HYPOTHESIS is a tentative assumption made in order to draw out and test its logical or empirical consequences.

A hypothesis is an assumption, an idea that is proposed for the sake of argument so that it can be tested to see if it might be true.

In the scientific method, the hypothesis is constructed before any applicable research has been done, apart from a basic background review.

A hypothesis is usually tentative; it's an assumption or suggestion made strictly for the objective of being tested.

A hypothesis (plural hypotheses) is a precise, testable statement of what the researcher(s) predict will be the outcome of the study.

A **THEORY**, in contrast, is a principle that has been formed as an attempt to explain things that have already been substantiated by data. It is used in the names of a number of principles accepted in the scientific community, such as the *Big Bang Theory*. Because of the rigors of experimentation and control, it is understood to be more likely to be true than a hypothesis is.

A research problem is a statement about an area of concern, a condition to be improved, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, in theory, or in practice that points to the need for meaningful understanding and deliberate investigation. In some social science disciplines the research problem is typically posed in the form of a question. A research problem **does not** state how to do something, offer a vague or broad proposition, or present a value question.

A research problem, as mentioned previously, is the issue being addressed in a study. The issue can be a difficulty or conflict to be eliminated; a condition to be improved; a concern to handle; a troubling question, a theoretical or practical controversy (or a gap) that exists in scholarly literature. A research problem helps in narrowing the topic down to something that is reasonable for conducting a study. **Creswell (2012)** defined research problem as "a general educational issue, concern, or controversy addressed in research that narrows the topic".

The purpose of a problem statement is to:

1. **Introduce the reader to the importance of the topic being studied**. The reader is oriented to the significance of the study and the research questions or hypotheses to follow.
2. **Places the problem into a particular context** that defines the parameters of what is to be investigated.
3. **Provides the framework for reporting the results** and indicates what is probably necessary to conduct the study and explain how the findings will present this information.

So What!

In the social sciences, the research problem establishes the means by which you must answer the "So What?" question. The "So What?" question refers to a research problem surviving the relevancy test [the quality of a measurement procedure that provides repeatability and accuracy]. Note that

answering the "So What" question requires a commitment on your part to not only show that you have researched the material, but that you have thought about its significance.

To survive the "So What" question, problem statements should possess the following attributes:

- Clarity and precision [a well-written statement does not make sweeping generalizations and irresponsible statements],
- Identification of what would be studied, while avoiding the use of value-laden words and terms,
- Identification of an overarching question and key factors or variables,
- Identification of key concepts and terms,
- Articulation of the study's boundaries or parameters,
- Some generalizability in regards to applicability and bringing results into general use,
- Conveyance of the study's importance, benefits, and justification [regardless of the type of research, it is important to address the "so what" question by demonstrating that the research is not trivial],
- Does not have unnecessary jargon; and,
- Conveyance of more than the mere gathering of descriptive data providing only a snapshot of the issue or phenomenon under investigation.

I. Types and Content

There are four general conceptualizations of a research problem in the social sciences:

1. **Casuist Research Problem** -- this type of problem relates to the determination of right and wrong in questions of conduct or conscience by analyzing moral dilemmas through the application of general rules and the careful distinction of special cases.
2. **Difference Research Problem** -- typically asks the question, "Is there a difference between two or more groups or treatments?" This type of problem statement is used when the researcher compares or contrasts two or more phenomena.
3. **Descriptive Research Problem** -- typically asks the question, "what is...?" with the underlying purpose to describe a situation, state, or existence of a specific phenomenon.
4. **Relational Research Problem** -- suggests a relationship of some sort between two or more variables to be investigated. The underlying purpose is to investigate qualities / characteristics that are connected in some way.

A problem statement in the social sciences should contain:

- A lead-in that helps ensure the reader will maintain interest over the study
- A declaration of originality [e.g., mentioning a knowledge void, which would be supported by the literature review]
- An indication of the central focus of the study, and
- An explanation of the study's significance or the benefits to be derived from an investigating the problem.

II. Sources of Problems for Investigation

Identifying a problem to study can be challenging, not because there is a lack of issues that could be investigated, but due to pursuing a goal of formulating a socially relevant and researchable problem statement that is unique and does not simply duplicate the work of others. To facilitate how you might select a problem from which to build a research study, consider these three broad sources of inspiration:

Deductions from Theory

This relates to deductions made from social philosophy or generalizations embodied in life in society that the researcher is familiar with. These deductions from human behavior are then fitted within an empirical frame of reference through research. From a theory, the research can formulate a research problem or hypothesis stating the expected findings in certain empirical situations. The research asks the question: "What relationship between variables will be observed if theory aptly summarizes the state of affairs?" One can then design and carry out a systematic investigation to assess whether empirical data confirm or reject the hypothesis and hence the theory.

Interdisciplinary Perspectives

Identifying a problem that forms the basis for a research study can come from academic movements and scholarship originating in disciplines outside of your primary area of study. A review of pertinent literature should include examining research from related disciplines, which can expose you to new avenues of exploration and analysis. An interdisciplinary approach to selecting a research problem offers an opportunity to construct a more comprehensive understanding of a very complex issue than any single discipline might provide.

Interviewing Practitioners

The identification of research problems about particular topics can arise from formal or informal discussions with practitioners who provide insight into new directions for future research and how to make research findings increasingly relevant to practice. Discussions with experts in the field, such as, teachers, social workers, health care providers, etc., offers the chance to identify practical, "real world" problems that may be understudied or ignored within academic circles. This approach also provides some practical knowledge which may help in the process of designing and conducting your study.

Personal Experience

Your everyday experiences can give rise to worthwhile problems for investigation. Think critically about your own experiences and/or frustrations with an issue facing society, your community, or in your neighbourhood. This can be derived, for example, from deliberate observations of certain relationships for which there is no clear explanation or witnessing an event that appears harmful to a person or group or that is out of the ordinary.

Relevant Literature

The selection of a research problem can often be derived from an extensive and thorough review of pertinent research associated with your overall area of interest. This may reveal where gaps remain in our understanding of a topic. Research may be conducted to: 1) fill such gaps in knowledge; 2) evaluate if the methodologies employed in prior studies can be adapted to solve other problems; or, 3) determine if a similar study could be conducted in a different subject area or applied to different study sample [i.e., different groups of people]. Also, authors frequently conclude their studies by noting implications for further research; this can also be a valuable source of problems to investigate.

III. What Makes a Good Research Statement?

A good problem statement begins by introducing the broad area in which your research is centered and then gradually leads the reader to the more narrow questions you are posing. The statement need not be lengthy but a good research problem should incorporate the following features:

Compelling topic

Simple curiosity is not a good enough reason to pursue a research study. The problem that you choose to explore must be important to you and to a larger community you share. The problem chosen must be one that motivates you to address it.

Supports multiple perspectives

The problem most be phrased in a way that avoids dichotomies and instead supports the generation and exploration of multiple perspectives. A general rule of thumb is that a good research problem is one that would generate a variety of viewpoints from a composite audience made up of reasonable people.

Researchable

It seems a bit obvious, but you don't want to find yourself in the midst of investigating a complex research project and realize that you don't have much to draw on for your research. Choose research problems that can be supported by the resources available to you. Not sure? Seek out help from a librarian!

NOTE: Do not confuse a research problem with a research topic. A topic is something to read and obtain information about whereas a problem is something to solve or framed as a question that must be answered.

