has two parts: the true measure of the subject, and an unknown amount of error. We can represent this as

$$\text{Score} = \text{True Measure} + \text{Error}$$

Think of two students who are equally prepared for an exam. When they arrive in class, one is completely healthy and the other has the flu. They will likely score differently on the exam. In this case, illness introduces an error term into the second student's score.

When we gather data in a haphazard, disorderly way, error interferes with the true measure of the variable. Like static on a television screen, the error masks the true picture of the data. Analysis of this *noisy* data will provide a numerical answer which is suspect. **Accurate measurement is a vital ingredient in the research process.**

## Verification

Science analyzes world processes which are systematic and recurring. **Researchers report their findings in a way that allows others to replicate their studies — to check the facts in the real world.** These replications either confirm or refute the original findings. When researchers confirm earlier results, they verify the earlier findings. Research reports provide readers the background, specific problem(s) and hypotheses of studies. Also included are the populations, definitions, limitations, assumptions, as well as procedures for collecting and analyzing data. Writers do this intentionally so others can evaluate the degree that findings can be generalized, and perhaps, replicate the study.

## Empiricism

The root of “empiricism” (Greek, *empeirikos*) refers to the “employment of empirical methods, as in science,” or “derived from observation or experiment; verifiable or provable by means of observation or experiment.”<sup>1</sup> Science uses the term to underscore the fact that it **bases its knowledge on observations of specific events, not on abstract philosophizing or theologizing.** These carefully devised observations of the real world form the basis of scientific knowledge. Therefore, the kinds of problems which science can deal with are testable problems.

**Empirical data is gathered by observation.** Basic observations can be done with the naked eye and an objective checklist (see Chapter 9). But observations are also made with instruments such as an interview or questionnaire (Chapter 10), a test (Chapter 11), an attitude scale (Chapter 12), or a controlled experiment (Chapter 13). **Scientific knowing cares less about philosophical reasoning than it does the *rational collection and analysis of factual data relevant to the problem to be solved.***

## Goal: Theories

**The goal of scientific research is theory construction,** the development of theories which explain the phenomena under study, not the mere cataloging of empirical data. **The inductive process of scientific knowing begins with the specifics (collected data) and leads to the general (theories).** What causes cancer? What makes it rain? How does man learn? What is the best way to relieve anxiety? What effect do children have on marital satisfaction?

Most ministerial students want pragmatic answers to pragmatic problems in the ministry. In the past ten years [*during the 1980's*] there have been a rash of studies

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<sup>1</sup>"Empiricism," "empirical." *The American Heritage Dictionary*, 3rd ed., Version 3.0A, WordStar International, 1993.



relating some variable to church growth. The pragmatic question is “How do I make my church grow?” But Christian research goes deeper. It looks beyond the surface of ministry programming to the social, educational, psychological, and administrative dynamics of church life and work. Each of these areas have many theories and theorists giving advice and explanation. **Are these views valid for Christian ministry? Can you modify these theories for effective use in church ministry?** Seek a solid theoretical base for your proposal.

## The Scientific Method

Felt Difficulty  
Problem  
Literature  
Hypothesis  
Population  
Sample(s)  
Collect  
Analyze  
Test  
Interpret

The scientific method is a step-by-step procedure for solving problems on the basis of empirical observations. Here are the major elements:

