Review of Applied Geography

- Components of Applied Geographic Research
  - Process oriented focused on discovery
  - Systematic and logical
  - Scientific method
  - Empirical approach based on collection, analysis, interpretation, presentation, and application of data to problem-solving.
  - Builds on conceptual framework
  - Starts with problem identification and definition.

What Research is

- Research is a systematic process of collecting, analyzing, and interpreting information in order to increase our understanding of the phenomenon about which we are interested or concerned
- Formal Research - we intentionally set out to enhance our understanding of a phenomenon and expect to communicate what we discover to the larger scientific community

Empirical Research

- Empirical evidence is derived from systematic observations of the world
- Scientific empiricism strives to be repeatable, accumulable, and publicly observable
- A few scientific principles based on empirical research
  - Our confidence in phenomena increases as our observations increase
  - Past regularities will probably reoccur in the future

Distinct Characteristics of Research

1. Research originates with a question or problem – asking questions leads to research problems, What? Why? Where?
2. Research requires a clear articulation of a goal – “What problem do you intend to solve”; can be simply stated as “The goal of this research is ...”
3. Research requires a specific plan (methodology) for proceeding – a carefully planned search and discover mission; must identify how you are going to reach your research goal
   - “Where are the data?”
   - “What will you do with the data?”

Distinct Characteristics Continued...

4. Research usually divides the data into subproblems – break the main problem into numerous subproblems
5. Research is guided by a specific research problem, question, or hypothesis
   - A hypothesis is a logical supposition, a reasonable guess, an educated conjecture
   - Hypothesis are rarely proved or disproved rather they are supported or not supported
   - As particular hypothesis are supported by a growing body of data they evolve into theories – A theory is an organized body of concepts and principals intended to explain a particular phenomena
Distinct Characteristics

6. Research accepts certain critical assumptions – self evident truths; must be valid; an assumption is a condition that is taken for granted; careful researchers state their assumptions

7. Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research – collect appropriate data and organize them in a meaningful ways so that they can be interpreted;
   • Significance of the data depends on how the researcher extracts meaning from them
   • Methodology directs the research - 2 primary functions
     1. To control and dictate the acquisition of data
     2. To extract meaning from them (“interpretation of the data”)

8. Research is, by its nature, cyclical or, more exactly helical. It follows logical developmental steps:
   a. Begins with a problem observed and question asked
   b. Question formally states as a problem
   c. Problem divided into more specific subproblems
   d. Preliminary data are gathered
   e. Data or information point to a hypothesis
   f. Data are collected more systematically
   g. Data is processed and interpreted
   h. A conclusion is reached
   i. Hypothesis is supported or not supported; question is answered or questioned not answered

The four basic elements of Research

1. There must be a problem or question to be answered
2. Data and information bearing on the problem or question to be answered must be collected
3. The collected data must be compiled and analyzed in some relevant fashion
4. A conclusion and recommendations must be stated

The Geographic Research Problem

Basic vs. Applied

• The line between them is blurry at best
• One type can influence the other and vise versa
  • An engineer studying theory of light rail construction techniques may lead to less expensive construction cost (THEORETICAL)
  • therefore leading to the ability of Regional Transportation authorities to implement extensive regional transportation systems that can efficiently transport people around the DFW area (APPLIED)
  • Development of efficient transportation systems may lead to new theories related to development and growth (THEORETICAL>APPLIED> THEORETICAL)
The Geographic Problem

- The geographic problem contains elements of WHAT, WHERE, and WHY
  - A distribution of geographic phenomena (what) whose location or spatial characteristics (where) are to be explained by their association, or lack of association, with other phenomena (why).
  - Should be stated clearly and concisely.
  - Should be no doubt about the need for this research nor the about the subfield of the discipline that will gain from the solution.

The Problem

- Two important criteria to consider when identifying a suitable research problem:
  1. Your problem should address an important question – the answer should actually make a difference.
  2. Your problem should:
     1. advance the knowledge base related to its field, and/or
     2. lead to new ways of thinking, and/or
     3. suggest possible applications, and/or
     4. pave the way for future research.