IV. Mistakes to Avoid

Beware of circular reasoning. Don't state that the research problem as simply the absence of the thing you are suggesting. For example, if you propose, "The problem in this community is that it has no hospital."

This only leads to a research problem where:

- The **need** is for a hospital
- The **objective** is to create a hospital
- The **method** is to plan for building a hospital, and
- The **evaluation** is to measure if there is a hospital or not.

This is an example of a research problem that fails the "so what?" test because it **does not reveal the relevance** of why you are investigating the problem of having no hospital in the community [e.g., there's a hospital in the community ten miles away] and because the research problem **does not elucidate the significance** of why one should study the fact that no hospital exists in the community [e.g., that hospital in the community ten miles away has no emergency room].

Identifying a research problem

The research problem is the heart of a study. It is a clear, definite statement of the area of concern or investigation and is backed by evidence (Bryman, 2007). It drives the research questions and processes and provides the framework for understanding the research findings.

> Bryman, Alan. "The Research Question in Social Research: What is its Role?" *International Journal of Social Research Methodology* 10 (2007): 5-20.

Where to Find a Research Problem

Ideas for research problems tend to come from two sources: real life and the scholarly arena. First, identifying a research problem can be as simple as observing the complications and issues in your local workplace. You may encounter ongoing issues on a daily basis in your workplace or observe your colleagues struggle with major issues or questions in your field. These ongoing obstacles and issues in the workplace can be the catalyst for developing a research problem.

Alternatively, research problems can be identified by reviewing recent literature, reports, or databases in your field. Often the section of "recommendations for the future studies" provided at the end of journal articles or doctoral dissertations suggest potential research problems. In addition, major reports and databases in the field may reveal findings or data-based facts that call for additional investigation or suggest potential issues to be addressed. Looking at what theories need to be tested is another opportunity to develop a research problem.

HOW TO EVALUATE A RESEARCH PROBLEM

Once you find your potential research problem, you will need to evaluate the problem and ensure that it is appropriate for research. A research problem is deemed appropriate when it is supported by the literature, and considered significant, timely, novel, specific, and researchable. Stronger research problems are more likely to succeed in publication, presentation, and application.

Supported by the Literature

Your research problem should be relevant to the field and supported by a number of recent peer-reviewed studies in the field. Even if you identify the problem based on the recommendation of one journal article or dissertation, you will still need to conduct a literature search and ensure that other researchers support the problem and need for conducting research to further address the problem.

Significant

Your research problem should have a positive impact on the field. The impact can be practical, in the form of direct application of the results in the field, or conceptual, where the work advances the field by filling a knowledge gap.

Timely

Your research problem should be related to the current needs in the field and well-suited for the present status of the issues in your field. Explore what topics are being covered in current journals in the field. Look at calls from relevant disciplinary organizations. Review your research center agenda and focused topics. For example, the topics of the Research Labs at Center for Educational and Instructional Technology Research including critical thinking, social media and cultural competency, diversity, and Science, Technology, Engineering, and Mathematics (STEM) in higher education are representative of the current timely topics in the field of education. Identifying a current question in the field and supporting the problem with the recent literature can justify the problem timeliness.

Novel

Your research problem should be original and unique. It should seek to address a gap in our knowledge or application. An exhaustive review of literature can help you identify whether the problem has already been addressed with your particular sample and/or context. Talking to experts in the research area can illuminate a problem. Replication of an existing study warrants discussion of value elsewhere, but novelty can be found in determining if an already-resolved problem holds in a new sample and/or context.

Specific and Clear

Your research problem should be specific enough to set the direction of the study, raise research question(s), and determine an appropriate research method and design. Vague research problems may not be useful to specify the direction of the study or develop research questions.

Researchable

Research problems are solved through the scientific method. This means research-ability, or feasibility of the problem, is more important than all of the above characteristics. You as the researcher should be able to solve the problem with your abilities and available research methods, designs, research sites, resources, and timeframe. If a research problem retains all of aforementioned characteristics but it is not researchable, it may not be an appropriate research problem.

Differences between Quantitative and Qualitative Research Problem

Quantitative Research Problem	Qualitative Research Problem
• Explains or predicts the connections, relations or comparisons between variables • Contains independent *and* dependent variables • Measures variables for getting quantified data • Tests theories or broad explanations • generalizes results to a large number of people	• Explores, understands, describes, generates, discovers phenomenon • Learn and describe individuals' views • Assess a process over time • Generate theories based on participants' views • The results cannot be generalized

Criteria for Selecting a Research Problem

A research problem is some difficulty either of a theoretical or practical character that an individual or business encounters and desires to get a solution for the same. The research problem undertaken for study should be diligently selected.

The following important considerations should be borne in mind while selecting the topic :

Economic Considerations **:** Research design work cost money. The value of the expected results should be commensurate with the efforts put in. Small research topics that can deliver considerable returns quickly should be chosen over long term research problems whose gains may be hard to anticipate.

Environmental Factors **:** Controversial topic shouldn't be selected for research, until and unless very much justified. The selection of research problem needs to be preceded by a preliminary study. Topics which are very narrowly defined or have a vague outcome must not be attempted. Additionally it is thought that a researcher should be knowledgeable about the domain area in which he/she wants to conduct the research study.

Technical Considerations **:** The researcher should be sure that sufficient technical knowledge is accessible with which to undertake the research problem. Whereas large problem throws up a number of subjects that are independent of each other, it is advisable to have small individual research problems instituted on each topic.

Human Considerations **:** In cases where resistance to change or reaction is likely to be high, people's involvement and contribution should be ensured.

Limitations and Constraints of Research problem : These are as follows:

· Time limit: The research should be accomplished by the proposed date.

· Resource Constraints: The research study should be well within the established resources allotted for it.

· Policy Constraints: The research problem must provide considerations to policy constraints.

RESEARCH DESIGN

The function of a research design is to ensure that the evidence obtained enables you to effectively address the research problem as unambiguously as possible. In social sciences research, obtaining evidence relevant to the research problem generally entails specifying the type of evidence needed to test a theory, to evaluate a program, or to accurately describe a phenomenon. However, researchers can often begin their investigations far too early, before they have thought critically about what information is required to answer the study's research questions. Without attending to these design issues beforehand, the conclusions drawn risk being weak and unconvincing and, consequently, will fail to adequate address the overall research problem.

Given this, the length and complexity of research designs can vary considerably, but any sound design will do the following things:

1. Identify the research problem clearly and justify its selection,
2. Review previously published literature associated with the problem area,
3. Clearly and explicitly specify hypotheses [i.e., research questions] central to the problem selected,
4. Effectively describe the data which will be necessary for an adequate test of the hypotheses and explain how such data will be obtained, and
5. Describe the methods of analysis which will be applied to the data in determining whether or not the hypotheses are true or false.

ACTION RESEARCH DESIGN

The essentials of action research design follow a characteristic cycle whereby initially an exploratory stance is adopted, where an understanding of a problem is developed and plans are made for some form of interventionary strategy. Then the intervention is carried out (the action in Action Research) during which time, pertinent observations are collected in various forms. The new interventional strategies are carried out, and the cyclic process repeats, continuing until a sufficient understanding of (or implement able solution for) the problem is achieved. The protocol is iterative or cyclical in nature and is intended to foster deeper understanding of a given situation, starting with conceptualizing and particularizing the problem and moving through several interventions and evaluations.