1. Begin with a “**felt difficulty**.” What is your interest? What questions do you want answered? How might a theory be applied in a specific ministry situation? What conflicting theories have you found? The felt difficulty is the beginning point for any study (but it has no place in the proposal).
2. Write a formal “**Problem Statement**.” The Problem establishes the focus of the study by stating the necessary variables in the study and what you plan to do with them (see Chapter 4).
3. **Gather literature information.** What is known? Before you plan to do a study of your own, you must learn all you can about what is already known. This is done through a literature search and results in a synthesis of recent findings on the topic (see Chap 6).
4. **State hypothesis.** On the basis of the literature search, write a hypothesis statement that reflects your best tentative solution to the Problem (see Chapter 4).
5. Select a **target group (population)**. Who will provide your data? How will you find subjects for your study? Are they accessible to you? (see Chapter 7)
6. Draw one or more **samples**, as needed. How many samples will you need? What kind of sampling will you use? (see Chapter 7).
7. **Collect data.** What procedure will you use to actually collect data from the subjects? Develop a step-by-step plan to obtain all the data you need to answer your questions (see Chapters 9-13).
8. **Analyze data.** What statistics will you use to analyze the data? Develop a step-by-step plan to analyze the data and interpret the results (see Chapters 14-25).
9. **Test** the null, or statistical, hypothesis. On the basis of the statistical results, what decision do you make concerning your hypothesis? (see Chapters 16-26).
10. **Interpret** the results. What does the statistical decision mean in terms of your study? Translate the findings from “statistics” to English. (see Chapters 16-26)

The scientific method provides a clear procedure for empirically solving problems. In chapter 2 we introduce you to the structure of a research proposal. As you read the chapter, notice how the elements of the proposal follow the steps of the scientific method. Refer back to this outline in order to understand the links between the scien-

tific method and the research proposal.

## Types of Research

Under the umbrella of scientific research, there are several types of studies you can do. These types differ in procedure – what they entail – and outcome – what they accomplish. Here are four major and three minor types of research from which you may choose.

Historical  
Descriptive  
Correlational  
Experimental  
Ex Post Facto  
Evaluation  
Research/Dev

### Historical Research

Historical research analyzes the question “**what was?**” It studies documents and relics in order to determine the relationship of historic events and trends to present-day practice.

#### Primary sources

A source of information is primary when it is **produced by the researcher**. Reports written by researchers who conduct studies are “eye witness” accounts, and are primary sources of information on the results. Other examples of primary sources are autobiographies and textbooks written by authors who conduct their own research. **Use primary sources as the major source of information in the Related Literature section of your proposal.** Primary sources take two forms: documents and relics.

**Documents.** Society creates documents to **expressly record events**. They are objective and direct. Documents provide straightforward information. Average Bible Study attendance listed on the Annual Church Letters on file in the state convention office is more likely to be accurate than numbers given from memory by ministers of education in local churches. However, information contained in documents may be incorrect. The documents may have been falsified, or word meanings in the documents may have changed.

**Relics.** Society creates relics simply by living. **Relics are artifacts left by communities and cultures in the past.** People did not create these objects to record information as is the case with documents. Therefore, information conveyed by relics requires interpretation. The historical researcher reconstructs the meaning of relics in the context of their time and place.

#### Secondary sources

A source of information is secondary when it is a **second-hand account of research**. Secondary sources may take the form of summaries, news stories, encyclopedias, or textbooks written by synthesizers of research reports. While secondary sources provide the bulk of materials used in term papers, you should use them only to provide a broad view of your chosen topic. As already stated, **emphasize the use of primary sources in your Synthesis of Related Literature.**

#### Criticism

The term “criticism” has a decidedly negative connotation to most of us. A critical person is one who finds fault, depreciates, or puts down someone or something. The term comes from the Greek *krino*, **to judge**. Webster defines “criticism” as the “art, skill, or profession of making discriminating judgments and evaluations, especially of literary or other artistic works.”<sup>12</sup> *Criticism can therefore refer to praise as well as depreciation.* A

<sup>12</sup>Criticism," *The American Heritage Dictionary*, 3rd ed., Version 3.0A, WordStar International, 1993.

Christian may cringe when he hears someone speaks of using “higher criticism” to study Scripture. It sounds as if the scholar is criticizing -- berating, slandering, putting down -- the Bible. The term actually means that **scholars objectively analyze language, culture, and comparative writings to determine the authenticity of the work**. Who wrote Hebrews? Paul? Apollos? Peter? Scholars apply the systematic tools of content analysis and “literary criticism” to determine the answer. Criticism takes two major forms: External criticism and internal criticism.

**External criticism.** External criticism answers the question of *genuineness* of the object. **Is the document or relic actually what it seems to be?** What evidence can we gather to affirm the authenticity of the object itself? For example, is this painting really a Rembrandt? Was this letter really written by Thomas Jefferson? External criticism focuses on the **object itself**.