Determine the Study Area

- Size of the study will be directly related to the type of phenomena, as well as scale, detail, and classification of the data.
  - “What is the relationship between types of land use and population densities in the U.S.”
  - “What is the relationship between types of land use and population densities in Denton County.”
  - “How is commercial land use in the CBD and commercial land use in outlying shopping centers related to population densities in the City of Denton.”
- Usually the smaller the study area the more specific the data will be.
- Delimitation criteria and rationale for selecting the research area should be clearly stated.

Stating the Research Problem

1. Think through the feasibility of the project that the problem implies: Is it practical? Can it be done?
2. Once determined to be a suitable project, state the problem clearly and completely—one or two grammatically complete sentences.
3. Say precisely what you mean—Absolute honesty and integrity are assumed in every statement a scholar makes; being able to state the nature of the problem reflects directly on the basic integrity of the whole research effort.
4. Edit your work—eliminate unnecessary words; chose the most appropriate adjectives (the thesaurus can be your best friend when writing); avoid using the same word numerous times.

How to State the Research Problem

- There is no one way to state the research problem.
- A question is a good way to pose a problem:
  - “What are the relationships between cash grain farming and low slope land in the American Corn Belt?”
- A specific statement of what the research will do:
  - “This research will analyze the relationship between cash grain farming and low slope land in the American Corn Belt.”
- Define the goal or objective:
  - “The objective of this research is to determine if cash grain farming is positively associated with low slope land in the American Corn Belt.”
Problem Examples (from 2005 class)

1. This research will analyze how we can expand applications of GIS to integrate archaeological site preservation and protection projects with planned construction activities to maximize training area availability for mission requirements.
2. What effect does the spatial proximity between residential properties and parkland have on real property values?
3. Does the transportation system surrounding the University of North Texas support bicycle commuting?
4. This research will investigate the effect of the 1986 oil industry collapse on population growth rates east and west of the I35 corridor.
5. This research will investigate the relationship between the location of organic farms and distance to market in 2003-2005 and compare the results to a similar study conducted in 1993-1995 to examine changing patterns over time in organic farming.
6. Does the University of North Texas currently fulfill the need for student housing and if so, can it continue to do so in the future?
7. This research will investigate the urban planning strategies of two “Smart Growth” cities and compare their effectiveness in encouraging mixed land use, conserving open space, and support multiple forms of transit.
8. This study will compare the rate of alcohol related crimes, in Dallas County, between areas that are wet (alcohol sales allowed) and areas that are dry (not sales allowed).
9. This research will recommend the most optimal location, with respect to response time, for a new fire station servicing the southwest portion of the City of Denton.

Problem Pitfalls

- Existing data is lacking
- Existing data cannot be obtained (cost effectively)
- New data cannot be collected in given time frame
- Make careful inventory of resources
  - Time
  - Money
  - Knowledge
- Consider reducing scope of the problem (break problem into subproblems)

The Hypothesis

- The question to the answer must be stated in a way that the tentative answer, the hypothesis, may be tested to determine if it is accepted or rejected.
- Some research questions may not have a formally stated hypothesis – if little or no information exists.
- In other cases, the problem statement includes a well-defined question and a separate formally stated hypothesis may be redundant.
- Usefulness of the hypothesis depends on how well it condenses an array of facts into a statement that can be investigated and tested.

Stating the hypothesis

- A hypothesis is a logical supposition, a reasonable guess, an educated conjecture.
- Hypotheses are tentative, intelligent guesses about how the research problem may be resolved.
- Both hypotheses and research questions provide guidance to data collection and analysis.
- May have a one to one relationship between subproblems and hypotheses.
- How do the data answer my research questions?

Difference between Research Hypothesis and statistical Hypothesis

1. Research hypothesis – evolve from the problem statement or subproblems.
   - Leads to a tentative guess of what the researcher expects to find.
   - It provides
     1. A temporary objective.
     2. An operational target.
     3. A logical framework that guides researcher as they collect and analyze data.
2. Statistical Hypothesis – “testing a hypothesis” refers to a statistical hypothesis, usually a null hypothesis.
Geographic Research Hypothesis