CASE STUDY DESIGN

A case study is an in-depth study of a particular research problem rather than a sweeping statistical survey. It is often used to narrow down a very broad field of research into one or a few easily researchable examples. The case study research design is also useful for testing whether a specific theory and model actually applies to phenomena in the real world. It is a useful design when not much is known about a phenomenon.

CASUAL DESIGN

Causality studies may be thought of as understanding a phenomenon in terms of conditional statements in the form, "If X, then Y." This type of research is used to measure what impact a specific change will have on existing norms and assumptions. Most social scientists seek causal explanations that reflect tests of hypotheses. Causal effect (nomothetic perspective) occurs when

variation in one phenomenon, an independent variable, leads to or results, on average, in variation in another phenomenon, the dependent variable.

Conditions necessary for determining causality:

- Empirical association--a valid conclusion is based on finding an association between the independent variable and the dependent variable.
- Appropriate time order--to conclude that causation was involved, one must see that cases were exposed to variation in the independent variable before variation in the dependent variable.
- Nonspuriousness--a relationship between two variables that is not due to variation in a third variable.

COHORT DESIGN

Often used in the medical sciences, but also found in the applied social sciences, a cohort study generally refers to a study conducted over a period of time involving members of a population which the subject or representative member comes from, and who are united by some commonality or similarity. Using a quantitative framework, a cohort study makes note of statistical occurrence within a specialized subgroup, united by same or similar characteristics that are relevant to the research problem being investigated, rather than studying statistical occurrence within the general population. Using a qualitative framework, cohort studies generally gather data using methods of observation. Cohorts can be either "open" or "closed."

- Open Cohort Studies [dynamic populations, such as the population of Los Angeles] involve a population that is defined just by the state of being a part of the study in question (and being monitored for the outcome). Date of entry and exit from the study is individually defined, therefore, the size of the study population is not constant. In open cohort studies, researchers can only calculate rate based data, such as, incidence rates and variants thereof.
- Closed Cohort Studies [static populations, such as patients entered into a clinical trial] involve participants who enter into the study at one defining point in time and where it is presumed that no new participants can enter the cohort. Given this, the number of study participants remains constant (or can only decrease).

CROSS-SECTIONAL DESIGN

Cross-sectional research designs have three distinctive features: no time dimension, a reliance on existing differences rather than change following intervention; and, groups are selected based on existing differences rather than random allocation. The cross-sectional design can only measure diffrrences between or from among a variety of people, subjects, or phenomena rather than change. As such, researchers using this design can only employ a relative passive approach to making causal inferences based on findings.

DESCRIPTIVE DESIGN

Descriptive research designs help provide answers to the questions of who, what, when, where, and how associated with a particular research problem; a descriptive study cannot conclusively ascertain

answers to why. Descriptive research is used to obtain information concerning the current status of the phenomena and to describe "what exists" with respect to variables or conditions in a situation.

EXPERIMENTAL DESIGN

A blueprint of the procedure that enables the researcher to maintain control over all factors that may affect the result of an experiment. In doing this, the researcher attempts to determine or predict what may occur. Experimental Research is often used where there is time priority in a causal relationship (cause precedes effect), there is consistency in a causal relationship (a cause will always lead to the same effect), and the magnitude of the correlation is great. The classic experimental design specifies an experimental group and a control group. The independent variable is administered to the experimental group and not to the control group, and both groups are measured on the same dependent variable. Subsequent experimental designs have used more groups and more measurements over longer periods. True experiments must have control, randomization, and manipulation.

EXPLORATORY DESIGN

An exploratory design is conducted about a research problem when there are few or no earlier studies to refer to. The focus is on gaining insights and familiarity for later investigation or undertaken when problems are in a preliminary stage of investigation.

The goals of exploratory research are intended to produce the following possible insights:

- Familiarity with basic details, settings and concerns.
- Well grounded picture of the situation being developed.
- Generation of new ideas and assumption, development of tentative theories or hypotheses.
- Determination about whether a study is feasible in the future.
- Issues get refined for more systematic investigation and formulation of new research questions.
- Direction for future research and techniques get developed.

HISTORICAL DESIGN

The purpose of a historical research design is to collect, verify, and synthesize evidence from the past to establish facts that defend or refute your hypothesis. It uses secondary sources and a variety of primary documentary evidence, such as, logs, diaries, official records, reports, archives, and non-textual information [maps, pictures, audio and visual recordings]. The limitation is that the sources must be both authentic and valid.

LONGITUDINAL DESIGN

A longitudinal study follows the same sample over time and makes repeated observations. With longitudinal surveys, for example, the same group of people is interviewed at regular intervals, enabling researchers to track changes over time and to relate them to variables that might explain why the changes occur. Longitudinal research designs describe patterns of change and help establish

the direction and magnitude of causal relationships. Measurements are taken on each variable over two or more distinct time periods. This allows the researcher to measure change in variables over time. It is a type of observational study and is sometimes referred to as a panel study.

OBSERVATIONAL DESIGN

This type of research design draws a conclusion by comparing subjects against a control group, in cases where the researcher has no control over the experiment. There are two general types of observational designs. In direct observations, people know that you are watching them. Unobtrusive measures involve any method for studying behavior where individuals do not know they are being observed. An observational study allows a useful insight into a phenomenon and avoids the ethical and practical difficulties of setting up a large and cumbersome research project.

PHILOSOPHICAL DESIGN

Understood more as an broad approach to examining a research problem than a methodological design, philosophical analysis and argumentation is intended to challenge deeply embedded, often intractable, assumptions underpinning an area of study. This approach uses the tools of argumentation derived from philosophical traditions, concepts, models, and theories to critically explore and challenge, for example, the relevance of logic and evidence in academic debates, to analyze arguments about fundamental issues, or to discuss the root of existing discourse about a research problem. These overarching tools of analysis can be framed in three ways:

- Ontology -- the study that describes the nature of reality; for example, what is real and what is not, what is fundamental and what is derivative?
- Epistemology -- the study that explores the nature of knowledge; for example, on what does knowledge and understanding depend upon and how can we be certain of what we know?
- Axiology -- the study of values; for example, what values does an individual or group hold and why? How are values related to interest, desire, will, experience, and means-to-end? And, what is the difference between a matter of fact and a matter of value?

SEQUENTIAL DESIGN

Sequential research is that which is carried out in a deliberate, staged approach [i.e. serially] where one stage will be completed, followed by another, then another, and so on, with the aim that each stage will build upon the previous one until enough data is gathered over an interval of time to test your hypothesis. The sample size is not predetermined. After each sample is analyzed, the researcher can accept the null hypothesis, accept the alternative hypothesis, or select another pool of subjects and conduct the study once again. This means the researcher can obtain a limitless number of subjects before finally making a decision whether to accept the null or alternative hypothesis. Using a quantitative framework, a sequential study generally utilizes sampling techniques to gather data and applying statistical methods to analze the data. Using a qualitative framework, sequential studies generally utilize samples of individuals or groups of individuals [cohorts] and use qualitative methods, such as interviews or observations, to gather information from each sample.

REVIEW OF LITERATURE

A literature review surveys scholarly articles, books and other sources relevant to a particular issue, area of research, or theory, and by so doing, providing a description, summary, and critical evaluation of these works. Literature reviews are designed to provide an overview of sources you have explored while researching a particular topic and to demonstrate to your readers how your research fits into the larger field of study.