**Internal criticism.** Internal criticism answers the question of *trustworthiness* of the object. **Can we believe what the document says?** What ideas are being conveyed? What does the writer mean by his words, given the culture and time period he wrote? Internal criticism focuses on the **object’s meaning**.

## Examples

Historical research is not merely the collection of facts from secondary sources about an historic event or process. It is the **objective interpretation of facts, in line with parallel events in history**. The goal of historical research is to in explain the underlying causes of present practices. Most of the historical dissertations written by our students have focused on former deans and faculty members. **Dr. Phillip H. Briggs** studied the contributions of Dr. J. M. Price, Founder and Dean of the School of Religious Education.<sup>3</sup> **Dr. Robert Mathis** analyzed the contributions of Dr. Joe Davis Heacock, Dean of the School of Religious Education, 1950-1973.<sup>4</sup> **Dr. Carl Burns** evaluated the contributions of Dr. Leon Marsh, Professor of Foundations of Education, School of Religious Education, Southwestern Seminary, 1956-1987.<sup>5</sup> **Dr. Sophia Steibel** analyzed the Life and Contributions of Dr. Leroy Ford, Professor of Foundations of Education, 1956-1984.<sup>6</sup> **Dr. Douglas Bryan** evaluated the contributions of Dr. John W. Drakeford, Professor of Psychology and Counseling.<sup>7</sup>

## Descriptive Research

Descriptive research analyzes the question “**what is?**” A descriptive study collects data from one or more groups, and then analyzes it in order to describe present conditions. Much of this textbook underscores the tools of descriptive research: survey by questionnaire or interview, attitude measurement, and testing. A popular use of descriptive research is to determine whether two or more groups differ on some variable of interest.

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<sup>3</sup>Phillip H. Briggs, “The Religious Education Philosophy of J. M. Price,” (D.R.E. diss., Southwestern Baptist Theological Seminary, 1964).

<sup>4</sup>Robert Mathis, “A Descriptive Study of Joe Davis Heacock: Educator, Administrator, Churchman,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1984)

<sup>5</sup>Carl Burns, “A Descriptive Study of the Life and Work of James Leon Marsh,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1991)

<sup>6</sup>Sophia Steibel, “An Analysis of the Works and Contributions of Leroy Ford to Current Practice in Southern Baptist Curriculum Design and in Higher Education of Selected Schools in Mexico,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1988)

<sup>7</sup>Douglas Bryan, “A Descriptive Study of the Life and Wrok of John William Drakeford,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1986)



Another application of descriptive research is whether two or more variables are related within a group. This latter type of study, while descriptive in nature, is often referred to specifically as *correlational research* (see the next section).

### An Example

The goal of descriptive research is to accurately and empirically describe differences between one or more variables in selected groups. **Dr. Dan Southerland** studied *differences in ministerial roles and allocation of time between growing and plateaued or declining Southern Baptist churches in Florida*.<sup>6</sup> Specified roles were pastor, worship leader, organizer, administrator, preacher and teacher.<sup>7</sup> The only role which showed significant difference between growing and non-growing churches was the amount of time spent serving as “organizer,” which included “vision casting, setting goals, leading and supervising change, motivating others to work toward a vision, and building groupness.”<sup>8</sup>

## Correlational Research

Correlational research is often presented as part of the descriptive family of methods. This makes sense since correlational research describes association between variables of interest in the study. It answers the question “*what is*” in terms of relationship among two or more variables. What is the relationship between learning style and gender? What is the relationship between counseling approach and client anxiety level? What is the relationship between social skill level and job satisfaction and effectiveness for pastors? In each of these questions we have asked about an association between two or more variables.

Correlational research also includes the topics of *linear and multiple regression* which uses the strengths of associations to make predictions. Finally, correlational analysis includes advanced procedures like Factor Analysis, Canonical Analysis, Discriminant Analysis, and Path Analysis – all of which are beyond the scope of this course.

