

Research Methods

(A Process of Inquiry): By Anthony M. Graziano & Michael L. Raulin

- Science is the way of thinking (logic used), asking and answering the questions about the nature. (accumulative knowledge)
- Science is a process of gaining knowledge (having knowledge), it has limits, precision
- Science is a process of formulating specific questions and then finding answers in order to gain a better understanding of the nature
- Science is a product of research
- I think I am exist = مبدأ الوجودية
- Intellectual = المثقف
- A process of inquiry is scientific research (Science)
- To be a consumers of the research, how to evaluate the validity of the claims, & to do it
- Why to do research = interest, emotions, memory, filling gaps, social process....
- Naïve = ساذج
- Premise = hypothesis = المسلمة
- “the issue here is how do people decide which information is valid”
- Information is subject to change if transferred from individual to another
- علم الأحاديث و المرجعيات و سند و المتن
- Data base = to log the history
- Think systematically and critically = for to be scientific
- Sciences uses (systematic and disciplined thinking) research methods
- “The essence of the modern science is the way of thinking, the disciplined way in which questions are posed and answered in order to understand natural events. It is logical processes and demands for evidence, and **not** the technologies that characterize science. It is an intellectual process, and its ultimate goal is to understand the natural universe” (Staddon & Bueno, 1991).
- Socrates and his follower used highly develop system to ask the questions? Over 2400 yrs ago
- Sharp question towards the area of ignorance and uncertainties
- Leonardo da Vinci (1452-1519) was scientist, painter, musician ,and anatomist, Galileo, Charles Darwin (1809-1882)-Origin of Species, Alfred Russel Wallace(1823-1913)-Naturalist; threatened the church
- Scientists attempt to resolve questions, not by reasserting old beliefs, but by studying the questions and seeking new answers

- Curiosity may have killed the cat, according to the old saying, but curiosity sustains the scientists (J. Robert Oppenheimer (1956))
- Skepticism = شكوكية
- Linus Pauling 1981 “satisfying one’s own curiosity is one of life’s greatest sources of happiness”
- B. F. Skinner 1956 “When you run on to something interesting, drop everything else and study it”
- Serendipitous = accidental discoveries; like what happen with Robert, 1989 and Anton Van Leeuwenhoek’s (1632-1723) for microscopic creatures do exist. Neuroscience Re.
- Albert Szent-Gyorgi “Discovery is an accident meeting a prepared mind”
- ASP (Acylation Stimulating Protein) discovered by chance via electrophoresis
- Louis Pasteur = accidentally discovered penicillin
- Disciplined curiosity
- Characteristic of Scientist:
 - Curiosity
 - Creativity
 - Skepticism
 - Tolerance of ambiguity
 - Commitment to hard work
 - Logical thinking
- The Greeks have developed the concept of evolution over 2000 yrs earlier
- Darwin & Wallace created the concept of natural selection
- Renaissance (1300-1800) = عصر النهضة
- Leonardo da Vinci (1452-1519) = the last supper and Mona Lisa
- The science is not the only way of thinking about the nature
- G. C. Helmstadter (1970) labeled the common methods of acquiring knowledge:
 1. **Tenacity:** القدرة على تذكر او الاصرار
 - A willingness to accept ideas as valid because they have been accepted for so long or repeated so often that they seem true. With no objections
 - There is no demand to check for accuracy of the idea(Not logic)
 - It has been always been so
 - Examples; Advertisements, Sales offers on TV, Political campaigning.
 2. **Intuition:** الحدس السريع او البديهية المفترطة
 - Rapid assessment based on unexamined experience, attitudes, feelings and can lead to errors
 - We feel it is so but not to prove but to ask only

- It is good for questioning – because you “feel” it’s true
- Without sensory process or rational thoughts or examinations
- Example is police detective, extra-sensory perception, liking or disliking a person from first seen, Psychics, Mysticism, spiritualism, on drug
- It uses hunches and guts feelings
- Extrasensory Perception = الفهم اللاحسي

3. Authority: المرجعية

- Is the acceptance of an idea as valid knowledge because some respected sources
- Examples; Religious writing, Court, President, Pop, if they claim some things
- Tenacity, Intuition, and Authority : (1) Make few demands on information, (2) require minimal process, (3) Easy to state or to claim (4) All of them share an uncritical acceptance of the information and conclusions
- An authority said so