Importance of a Good Literature Review

A literature review may consist of simple a summary of key sources, but **it usually has an organizational pattern and combines both summary and synthesis, often within specific conceptual categories**. A summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that information in a way that informs how you are planning to investigate a research problem. The analytical features of a literature review might:

● Give a new interpretation of old material or combine new with old interpretations,
● Trace the intellectual progression of the field, including major debates,
● Depending on the situation, evaluate the sources and advise the reader on the most pertinent or relevant, or
● Usually in the conclusion of a literature review, identify where gaps exist in how a problem has been researched to date.

The purpose of a literature review is to:

● Place each work in the context of its contribution to the understanding of the research problem being studied,
● Describe the relationship of each work to the others under consideration,
● Identify new ways to interpret, and shed light on any gaps in previous research,
● Resolve conflicts amongst seemingly contradictory previous studies,
● Identify areas of prior scholarship to prevent duplication of effort,
● Point the way in fulfilling a need for additional research, and
● Locate your own research within the context of existing literature.

Types of Literature Review

It is important to think of knowledge in a given field as consisting of three layers.* First, there are the primary studies that researchers conduct and publish. Second are the reviews of those studies that summarize and offer new interpretations built from and often extending beyond the original studies. Third, there are the perceptions, conclusions, opinion, and interpretations that are shared informally that become part of the lore of field. In composing a literature review, it is important to note that it is often this third layer of knowledge that is cited as "true" even though it often has only a loose relationship to the primary studies and secondary literature reviews. Given this, while literature reviews are designed to provide an overview and synthesis of pertinent sources you have explored, there are a number of approaches you could adopt depending upon the type of analysis underpinning your study.

Types of Literature Reviews

Argumentative Review
This form examines literature selectively in order to support or refute an argument, deeply

imbedded assumption, or philosophical problem already established in the literature. The purpose is to develop a body of literature that establishes a contrarian viewpoint. Given the value-laden nature of some social science research [e.g., educational reform; immigration control], argumentative approaches to analyzing the literature can be a legitimate and important form of discourse. However, note that they can also introduce problems of bias when they are used to to make summary claims of the sort found in systematic reviews.

Integrative Review
Considered a form of research that reviews, critiques, and synthesizes representative literature on a topic in an integrated way such that new frameworks and perspectives on the topic are generated. The body of literature includes all studies that address related or identical hypotheses. A well-done integrative review meets the same standards as primary research in regard to clarity, rigor, and replication.

Historical Review
Few things rest in isolation from historical precedent. Historical reviews are focused on examining research throughout a period of time, often starting with the first time an issue, concept, theory, phenomena emerged in the literature, then tracing its evolution within the scholarship of a discipline. The purpose is to place research in a historical context to show familiarity with state-of-the-art developments and to identify the likely directions for future research.

Methodological Review
A review does not always focus on **what** someone said [content], but **how** they said it [method of analysis]. This approach provides a framework of understanding at different levels (i.e. those of theory, substantive fields, research approaches and data collection and analysis techniques), enables researchers to draw on a wide variety of knowledge ranging from the conceptual level to practical documents for use in fieldwork in the areas of ontological and epistemological consideration, quantitative and qualitative integration, sampling, interviewing, data collection and data analysis, and helps highlight many ethical issues which we should be aware of and consider as we go through our study.

Systematic Review
This form consists of an overview of existing evidence pertinent to a clearly formulated research question, which uses pre-specified and standardized methods to identify and critically appraise relevant research, and to collect, report, and analyse data from the studies that are included in the review. Typically it focuses on a very specific empirical question, often posed in a cause-and-effect form, such as "To what extent does A contribute to B?"

Theoretical Review
The purpose of this form is to concretely examine the corpus of theory that has accumulated in regard to an issue, concept, theory, phenomena. The theoretical literature review help establish what theories already exist, the relationships between them, to what degree the existing theories have been investigated, and to develop new hypotheses to be tested. Often this form is used to help establish a lack of appropriate theories or reveal that current theories are inadequate for explaining new or emerging research problems. The unit of analysis can focus on a theoretical concept or a whole theory or framework.

I. The structure of a literature review should include the following:

- An overview of the subject, issue or theory under consideration, along with the objectives of the literature review,
- Division of works under review into themes or categories (e.g. works that support of a particular position, those against, and those offering alternative approaches entirely),

- An explanation of how each work is similar to and how it varies from the others,
- Conclusions as to which pieces are best considered in their argument, are most convincing of their opinions, and make the greatest contribution to the understanding and development of their area of research

The critical evaluation of each work should consider:

- **Provenance** -- what are the author's credentials? Are the author's arguments supported by evidence (e.g. primary historical material, case studies, narratives, statistics, recent scientific findings)?
- **Objectivity** -- is the author's perspective even-handed or prejudicial? Is contrary data considered or is certain pertinent information ignored to prove the author's point?
- **Persuasiveness** -- which of the author's theses are most/least convincing?
- **Value** -- are the author's arguments and conclusions convincing? Does the work ultimately contribute in any significant way to an understanding of the subject?

II. Development of the Literature Review

Four Stages

1. Problem formulation -- which topic or field is being examined and what are its component issues?
2. Literature search -- finding materials relevant to the subject being explored.
3. Data evaluation -- determining which literature makes a significant contribution to the understanding of the topic.
4. Analysis and interpretation -- discussing the findings and conclusions of pertinent literature.

Consider the following issues before writing the literature review:

Clarify
If your assignment is not very specific about what form your literature review should take, seek clarification from your professor by asking these questions:

1. Roughly how many sources should I include?
2. What types of sources should I review (books, journal articles, websites)?
3. Should I summarize, synthesize, or critique your sources by discussing a common theme or issue?
4. Should I evaluate the sources?
5. Should I provide subheadings and other background information, such as definitions and/or a history?

Find Models
Use the exercise of reviewing the literature to examine how authors in your discipline or area of interest have composed their literature reviews. Read them to get a sense of the types of themes you might want to look for in your own research or ways to organize your final review. The bibliography or reference section of sources you've already read are also excellent entry points into your own research.

Narrow the Topic
The narrower your topic, the easier it will be to limit the number of sources you need to read in

order to obtain a good survey of relevant resources. Your professor will probably not expect you to read everything that's available about the topic, but you'll make your job easier if you first limit scope of the research problem. A good strategy is to begin by searching the HOMER catalog for books about the topic and review their contents for chapters that focus on more specific issues. You can also review the subject indexes of books to find references to specific issues that can serve as the focus of your research. For example, a book surveying the history of the Israeli-Palestinian conflict may include a chapter on the role Egypt has played in mediating the conflict.

Consider Whether Your Sources are Current

Some disciplines require that you use information that is as current as possible. This is very common in the sciences where research conducted only two years ago could be obsolete. However, when writing a review in the social sciences, a survey of the history of the literature may be what is needed because what is important is how perspectives have changed over the years or within a certain time period. Try sorting through some other current bibliographies or literature reviews in the field to get a sense of what your discipline expects. You can also use this method to consider what is consider by scholars to be a "hot topic" and what is not.

III. Ways to Organize Literature Review

Chronological of Events

If your review follows the chronological method, you could write about the materials according to when they were published. This approach should only be followed if a clear path of research building on previous research can be identified and that these trends follow a clear chronological order of development. For example, a literature review that focuses on continuing research about the emergence of German economic power after the fall of the Soviet Union.