### An Example

The goal of correlational research is to establish whether relationships exist between selected variables. **Dr. Robert Welch** studied *selected factors relating to job satisfaction in staff organizations in large Southern Baptist Churches*.<sup>9</sup> He found the most important intrinsic factors affecting job satisfaction were praise and recognition for work, performing creative work and growth in skill. The most important extrinsic factors were salary, job security, relationship with supervisor, and meeting family needs.<sup>10</sup> Findings were drawn from 579 Southern Baptist ministers in 153 churches.<sup>11</sup>

## Experimental Research

Experimental research analyzes the question “*what if?*” Experimental studies use carefully controlled procedures to manipulate one (independent) variable, such as

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<sup>6</sup>Dan Southerland, “A Study of the Priorities in Ministerial Roles of Pastors in Growing Florida Baptist Churches and Pastors in Plateaued or Declining Florida Baptist Churches,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1993)

<sup>7</sup>*Ibid.*, 1

<sup>8</sup>*Ibid.*, 2

<sup>9</sup>Robert Horton Welch, “A Study of Selected Factors Related to Job Satisfaction in the Staff Organizations of Large Southern Baptist Churches,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1990)

<sup>10</sup>*Ibid.*, 2

<sup>11</sup>*Ibid.*, 61

Teaching Approach, and measure its effect on other (dependent) variables, such as Student Attitude and Achievement. Manipulation is the distinguishing element in experimental research. Experimental researchers don't simply observe what is. They **manipulate variables and set conditions in order to design the framework for their observations**. What would be the difference in test anxiety across three different types of tests? Which of three language training programs is most effective in teaching foreign languages to mission volunteers? What is the difference between Counseling Approach I and Counseling Approach II in reducing marital conflict?

In each of these questions we find a researcher introducing a **treatment** (type of test, training program, counseling approach) and measuring an **effect**. *Experimental Research is the only type which can establish cause-and-effect relationships between independent and dependent variables*. See Chapter 13 for examples of experimental designs.

### An Example

The goal of experimental research is to establish cause-effect relationships between independent and dependent variables. **Dr. Daryl Eldridge** analyzed the **effect of knowledge of course objectives on student achievement in and attitude toward the course**.<sup>12</sup> He found knowledge of instructional objectives produced significantly higher scores on the Unit I exam (mid-range cognitive outcomes) but not on the Unit III exam (knowledge outcomes). Knowledge of objectives did produce significantly higher scores on the postcourse attitude inventory.<sup>13</sup>

### Ex Post Facto Research

Ex Post Facto (which translates into English as "after the fact") research is similar to experimental research in that it answers the question, "what if?" But in ex post facto designs, **nature — not the researcher — manipulates the independent variable**. In studying the effects of brain damage on the attitudes of children toward God, it would be immoral and unethical to randomly select two groups of children, brain damage one of them, and then test for differences!

But in an ex post facto approach the researcher defines two populations: normal children and brain-damaged children. Nature has applied the treatment of brain damage. The experiment is done "after the fact" of the brain damaged condition. Experimental studies involving juvenile delinquency, AIDS, cancer, criminal or immoral behavior and the like all require an Ex Post Facto approach.

### An Example

The goal of ex post facto research is to establish cause-and-effect relationships between independent and dependent variables "after the fact" of manipulation. An example of Ex Post Facto research would be "An Analysis of the Difference in Social Skills and Interpersonal Relationships Between Congenitally Deaf and Hearing College Students." Congenital deafness in this case is the treatment already applied by nature.

### Evaluation

Evaluation is the **systematic appraisal of a program or product to determine if it is accomplishing what it proposes to do**. It is the application of the scientific method to the

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<sup>12</sup>Daryl Roger Eldridge, "The Effect of Student Knowledge of Behavioral Objectives on Achievement and Attitude Toward the Course," (Ed.D. diss., Southwestern Baptist Theological Seminary, 1985)

<sup>13</sup>*Ibid.*, 2

practical worlds of educational and administrative programming. Specialists commend to us a variety of programs designed to solve problems. Depending upon the degree of personal involvement of these specialists with the programs, these commendations may contain more word magic than substance. **Does a program do what it's supposed to do?**

The danger in choosing an evaluation type study for dissertation research is the **political ramifications** which come if the evaluation proves embarrassing to the church or agency conducting the program. Program leaders may not appreciate negative evaluations and apply pressure to modify results. This distorts the research process. Suppose you choose to evaluate a new counselor orientation program at a highly visible counseling network — and you find the program substandard. Will this impact your ability to work with this agency as a counselor? Or suppose you want to compare Continuous Witness Training (CWT) with Evangelism Explosion (EE) as a witness training program. What are the implications of your finding one program much better than the other?