- Research hypothesis provide speculative answers and help guide researchers

1. Consider the distribution of the geographic phenomena the researcher wished to explain and to seek reasonable explanation in the laws that control the phenomena
   - Starting point is the distribution of some phenomena
   - Research wishes to understand in terms of where and why
   - Location pattern is the dependent variable
   - Location pattern “depends” on other variables the effect it
   - “Underground storage tanks are more apt to fail in they are located in highly expansive and corrosive soils”

2. Consider the pattern, location, and density of the phenomena and to compare this distribution with that of other supposedly related data
   - Starting point is the distribution of some phenomena
   - Research wishes to compare different areas or distributions
   - Location pattern depends on differences between areas or distributions
   - The rate of DUI’s will be greater in “wet” areas compared to those in “dry” areas

Delimiting the Research

- What the researcher intends to do is stated in the problem
- What the researcher is not going to do is stated in the delimitations
- The limits of the problem should be carefully bounded

More Delimitations

- Defining the terms – explicitly state the meaning of important terms with the problem statement, subproblems, hypotheses, and delimitations
- State the assumptions – all assumptions that have a material bearing on the openly set forth, ask yourself “what am I taking for granted with respect to the problem?”
- Importance of the study – describe the importance of the study – “What use does it have?” “What is its practical value?”

Problem Examples

Original Problem Statement

- This study will analyze the overwhelming problem of increasing pollution levels in the Gulf of Mexico and will focus on the associated concerns with its effect on the overall health of the coastal bays, estuaries and wetlands of Texas

Edited Problem Statement

- The purpose of the study analyze the water quality within a small segment of the Corpus Christi bay complex (Oso Bay) to help determine if the water is safe for recreational use, and healthy enough to provide an adequate estuary for various wildlife types.

Original Hypothesis

- Water quality in Texas' bays, estuaries, and wetlands is becoming increasingly degraded over time.

Edited Hypothesis

- The Oso Bay watershed will not meet EPA standards for essential water quality parameters.

Subproblems

- Most research is too large and complex to be solved without subdividing them – break the problem down into smaller more manageable units
- Subproblem suggests ways of approaching the goal in a manageable, systematic way
- Pseudo-subproblems – procedural issues
  - What is the best way to choose a sample
  - How large should a representative sample be
  - What instruments or methods should be used to collect the data
  - What statistical procedures should be used to analyze the data

Characteristics of the subproblem

- Four key characteristics of the subproblem:
  1. Each subproblem should be a completely researchable unit – researched as a separate subproject of the larger research goal (stated in the form of a question)
  2. Each subproblem should be clearly tied to the interpretation of the data – the fact that the data will be interrelated should be evident
  3. Subproblems must add up to the totality of the problem
  4. Subproblems should be small in number (2-6)
Subproblem Example

- The purpose of the study is to analyze the water quality within a small segment of the Corpus Christi bay complex (Oso Bay) to help determine if the water is safe for recreational use and healthy enough to provide an adequate estuary for various wildlife types.

  Subproblem 1: characterize the water quality in Oso Bay
  Subproblem 2: determine "healthy ecosystem" (benchmark) in terms of water quality
  Subproblem 3: compare water quality in Bay to benchmark

Finding a legitimate problem

1. Look around you – spatial patterns, distributions, phenomena (what factors are important)
2. Find research area that interests you
3. Read the literature – find out what is already known about your topic, may also tell you what is not known
   - Address suggestions for future research
   - Replicate a research project in a different area (setting, population)
   - Consider how different subpopulations may be different
   - Apply an existing perspective to a new situation
   - Explore unexpected or contradictory findings in previous studies
   - Challenge research findings that contradict what you know or believe to be true

4. Attend professional conferences – local or regional, Environmental Seminars, UNT Conferences
5. Seek the advice of experts – State or municipal government, professors
6. Choose a topic that you are interested in!
7. Choose a topic that others will find interesting or applicable to a real world problem

Geographic Journals

- Applied Geography
- Economic Geography
- Applied Geographic Studies
- Urban Geography
- Process of Physical Geography
- Growth and Change
- Environmental Geology
- Water Resources Bulletin
- Environmental Management

Research Tips

- Keep a research journal or notebook with annotated bibliography of articles you read
  - Author’s Name
  - Title of Article
  - Name of Journal, Year, Volume, Issue, and Page Number
  - Brief paragraph of main ideas/points/results