By Publication

Order your sources by publication chronology, then, only if the order demonstrates a more important trend. For instance, you could order a review of literature on environmental studies of brown fields if the progression revealed, for example, a change in the soil collection practices of the researchers who wrote and/or conducted the studies.

Thematic ("conceptual categories")

Thematic reviews of literature are organized around a topic or issue, rather than the progression of time. However, progression of time may still be an important factor in a thematic review. For example, a review of the Internet's impact on American presidential politics could focus on the development of online political satire. While the study focuses on one topic, the Internet's impact on American presidential politics, it will still be organized chronologically reflecting technological developments in media. The only difference here between a "chronological" and a "thematic" approach is what is emphasized the most: the role of the Internet in presidential politics. Note however that more authentic thematic reviews tend to break away from chronological order. A review organized in this manner would shift between time periods within each section according to the point made.

Methodological

A methodological approach focuses on the methods utilized by the researcher. For the Internet in American presidential politics project, one methodological approach would be to look at cultural differences between the portrayal of American presidents on American, British, and French websites. Or the review might focus on the fundraising impact of the Internet on a particular political

party. A methodological scope will influence either the types of documents in the review or the way in which these documents are discussed.

Other Sections of Literature Review

Once you've decided on the organizational method for your literature review, the sections you need to include in the paper should be easy to figure out because they arise from your organizational strategy. In other words, a chronological review would have subsections for each vital time period; a thematic review would have subtopics based upon factors that relate to the theme or issue. However, sometimes you may need to add additional sections that are necessary for your study, but do not fit in the organizational strategy of the body. What other sections you include in the body is up to you but include only what is necessary for the reader to locate your study within the larger scholarship framework.

Here are examples of other sections you may need to include depending on the type of review you write:

- **Current Situation**: information necessary to understand the topic or focus of the literature review.
- **History**: the chronological progression of the field, the literature, or an idea that is necessary to understand the literature review, if the body of the literature review is not already a chronology.
- **Selection Methods**: the criteria you used to select (and perhaps exclude) sources in your literature review. For instance, you might explain that your review includes only peer-reviewed articles and journals.
- **Standards**: the way in which you present your information.
- **Questions for Further Research**: What questions about the field has the review sparked? How will you further your research as a result of the review?

IV. Writing Literature Review

Once you've settled on how to organize your literature review, you're ready to write each section. When writing your review, keep in mind these issues.

Use Evidence

A literature review in this sense is just like any other academic research paper. Your interpretation of the available sources must be backed up with evidence to show that what you are saying is valid.

Be Selective

Select only the most important points in each source to highlight in the review. The type of information you choose to mention should relate directly to the research problem, whether it is thematic, methodological, or chronological.

Use Quotes Sparingly

Some short quotes are okay if you want to emphasize a point, or if what the author said just cannot be rewritten in your own words. Sometimes you may need to quote certain terms that were coined by the author, not common knowledge, or taken directly from the study. Do not use extensive quotes as a substitute your own summary and interpretation of the literature.

Summarize and Synthesize

Remember to summarize and synthesize your sources within each paragraph as well as throughout the review. Recapitulate important features of a research study, but then synthesize it by rephrasing the study's significance and relating it to their own work.

Keep Your Own Voice

While the literature review presents others' ideas, your voice (the writer's) should remain front and center. For example, weave references to other sources into what you are writing but maintain your own voice by starting and ending the paragraph with your own ideas and wording.

Use Caution When Paraphrasing

When paraphrasing a source that is not your own, be sure to represent the author's information or opinions accurately and in your own words. Even when paraphrasing an author's work, you still must provide a citation to that work.

V. Common Mistakes to Avoid

These are the most common mistakes made in reviewing social science research literature.

- Sources in your literature review do not clearly relate to the research problem;
- You do not take sufficient time to define and identify the most relevent sources to use in the literature review related to the research problem;
- Relies exclusively on secondary analytical sources rather than including relevant primary research studies or data;
- Uncritically accepts another researcher's findings and interpretations as valid, rather than examining critically all aspects of the research design and analysis;
- Does not describe the search procedures that were used in the literature review;
- Reports isolated statistical results rather than synthesizing them in chi-squared or meta-analytic methods; and,
- Only includes research that validates assumptions and does not consider contrary findings and alternative interpretations found in the literature.

RESEARCH PROPOSAL WRITING

The goal of a research proposal is to present and justify a research idea you have and to present the practical ways in which you think this research should be conducted. The forms and procedures for such research are defined by the field of study, so guidelines for research proposals are generally more exacting and less formal than a project proposal. Research proposals contain extensive literature reviews and must provide persuasive evidence that there is a need for the research study being proposed. In addition to providing rationale for the proposed research, a proposal describes detailed methodology for conducting the research consistent with requirements of the professional or academic field and a statement on anticipated outcomes and/or benefits derived from the study.

How to approach writing a research proposal

Your professor may assign the task of writing a research proposal for the following reasons:

- Develop your skills in thinking about and designing a comprehensive research study.
- Help learn how to conduct a comprehensive review of the literature to ensure a research problem has not already been answered [or you may determine the problem has been

answered ineffectively] and, in so doing, become familiar with scholarship related to your topic.
- Improve your general research and writing skills.
- Practice identifying what logical steps must be taken to accomplish one's research goals.
- Nurture a sense of inquisitiveness within yourself and to help see yourself as an active participant in the process of doing scholarly research.

A proposal should contain all the key elements involved in designing a complete research study, with sufficient information that allows readers to assess the validity and usefulness of your proposed study. The only elements missing from a research proposal are the results of the study and your analysis of those results. Finally, an effective proposal is judged on the quality of your writing. It is, therefore, important that your writing is coherent, clear, and compelling.

Regardless of the research problem you are investigating and the methodology you choose, all research proposals must address the following questions:

1. **What do you plan to accomplish?** Be clear and succient in defining the research problem and what it is you are proposing to research.
2. **Why do you want to do it?** In addition to detailing your research design, you also must conduct a thorough review of the literature and provide convincing evidence that it is a topic worthy of study. Be sure to answer the "So what? question.
3. **How are you going to do it?** Be sure that what you propose is doable.

Common Mistakes to Avoid

- Failure to be concise; being "all over the map" without a clear sense of purpose.
- Failure to cite landmark works in your literature review.
- Failure to delimit the contextual boundaries of your research [e.g., time, place, people, etc.].
- Failure to develop a coherent and persuasive argument for the proposed research.
- Failure to stay focused on the research question; going off on unrelated tangents.
- Sloppy or imprecise writing. Poor grammar.
- Too much detail on minor issues, but not enough detail on major issues.

Beginning the Proposal Process

As with writing a traditional research paper, research proposals are generally organized the same way throughout the social sciences. Most proposals are between ten and fifteen pages in length. However, before you begin, read the assignment carefully and, if anything seems unclear, ask your professor whether there are any specific requirements for organizing and writing the proposal.

A good place to begin is to ask yourself a series of questions:

- What do I want to study, and why?
- How is it significant within the subject areas covered in my class?
- What problems will it help solve?
- How does it build upon [and hopefully go beyond] research already conducted on my topic?
- What exactly should I plan to do, and can I get it done in the time available?