### An Example

The goal of evaluation research is to objectively measure the performance of an existing program in accordance with its stated purpose. An example of this type of study would be “A Critical Analysis of Spiritual Formation Groups of First Year Students at Southwestern Baptist Theological Seminary.” Program outcomes are measured against program objectives to determine if Spiritual Formation Groups accomplish their purpose.

## Research and Development

Research and Development (“R&D”) is the application of the scientific method in **creating a new product**: a standardized test, or program, or technique. R&D is a cyclical process in which developers (1) state the objectives and performance levels of the product, (2) develop the product, (3) measure the results of the product's performance, and (4) (if the results of the treatment do not meet the stated levels) revise the materials for further testing. “Cyclical process” means that the materials are revised and tested until they perform according to the standards set at the beginning of the product's development.

### An Example

The goal of research and development is the production of a new product which performs according to specified standards. **Dr. Brad Waggoner developed an instrument to measure “the degree to which a given church member manifests the functional characteristics of a disciple.”**<sup>14</sup>

Two pilot tests using this original instrument produced Cronbach Alpha reliability coefficients of 0.9745 and 0.9618, demonstrating its ability to produce a reliable measurement of a church member's functional characteristics of a disciple.<sup>15</sup> **In 1998, this instrument was incorporated into MasterLife materials produced by LifeWay Christian Resources (SBC).**<sup>16</sup>

<sup>14</sup>Brad J. Waggoner, “The Development of an Instrument for Measuring and Evaluating the Discipleship Base of Southern Baptist Churches,” (Ed.D. diss., Southwestern Baptist Theological Seminary, 1991)

<sup>15</sup>*Ibid.*, 118

<sup>16</sup>Report of joint development between Lifeway and the International Mission Board (SBC) at the 1998 Meeting of the Southern Baptist Research Fellowship.

## Qualitative Research

In 1979 the faculty of the School of Religious Education at Southwestern created a teaching position for research and statistics. Their desire was for this position to give emphasis to helping students understand research methods and procedures for statistical analysis. It was further the desire that **doctoral research become more objective and scientific, less philosophical and historical**. In 1981, after two years of interviews and discussions, Religious Education faculty voted, and the president approved, my election to their faculty to provide this emphasis. This textbook, and the dissertation examples it contains, are products of 25 years of emphasis on descriptive, correlational and experimental research -- most of which is **quantitative** or statistical in nature.

In recent years interest has grown in research methods which focus more on the issue of **quality than quantity**. **A qualitative study is an inquiry process of understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting.**<sup>17</sup> **Dr. Don Ratcliff**, in a 1999 seminar for Southwestern doctoral students, suggested the following as the most common qualitative research designs: ethnography, field study, community study, biographical study, historical study, case study, survey study, observation study, grounded theory and any combination of the above.<sup>18</sup>

Grounded theory is a popular choice of qualitative researchers. It originated in the field of sociology and calls for the **researcher to live in and interact with the culture or people being studied**. The researcher attempts to derive a theory by using multiple stages of data collection, along with the process of refining and inter-relating categories of information.<sup>19</sup>

**Qualitative research is subjective, open-ended, evolving and relies on the ability of the research to reason and logically explain relationships and differences.** **Dr. Marcia McQuitty**, Professor of Childhood Education in our school, has become our resident expert in qualitative designs. I continue to focus on quantitative research, which is, in comparison, objective, close-ended (once problem and hypothesis is established), structured and relies on the ability of the research to gather and statistically analyze valid and reliable data to explain relationships and differences.