Components of a Research Proposal

Krathwohl (2005) suggests and describes a variety of components to include in a research proposal. The following sections – Introductions, Background and significance, Literature Review; Research design and methods, Preliminary suppositions and implications; and Conclusion present these components in a suggested template for you to follow in the preparation of your research proposal.

In the end, your research proposal should document your knowledge of the topic and highlight enthusiasm for conducting the study. Approach it with the intention of leaving your readers feeling like—"Wow, that's an exciting idea and I can't wait to see how it turns out!"

In general your proposal should include the following sections:

I. Introduction

In the real world of higher education, a research proposal is most often written by scholars seeking grant funding for a research project or it's the first step in getting approval to write your doctoral dissertation. Even if this is just a course assignment, treat your introduction as the initial pitch of an idea. After reading the introduction, your readers should not only have an understanding of what you want to do, but they should also be able to sense your passion for the topic and be excited about its possible outcomes.

Think about your introduction as a narrative written in one to three paragraphs that succinctly answers the following four questions:

1. What is the central research problem?
2. What is the topic of study related to that problem?
3. What methods should be used to analyze the research problem?
4. Why is this important research, and why should someone reading the proposal care about the outcomes from the study?

II. Background and Significance

This section can be melded into your introduction or you can create a separate section to help with the organization and flow of your proposal. This is where you explain the context of your project and outline why it's important. Approach writing this section with the thought that you can't assume your readers will know as much about the research problem as you do. Note that this section is not an essay going over everything you have learned about the research problem; instead, you must choose what is relevant to help explain your goals for the study.

To that end, while there are no hard and fast rules, you should attempt to deal with some or all of the following:

- State the research problem and give a more detailed explanation about the purpose of the study than what you stated in the introduction.
- Present the rationale of your proposed study and clearly indicate why it is worth doing. Answer the "So what? question [i.e., why should anyone care].
- Describe the major issues or problems to be addressed by your research.
- Explain how you plan to go about conducting your research. Clearly identify the key sources you intend to use and explain how they will contribute to the analysis of your topic.
- Set the boundaries of your proposed research in order to provide a clear focus.
- Provide definitions of key concepts or terms, if necessary.

III. Literature Review

Connected to the background and significance of your study is a more deliberate review and synthesis of prior studies related to the research problem under investigation. The purpose here is to place your project within the larger whole of what is currently being explored, while demonstrating to your readers that your work is original and innovative. Think about what questions other researchers have asked, what methods they've used, and what is your understanding of their findings. Assess what you believe is still missing, and state how previous research has failed to examine the issue that your study addresses.

Since a literature review is information dense, it is crucial that this section is intelligently structured to enable a reader to grasp the key arguments underpinning your study in relation to that of other researchers. A good strategy is to break the literature into "conceptual categories" [themes] rather than systematically describing materials one at a time.

To help frame your proposal's literature review, here are the "five C's" of writing a literature review:

1. **Cite**: keep the primary focus on the literature pertinent to your research problem.
2. **Compare** the various arguments, theories, methodologies, and findings expressed in the literature: what do the authors agree on? Who applies similar approaches to analyzing the research problem?
3. **Contrast** the various arguments, themes, methodologies, approaches and controversies expressed in the literature: what are the major areas of disagreement, controversy, or debate?
4. **Critique** the literature: Which arguments are more persuasive, and why? Which approaches, findings, methodologies seem most reliable, valid, or appropriate, and why? Pay attention to the verbs you use to describe what an author says/does [e.g., asserts, demonstrates, etc.].
5. **Connect** the literature to your own area of research and investigation: how does your own work draw upon, depart from, or synthesize what has been said in the literature?

IV. Research Design and Methods

This section <u>must</u> be well-written and logically organized because you are not actually doing the research. As a consequence, the reader will never have a study outcome from which to evaluate whether your methodological choices were the correct ones. The objective here is to ensure that the reader is convinced that your overall research design and methods of analysis will correctly address the research problem. Your design and methods should be absolutely and unmistakably tied to the specific aims of your study.

Describe the overall research design by building upon and drawing examples from your review of the literature. Be specific about the methodological approaches you plan to undertake to collect information, about the techniques you will use to analyze it, and about tests of external validity to which you commit yourself [i.e., the trustworthiness by which you can generalize from your study to other people, places or times].

When describing the methods you will use, be sure to cover these issues:

- Specify the research operations you will undertake and the way you will interpret the results of these operations in relation to your research problem. Don't just describe what you intend to achieve from applying the methods you choose, but state how you will spend your time while doing it.

- Keep in mind that a methodology is not just a list of research tasks; it is an argument as to why these tasks add up to the best way to investigate the research problem. This is an important point because the mere listing of tasks to perform does not demonstrate that they add up to the best feasible approach.
- Be sure to anticipate and acknowledge any potential barriers and pitfalls in carrying out your research design and explain how you plan to get around them.

V. Preliminary Suppositions and Implications

Just because you don't have to actually conduct the study and analyze the results, it doesn't mean that you can skip talking about the process and potential implications. The purpose of this section is to argue how and in what ways you believe your research will refine, revise, or extend existing knowledge in the subject area under investigation. Depending on the aims and objectives of your study, describe how the anticipated results of your study will impact future scholarly research, theory, practice, forms of interventions, or policy. Note that such discussions may have either substantive [a potential new policy], theoretical [a potential new understanding], or methodological [a potential new way of analyzing] significance.

When thinking about the potential implications of your study, ask the following questions:

- What might the results mean in regards to the theoretical framework that frames the study?
- What suggestions for subsequent research could arise from the potential outcomes of the study?
- What will the results mean to practitioners in the "real world"?
- Will the results influence programs, methods, and/or forms of intervention?
- How might the results contribute to the solution of social, economic, or other types of problems?
- Will the results influence policy decisions?
- What will be improved or changed as a result of the proposed research?
- How will the results of the study be implemented, and what innovations will come about?

VI. Conclusion

The conclusion reiterates the importance or significance of your proposal and provides a brief recap of the entire study. This section should be only one or two paragraphs long, emphasizing why your research study is unique, why it advances knowledge, and why the research problem is worth investigating.

Someone reading this section should come away with an understanding of:

- Why the study was done,
- The specific purpose of the study and the research questions it attempted to answer,
- The research design and methods used,
- The potential implications emerging from your proposed study of the research problem, and
- A sense of how your study fits within the broader scholarship about the research problem.

VII. Citations

As with any scholarly research paper, you must cite the sources you used in composing your proposal. In a standard research proposal, this section can take two forms, so speak with your professor about which one is preferred.

1. **References --** lists only the literature that you actually used or cited in your proposal.
2. **Bibliography --** lists everything you used or cited in your proposal with additional citations of any key sources relevant to understanding the research problem.

In either case, this section should testify to the fact that you did enough preparatory work to make sure the project will complement and not duplicate the efforts of other researchers. Start a new page and use the heading "References" or "Bibliography" at the top of the page. Cited works should always use a standard format that follows the writing style advised by the discipline of your course [i.e., education=APA; history=Chicago, etc]. This section normally does not count towards the total length of your proposal.

Introduction to Qualitative, Quantitative and Mixed methods Research

Before conducting research, you need to consider which type of research would be the most suitable to answer your research questions. There are two main types of research: (i) quantitative, and (ii) qualitative.

Quantitative research is a formal, objective and systematic process in which numerical data is used to obtain information. It involves testing a hypothesis or trying to discover relationships. It is generally deductive research (this means that a scientist would start from a hypothesis and then begin observations to prove the hypothesis). It is designed to establish differences, relationships or causality (does one thing cause another?).

Qualitative research is generally subjective and involves words rather than numbers. It looks at feelings, opinions and emotions and is concerned with trying to explain why rather than what or how many. It tends to be inductive, which means a hypothesis can be developed through the research. It tries to explain differences, relationships or causality. Qualitative data can also produce quantitative data, for example, you may record how many people said that they like playing sport because they can spend time with their friends.

Qualitative and quantitative research methods have distinctly different strengths and weaknesses.

In sports and exercise psychology, qualitative research is distinguished from quantitative research principally by the emphasis given to descriptions "from the inside" of observed phenomena (e.g. Biddle et al., 2001). Qualitative research (i.e., interpretive, naturalistic, ethnographic, or phenomenological) tries to account for the athlete's subjective experience, thereby offering a detailed (or in-depth) description of how athletes make sense of their world (e.g. Dale, 1996). This type of study offers interesting opportunities for Performance Analysis, as it is widely acknowledged that qualitative research is especially suited to (a) understanding the meaning of events and actions, (b) understanding their context, (c) identifying unanticipated phenomena, and (d) understanding the

processes by which the events and actions take place (e.g. Stelter et al., 2003). This type of research can, for example, identify the performance indicators taken into account by athletes even during competition. These "subjective" indicators may in some cases be inappropriate and thus lead to a deterioration in performance (which justifies the continued use of classic methods in Performance Analysis). However, in other cases, these same indicators, even when partial, may be pertinent and sufficient for making decisions in dynamic and uncertain situations presenting with strong time constraints.

The term Performance Analysis is used to describe an approach that combines biomechanical analysis (e.g. analyses of technique, motor control, etc.) and notational analysis (e.g. match analysis) in order to provide coaches and athletes with an objective set of information on performance.

Usually, this approach focuses on numerical indicators (i.e., quantifiable or countable) that target and capture diverse but specific dimensions of sports performances. These indicators are subcategorized into general performance, tactical, technical, and biomechanical indicators, and they are defined according to the study objectives and the specificities of the sport under study (Hughes and Bartlett, 2002b).

Qualitative research has progressively infiltrated Performance Analysis, to such a point that it is sometimes difficult to distinguish qualitative studies from quantitative studies. Qualitative analysis in biomechanics describes and analyzes movements non-numerically by seeing movements as "patterns," while quantitative analysis describes and analyzes movements numerically.

Although sports biomechanists mainly use a quantitative approach to analyzing human movement patterns in sport, movement or performance analysts generally use qualitative or quasi-quantitative analysis.

In sports and exercise psychology, qualitative research is distinguished from quantitative research principally by the emphasis given to descriptions "from the inside" of observed phenomena (e.g. Biddle et al., 2001). Qualitative research (i.e., interpretive, naturalistic, ethnographic, or phenomenological) tries to account for the athlete's subjective experience, thereby offering a detailed (or in-depth) description of how athletes make sense of their world (e.g. Dale, 1996).

Table 1. QUALITATIVE, QUANTITATIVE AND MIXED-METHODS APPROACHES (Creswell, 2003:19)

Tend to or typically	Qualitative approaches	Quantitative approaches	Mixed-Methods approaches
Use these philosophical assumptions Employ these strategies of inquiry	Constructive/ Advocacy/ Participatory knowledge claims Phenomenology, grounded theory, ethnography, case study, and narrative	Post-positive knowledge claims Surveys and experiments	Pragmatic knowledge claims Sequential, concurrent, and transformative
Employ these methods	Open-ended questions, Emerging approaches, Text or image data	Closed-ended questions, predetermined approaches, numeric data	Both open- and closed-ended questions, Both emerging and predetermined approaches, Both quantitative and qualitative data and analysis
Use these practices of research, as the researcher	Positions himself or herself Collects participant meanings Focuses on a single concept or phenomenon Brings personal values into the study Studies the context or setting of participants Validates the accuracy of findings Makes interpretations of the data Creates an agenda for change or reform Collaborates with the participants	Tests or verifies theories or explanations Identifies variables to study Relates variables in questions or hypotheses Uses standards of validity and reliability Observes and measures information numerically Uses unbiased approaches Employs statistical procedures	Collects both quantitative and qualitative data Develops a rationale for mixing Integrates the data at different stages of inquiry Presents visual pictures of the procedures in the study Employs the practices of both qualitative and quantitative research

- "Mixed methods research is a research design (or methodology) in which the researcher collects, analyzes, and mixes (integrates or connects) both quantitative and qualitative data in a single study or a multiphase program of inquiry" (Creswell as cited in Johnson *et al.*, 2007:119).

- "Mixed methods research is the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study or set of related studies" (Johnson & Onwuegbuzie as cited in Johnson *et al.*, 2007:120).

- "Mixed methods research is a type of research design in which QUAL and QUAN approaches are used in the type of questions, research methods, data collection and analysis procedures, or in inferences" (Tashakkori & Teddlie as cited in Johnson *et al.*, 2007:121).

Key issues influence the quality of research, are:

(i)   Validity – whether you are measuring what you are supposed to be measuring.

(ii)   Reliability – the repeatability of a set of results.

(iii)   Accuracy – how close a measurement is to the true value.

(iv)   Precision – how fine or small a difference a measurement can detect

Validity

Validity is essential in research because it relates to whether you are actually measuring what you planned to measure. There are different types of validity, but two key types are internal validity and external validity. **Internal validity** relates to whether the results of the study can be attributed to the different treatments in the study. This means that for your research to claim internal validity, you need to ensure that you have controlled everything that could affect the results of the study. **External validity** relates to whether or not the results of the study can be applied to the real world.

Reliability

Reliability relates to whether, if you carried out the research again, you would get the same or similar results. However, reliability can be claimed without results being correct. For example, if you always ask the wrong questions in research, you will always get the same wrong answers. This will mean the test is reliable because you have received the same wrong answers, even though they are not the ones you wanted.

In quantitative research, reliability can be one researcher conducting the same test on the same individual on a number of occasions, and getting the same or similar results. Alternatively, it can be different researchers conducting the same test on the same individual and getting the same or similar results. In qualitative research, reliability relates to the same researcher placing results into the same categories on different occasions, or different researchers placing results into the same or similar categories.

There are certain factors you should take into account that can affect reliability. For example:

(i)   errors can happen when researchers don't know how to use the equipment correctly

(ii)   the equipment may be poorly maintained

(iii)   the wrong type of equipment may be selected.

There are two types of reliability: inter-researcher reliability and test-retest reliability.

Inter-researcher reliability examines whether different researchers in the same situation would get the same (or similar) results. An example of when inter-researcher reliability is a problem is body composition assessment. When people are learning to use the skinfold calliper technique of assessing body composition, it is difficult to take accurate measurements from the correct sites. Researchers come up with different values. When this happens, you cannot claim to have achieved inter-researcher reliability.

Test-retest reliability relates to doing the same test on different occasions and getting the same (or similar) results. An example of a test-retest reliability issue in sport or exercise research is the measurement of heart rate. Heart rate can be affected by different factors, such as temperature, time of day, diet, sleep patterns, physical activity levels and alcohol. If you measured the heart rate on the same person at the same time of day, but on different days, you could get different measurements.