## Faith and Science

What is the relationship between faith and science? Are faith and science enemies? Can ministers use scientific methodology to study the creation and retain a fervent faith in the Creator. I believe we can -- and should. But care must be taken to consciously mark out the boundaries of each. There *is* a difference between faith-knowing and scientific knowing, and that difference sometimes explodes into conflict -- a conflict fueled by both sides. First we'll look at the suspicion of science by the faithful. Then we'll consider the suspicion of religion by scientists.

### Suspicion of Science By the Faithful

Anselm wrote in the 10th century, "I believe so that I may understand." In other words, commitment and faith are essential elements in gaining spiritual understanding.

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<sup>17</sup>Randy Covington, "An Investigation into the Administrative Structure and Polity Practiced by the Union of Evangelical Christians - Baptists of Russia," (Ph.D. proposal, Southwestern Baptist Theological Seminary, 1999), 20 paraphrasing John W. Creswell, *Research Design: Qualitative and Quantitative Approaches* (Thousand Oaks, CA: Sage Publications, 1994), 1-2

<sup>18</sup>*Ibid.*, 25 quoting doctoral conference notes from meeting with Ratliff, Southwestern, April 24, 1999

<sup>19</sup>*Ibid.*, 26 paraphrasing Creswell, 12

His words reflect Jesus' teaching that He gives understanding to those who follow Him (Mt. 11:29; 16:24).

Blaise Pascal wrote in the 17th century, "The heart has reasons which are unknown to reason.... It is the heart which is aware of God and not reason. That is what faith is: God perceived intuitively by the heart, not by reason." The truth of Christ comes by living it out, by risking our lives on Him, by **doing** the Word. We grow in our knowledge of God through personal experience as we follow Him and work with Him. We believe in order to understand spiritual realities. This approach to knowing is **private** and **subjective**. Such belief-knowing resents an anti-supernatural skepticism of open-minded inquiry. More than that, some scientists consider the scientific method *to be their religion*. Their "belief in evolution" may be a justification for their unbelief in God. **Science is helpful in learning about our world, but it makes a poor religion**. So the faithful view science and its adherents with suspicion.

Sometimes, however, the suspicion of science by the religious has less to do with faith than it does **political power**. In the Middle Ages, the accepted view of the universe was geocentric ("earth-center"). The moon, the planets, the sun (located between between Venus and Mars) and the stars were believed to rotate about the earth in perfect circles. This view had three foundations: science, philosophy and the Church.

Greek science ( Ptolemy) and Greek philosophy (Aristotle) supported a geocentric view of the universe. The logic was rock solid for centuries: Man is the pinnacle of creation. Therefore, the earth must be the center of the universe.

The Roman Catholic Church taught that the geocentric view was Scriptural, based on Joshua 10:12-13.

"Joshua said to the LORD in the presence of Israel: 'O sun, stand still over Gibeon, O moon, over the Valley of Aijalon.' **So the sun stood still, and the moon stopped**, till the nation avenged itself on its enemies, as it is written in the Book of Jashar. The sun stopped in the middle of the sky and delayed going down about a full day."

For the sun and moon to stand still, the Church fathers reasoned, they would have to be circling the earth.

Then several scientists began their **skeptical work of actually observing the movements of the planets and stars**. **Copernicus**, a Polish astronomer, created a 15th century revolution in astronomy when he published his heliocentric ("sun-center") theory of the solar system. He theorized, on the basis of his observations and calculations, that the earth and its sister planets revolved around the sun in perfect (Aristotelian) circles. **Keplar** later demonstrated that the solar system was indeed heliocentric, but that the planets, including earth, orbited the sun in elliptical, not circular, paths. **The Roman Catholic Church attacked their views because they displaced earth from its position of privilege, and opened the door to doubt in other areas**. But Poland is a long way from Rome (it was especially so in the 15th century!), and so Copernicus and Keplar remained outside the Church's reach.

**Galileo** is the father of modern Physics and did his work in Italy in the 16th and 17th centuries. He studied the work of Copernicus and Keplar, and built a telescope in order to more closely observe the planets. In 1632, he published the book *Dialogue Concerning the Two Chief World Systems: Ptolemaic and Copernican*, in which he supported a heliocentric view of the solar system. He was immediately attacked by Church authorities who continued to espouse a geocentric world view. **Professors at the University of Florence refused to look through Galileo's telescope: they did not believe his theory, so they refused to observe**. Very unscientific! Galileo, under threat of being burned at the stake, recanted his findings. It was not until **October 1992** that the Roman



Catholic Church officially overturned the decision against Galileo's book and agreed that he had indeed been right. *Science questions, observes, and seeks to learn how the world works. Sometimes this process collides with the vested interests of dogmatic religious leaders.*

### Suspicion of Religion By the Scientific

Science is meticulous in its focus on the rational structure of the universe. *Scientists look with suspicion at the simple faith of believers who glibly say "I don't know how, but I just know God did it."* Such a statement reflects mental laziness. How does the world work? What can we learn of the processes?

### There Need Be No Conflict

Many of the European men and women who pioneered science were *motivated by the Reformation and their new found faith to discover all they could about God's creation.* Stephen Hales, English founder of the science of plant physiology, wrote (1727),

"Since we are assured that the all-wise Creator has observed the most exact proportions of number, weight and measure in the make of all things, the most likely way therefore to get any insight into the nature of those parts of the Creation which come within our observation must in all reason be to number, weigh and measure."<sup>20</sup>

Hales' commitment to scientific methodology in no way compromised his faith in the "all-wise Creator." Nor did his faith undermine his scientific precision.

Still, the *skeptical neutrality of science often collides with the perspective of faith, acceptance and obedience.* When I was in the sixth grade, our science class began a unit on the water cycle. I had always believed that "God sent the rain to water the flowers and trees," because that's what mom told me (*authoritative knowing*) when I asked her why it rained.

Now, before my very eyes was a chart showing a mountain and a river, and an ocean and a cloud. Carefully the teacher explained the diagram. "Water vapor evaporates from the ocean and forms a cloud. The wind blows the cloud to the mountain, where water condenses in the form of rain. The rain collects and forms a river which flows back into the ocean. This is the water cycle." *I can vividly remember my confusion and fear — where was God in the water cycle?* My dad helped when he got home that night. "Well, the water cycle certainly explains the mechanical process of evaporation and condensation, *but Who do you think designed the water cycle?*" My confusion was gone. My faith was strengthened — though less simplistic and naive than it had been before ("If God sends rain to water the plants, why doesn't He send some to the areas of drought, where people are starving to death?"). And, I had learned something about how the world works that I hadn't even thought about before. *The faithful should not use "faith" as a cop out for mental laziness.*

And so, *faith* focuses on the *supernatural* and *subjectively sees with the heart's eye* that which is unseen by the natural eye. Scripture, the Objective Anchor of our subjective experiences, is a record of personal experiences with God through the ages. *Faith focuses on the Creator.*

*Science* focuses on the *natural* and *objectively gathers data on repeatable phenom-*

<sup>20</sup>"Stephen Hales," *The Columbia Dictionary of Quotations* is licensed by Microsoft Bookshelf from Columbia University Press. Copyright © 1993 by Columbia University Press. All rights reserved.

ena, the machinery, so we may better understand how the world works. Science focuses on the creation.

There need be no conflict between giving your heart to the Lord and giving your mind to the logical pursuit of natural truth.

## Summary

In this chapter we looked at six ways of knowing. We discussed specifically how scientific knowing differs from the other five. We introduced you to the scientific method, as well as seven types of research. Finally, we made a brief comparison of faith-knowing and science-knowing.