Data collection techniques for the sport and exercise sciences

Types of data

Primary data is data that you collect through questionnaires, interviews and observations which you use to investigate your research problem.

Secondary data is previously published data found in books, journals, government publications, websites and other forms of media. Secondary data is used to form rationales for your research and to support or counter-argue your research findings.

Classifications of data

Discrete data is a form of data where only separate, isolated or opposite values can be achieved (for example, male/female, win/lose, yes/no).

Nominal data A nominal scale is where participants are put into categories and counted, for example, grouping basketball players under the team they play for. You will group the players in this way to count them, not necessarily to say that one group is better than another.

Ordinal data is ranked data that gives no indication of the difference between levels. It allows you to say who is best and second best, but does not tell you the difference between the two. This type of data provides the researcher with a rank order, but does not give an exact value. For example, on a badminton ladder, the person at the top is assigned a rank of 1, the person second down is awarded a rank of 2, the third person is awarded a rank of 3, and so on. There is nothing to say, however, that the person at the top of the ladder is three times as good as the person in third place on the ladder.

Continuous data is data that can have any numerical value with any number of decimal places. For example, lap times in a Moto GP race can be classed as continuous data because of the values they are given (1 minute, 35.37 seconds).

Interval data is based on a scale that has equal intervals of measurement with equal intervals between each score. For example, in a figure skating scoring scale there is the same difference between scoring 5 and 5.5 as there is between scoring 5.5 and 6.

Ratio data has proportional equal units of measurement. Ratio scales range from zero upwards and cannot have negative scores. For example, if a rugby team scores 40 points, it is worth twice as much as their opponents who have scored 20 points.

Qualitative data collection techniques

Three main types of data collection are involved with qualitative research:

- interviews
- focus groups
- observations.

Each type of data collection method has its advantages and disadvantages.

Interviews An interview is a conversation with a purpose. There are four types of interview: structured, unstructured, semi-structured and focus groups (focus groups will be covered separately as they are a group-based interview whereas the others are individual interview.

Structured interview – a set interview guide that you adhere to without making any changes in light of the participant's responses.

Unstructured interview – this type of interview has a start question and then the conversation goes from there. You must be skilled at focusing your conversation to get a lot out of this type of interview.

Semi-structured interview – an interview that follows the guide but allows scope for probing further with your questions if a topic of interest is brought up. This is a good technique as it allows you to get deeper information from your participant through additional questioning as well as giving the participant the opportunity to discuss things further if they wish.

Focus group – a group-based interview where the group interaction is an essential aspect of data collection. These tend to be a semi-structured group-based interview.

Focus groups

Focus groups are similar to interviews, but involve more than one participant. There are usually between six and 12 participants and the researcher acts as a discussion facilitator rather than an interviewer. In this context, your role as the researcher is to ensure that the focus group stays on topic and doesn't wander. Focus groups are more effective if everyone has a say in the discussion. They can provide you with a better quality of data because the discussion gets deeper as the group develops ideas. They are a good way of finding out opinions and ideas.

Observations

Two main types of observation are used in qualitative research: participant and non-participant. s Participant observation means that the researcher is actively involved in the topic they are researching. For example, if you were studying team cohesion in rugby, you could join a rugby team, to observe 'from the inside' and gain your own experiences of cohesion as a player. Data would then be recorded in the form of field notes, with you recording your own thoughts, feelings, opinions, emotions and experiences. This method is useful when trying to discover the more delicate aspects of group behaviour that are not easy to see from the outside. s Non-participant observation involves the researcher observing 'from the outside'. There is no interaction with the individuals or the activity being observed. For example, if you wanted to look at injuries during a basketball match, you

could watch how many injuries happened, what types of injuries they were and record the numbers on a data recording sheet.

Quantitative data collection techniques

Several data collection techniques can be used for quantitative data collection. You have covered how non-participant observation can be used in both qualitative and quantitative research – don't forget about this technique when considering quantitative research. Other techniques used in quantitative research include questionnaires. The settings in which data will be collected are either field-based data collection settings or laboratory-based data collection settings.

Questionnaires

Questionnaires are used when you are trying to collect a large amount of data from large groups and when the data you want to collect is not in-depth. If you need to obtain more in-depth information, questionnaires would not be suitable alone. However, they could be effective if used alongside other qualitative methods of data collection (such as interviews). As with other data collection methods, questionnaires have advantages and disadvantages.

Questionnaire design If your questionnaire looks poorly organised and unprofessional, it may be thrown away, particularly if you decide to post your questionnaires to people. If it looks well organised and purposeful, you have a better chance of it being completed. The use of coloured paper, artistic designs, dotted lines and tick boxes all help, but ensure your design is geared towards the audience it is aimed at. For example, make it easy and simple to use for young children. When designing your questionnaire, remember that if it is more than one page long it is much less likely to be filled in – so keep it short. Always consider why you are asking a question. This will stop you including unnecessary questions. The quality of your questionnaire will increase as its validity increases. Decide which format would be most appropriate for the question you want to ask. Should it be an open question or a closed question? When you start to design your questionnaire, you need to consider a number of factors including:

- what you want to find out
- your sample (this will affect how you write your questionnaire)
- the length and appearance of your questionnaire (when you design it, don't make it too long or difficult to answer)
- how and when you are going to distribute your questionnaire. If you are going to distribute it by hand, wait for it to be completed rather than going away and returning later. Another way you can distribute your questionnaire is by post or email, but this reduces the chances of it being returned. Include a return address and a covering letter to explain why your questionnaire is being sent out
- how to analyse the results.

Remember that there are different types of questions: open and closed.

Open questions are used more in qualitative research than in quantitative research. They allow people to express ideas, opinions and sentiments in words. They are used when asking questions that could lead to complex or in-depth answers, or if you are unsure of what the answers to the question could be. Open questions can take longer to answer than closed questions, so make sure that you plan your research to account for this. An example of an open ended question could be 'What are your thoughts on the promotion of sport for people with disability.

Closed questions are used when a specific response is required and answers involve ranking, scales or categories. These questions are used more in quantitative data collection as they generate numbers for you to analyse using statistical methods. The participants respond to answers that the researcher has included on the questionnaire. The responses are in less depth than those from open questions. An example of a closed question could be 'Do you like playing rugby? Yes/No'.

Laboratory-based data collection

Laboratory-based data collection involves collecting data in an environment where all the conditions and variables are controlled, so that you are only measuring the variables in question. One advantage of laboratory-based data collection is that it has high levels of internal validity. You are controlling all your variables so you know that you are only measuring the aspect you mean to measure. One disadvantage of laboratory-based data collection is that it has low levels of ecological validity because the data is not collected in an environment that reflects the situation in which the activity is performed. Another disadvantage of laboratory-based data collection is that it normally requires the use of expensive or technical equipment to collect data, making it difficult to use this if you don't have a lot of resources.

Field-based data collection

Field-based data is collected in the environment that simulates the one in which the sport is played. One of the key strengths of field-based data collection is that it mimics the performance environment so you can claim ecological validity when you are collecting data in this setting. Field-based data collection can be cheaper than laboratory-based collection, making it more accessible to people without lots of resources. However, one limitation is that you don't control all the variables in this data collection setting, so it can be difficult to claim internal validity.