## Vocabulary

authority	knowledge based on expert testimony
common sense	cultural or familial knowledge, local
control of bias	maintaining neutrality in gaining knowledge
correlational research	analyzing <b>relationships among variables</b>
deductive reasoning	from principle (general) to particulars (specifics)
descriptive research	analyzing specified variables in select populations
empiricism	basing knowledge on observations
evaluation	analyzing existing programs according to set criteria
ex post facto research	analyzing effects of independent variables "after the fact"
experience	knowledge gained by trial and error
experimental research	determining cause and effect relationships between treatment and outcome
external criticism	determining the <b>authenticity</b> of a document or relic
historical research	analyzing variables and trends from the past
inductive reasoning	from particulars (specific) to principles (general)
internal criticism	determining the <b>meaning</b> of a document or relic
intuition/revelation	knowledge discovered from within
precision	striving for accurate measurement
primary sources	materials written by researchers themselves (e.g. journal articles)
research and development	creating new materials according to set criteria
scientific method	objective procedure for gaining knowledge about the world
secondary sources	materials written by analysts of research (e.g. books about)
theory construction	converting research data into usable principles
verification	replicating (re-doing) studies under varying conditions to test findings

## Study Questions

1. Define in your own words six ways we gain knowledge. Give an original example of each.
2. Define "science" as a way of knowing.
3. Compare and contrast "faith" and "science" as ways of knowing for the Christian.
4. Define in your own words five characteristics of the scientific method.
5. Define in your own words eight types of research.

## Sample Test Questions

1. Learning by trial and error is most closely related to
  - A. deductive reasoning
  - B. intuition
  - C. common sense
  - D. experience
  
2. Inductive logic is best described by
  - A. particulars drawn from general principles
  - B. general principles derived from a collection of particulars
  - C. particulars established through reasoning
  - D. general principles grounded in authoritative knowledge
  
3. Match the type of research with the project by writing the letter below in the appropriate numbered blank line.

**H**istorical  
**E**xperimental  
**R**esearch & Development

**D**escriptive  
**E**x Post Facto  
**Q**ualitative

**C**orrelational  
**E**valuation

- \_\_\_ An Analysis of Church Staff Job Satisfaction by Selected Pastors and Staff Ministers
- \_\_\_ Differentiating Between the Effects of Testing and Review on Retention
- \_\_\_ The Effect of Seminary Training on Specified Attitudes of Ministers
- \_\_\_ An Analysis of the Differences in Cognitive Achievement Between Two Specified Teaching Approaches
- \_\_\_ Determining the Relationship Between Hours Wives Work Outside the Home and the Couples' Marital Satisfaction scores
- \_\_\_ The Church's Role in Faith Development in Children as Perceived by Pastors and Teachers of Preschoolers
- \_\_\_ The Relationship Between Study Habits and Self Concept in Baptist College Freshmen
- \_\_\_ The Life and Ministry of Joe Davis Heacock, Dean of the School of Religious Education, 1953-1970
- \_\_\_ Church Life Around the Conference Table: An Observational Analysis of Interpersonal Relationships, Communication, and Power in the Staff Meetings of a Large Church
- \_\_\_ An Analysis of the Relationship Between Personality Trait and Level of Group Member Conflict...
- \_\_\_ The Role of Woman's Missionary Union in Shaping Southern Baptists' View of Missions
- \_\_\_ The Effectiveness of the CWT Training Program in Developing Witnessing Skills
- \_\_\_ Determining the Effect of Divorce on Men's Attitudes Toward Church
- \_\_\_ A Learning System for Training Church Council Members in Planning Skills

**Answer Key Provided  
 for Sample Test Questions.  
 See Appendix A1**

**Affectionate Warning:**  
*Memorizing right answers is not enough to understand research and statistics. Be sure you understand **why** the right answer is right.*

- \_\_\_\_ A Multiple Regression Model of Marital Satisfaction of Southwestern Students
- \_\_\_\_ The Effect of Student Knowledge of Objectives on Academic Achievement
- \_\_\_\_ A Study of Parent Education Levels as They Relate to Academic Achievement Among Home Schooled Children
- \_\_\_\_ A Critical Comparison of Three Specified Approaches to Teaching the Cognitive Content of the Doctrine of the Trinity to Volunteer Adult Learners in a Local Church
- \_\_\_\_ Curriculum Preferences of Selected Latin American Baptist Pastors
- \_\_\_\_ A Study of Reading Comprehension of Older Children Using Selected Bible Translations