4. Rationalism: العقلانية

- Developing valid ideas by using existing ideas and principles of logic
- Knowledge is developed **through reasoning** and information is carefully stated and logical results are followed to arrive at acceptable conclusion.
- The hypothesis is tested empirically but built by rationalism with correct conclusion, **reasoning process**, and **accuracy of premises** = hypothesis
- Conclusion is reached through logic and premises must be true as determined by some other evidence to arrive at the correct conclusion
- To make sense of it but it has its limitations

5. Empiricism: التجربة العلمية

- Gaining knowledge through observation by experiencing using senses, it’s also has limitations as old as civilization
- Example; cities which not seen does not mean it’s not exist, I won’t believe unless I see it- all old scientist applied this form of method, Arabs were leaders on that
- Empiricism needs to be integrated with rational thought
- Naïve and sophisticated empiricism
- Experimentation is the best way to prove

6. Science: العلم

- A process that combines the principles of rationalism with process of empiricism using rationalism to develop theories and empiricism to test the theories
- Perception = الفهم
- **Orderliness belief (Whitehead 1925)** = universe operates in an orderly, lawful manner. If it did not or if we did not hold this belief there, then could be no science. If the

universe were not orderly and predictable, it would not stay the same long enough to be studied.

- **Pseudo-Science:** uses unscientific methods, theories, assumptions, and conclusions that pretend to be scientific. You find it in a TV advertisers, books, manuals, tapes, computer programs, GSMs. They are empty or make-believe science
- How to recognize the pseudoscience?
 1. What is the nature of evidence?
 2. In what form evidence is reported and made to public?
 3. Where this scientist is from?
- Thales (CA. 640-550) was the first Greek philosopher to combine an empirical-rational view of the universe and he is the father of Science
- Hippocrates (450 B.C.) no exorcism, demons, or spirits caused the illness
- Philosopher **Karl Popper** suggested that it is impossible to prove a scientific theory true by means of **induction**, because no amount of evidence assures us that contrary evidence will not be found. Instead, Karl Popper proposed that proper science is accomplished by **deduction**. Deduction involves the process of **falsification**
- Falsification is a particular specialized aspect of **hypothesis testing**
- Popper's version of scientific method first begins with the postulation of a **hypothesis**. A hypothesis is an educated guess or a theory that explains some phenomenon. The researcher then tries to prove or test this scientific theory false through **prediction** or **experimentation**
- The process of testing theories in science is endless. Part of this problem is related to the complexity of nature. Any one phenomenon in nature is influenced by numerous factors each having its particular cause and effect. For this reason, one positive test result is not conclusive proof that the phenomenon under study is explained. However, some tests are better than others and provide us with stronger confirmation. These tests usually allow for the isolation of the phenomena from the effects of causal factors. Manipulative experiments tend to be better than tests based on prediction in this respect.
- hypothetico-deductive method, also called H-D method or H-D, procedure for the construction of a **scientific theory** that will account for results obtained through direct observation and **experimentation** and that will, through **inference**, predict further effects that can then be verified or disproved by empirical evidence derived from other experiments.
- **inference** = الاستدلال

- **Research** is a process of inquiry = is a systematic search for information, carried out any where, on any phenomena in nature and by anyone. (Any type of investigation that uncover the knowledge)
- Research involves by Kerlinger:
 - Systematic
 - Control
 - Empirical
 - Critical observation
 - Guided by theory
- Type of research:
 1. **Basic:** It's fundamental or pure. Which focus on new things by theoretical aspects, difficult to found? Gravity if exist? Again.
 2. **Applied:** to solve real life problems, easy to found, putting research on applications.
 3. **Action:** No control involved and immediate. like BMS at SQUH
 4. **Replication:** two same research on different places to test generalizability
- Not all research is scientific, what differ scientific research from other research is the using of both rational and empirical processes
- Every discipline, including the science is built on **assumptions**-ideas that are tentatively accepted as being true without further examination and are subject in science for both rationalism and empiricism (Change):
- Scientist share some basic assumptions about the nature:
 1. A true, **physical universe** exists
 2. While there may be randomness and thus unpredictability in the universe, it is primarily an **orderly system**
 3. The principles of this orderly universe can be **discovered**, particularly through **scientific research**
 4. Our knowledge about the universe is always incomplete. New knowledge can, and should, alter current ideas and theories. Therefore, all knowledge and theories are **tentative**
- Yet we are confident in using concepts about unseen events because we constantly challenge their validity. Like e.g. Gravity
- We may hypothesize about an unseen (invisible) events
- How to challenge an existing theory is by:
 1. Exposing its flaws with well designed research
 2. Proposing a better theory
- At minimum, scientific research involves:

1. Posing a question?
 2. Developing a procedure to answer the question
 3. Planning for, and then making, appropriate empirical observations
 4. Rationally interpreting the empirical observations
- **Facts** are those events that can be directly, empirically, and repeatedly observed. Measurable, reliable and the use of 5 senses
 - Each discipline has its own **facts (empirical observations)**
 - **Not really Facts** examples; behaviors, emotions, intelligence, attitudes, values, creativity, thinking, perception, humor, and so on, But **a constructs**
 - **Observation** is the empirical process of using our senses to recognize and record factual events
 - **Inference:** is an intellectual process in which conclusions are derived from observed facts (inductive-empirically) or from other ideas (deductive-rationally)
 - Inferences can be drawing from other inferences but should be precise, be close to data
 - **Reification of a construct:** confusing a construct for a fact is a logical error. When some believe there really is ego for example and this is only tentative observations. Can be avoided by using systematic disciplined logic in their work
 - **Psychological construct:** are ideas constructed by the researcher through a rational process of inference. These constructs are based on empirical observation as well as on other constructs. The constructs are used in further thinking and research as if they exist and as if they have observable effects. These constructs are inferences; it would be an error to believe that constructs are facts
 - It is best to remember that no theory is completely true, but rather provides accurate explanations for a certain percentage of situations or events
 - Empirical observation and rational abstractions
 - A model represents reality but does not duplicate it. Example; model of air-plane
 - Descriptive and explanatory ideas: **Models** use to organize the (information) knowledge and hypothesis about the reality. To illustrate relationships among parts, to create new ideas
 - The scientist observes the facts of the nature, draw inferences, and constructs ideas about the relationships among them
 - **Scientific Method:** process of inquiry repeatedly cycles through observations and inferences – facts and constructs:
 - **Identify the problem**
 - **Define the problem**
 - **Formulate the test hypothesis**

- **Determine the research question**
- **Test the hypothesis**
- **Inductive reasoning:** A researcher who begins with empirical observations and then infers constructs. (دأرسة كل شيء عن المتغير و البحث في تاريخه)
- **Deductive reasoning:** using the constructs as the basis of making predictions about new, specific observation. (Description, Prediction, Improvement, and Explanation)
- Example; of Lisa upstairs and kids back to home and main door is open. (Inductively then Deductively –Predictions)
- “The essence of science is its process of thinking, and that process entails systematic inductive-deductive logic”
- **Theory:** is a formalized set of concepts that organizes observations and inferences and predicts and explains phenomena. Theory must be testable to be scientific
- **Parsimony:** a simple, straightforward theory is preferred over a complex theory if the theories provide equivalent predictive validity
- **Types of theory by Marx (1963):**
 1. **Inductive theory:** stay very close to the empirical data. Skinner (1972)
 2. **Deductive theory:** more traditional, formalized theory that emphasizes constructs. Deduct the constructs and tested empirically
 3. **Functional theory:** equal emphasis on induction and deduction
 4. **Model theory:** Model is an analogical representation of reality and not duplicate of reality but only representation. Mini-theories
- How to judge the theories:
 - How useful they are in organizing information
 - Explaining the phenomena
 - Generating an accurate predictions
- There is nothing as useful as good theory
- **Constructs:** are ideas and concepts about the relationship among observed facts
- **Scientific Methods:**
 1. Investigate the phenomena
 2. Acquire new knowledge
 3. Correcting & investigating other knowledge’s
- “Opportunity comes to open mind”
- “hard work does not insure success but make it more likely”
- **Methods of Frauds in Scientific Research:**
 - Hoaxing: Publishing something which is never happened or exist. In 1788, there is animal new creature in Malta????!!

- Forging: Is someone who wants to gain reputation in science by recording observation which has never been made
- Trimming: Clipping off little bit here and there from observations – anything which is differ from the mean. Averages may remain the same but he wants to gain accuracy in making observations
- Cooking: Producing a very big multitude of observations and out of these he/she selects those which only suit his/her interest.
- Obfuscation: This newly came in science field and it's intended to make something obscure or to hide real information by making long paragraphs, long sentences, usage of difficult long words in English.
- **Ethics**: Is the principle of good human behaviors and bad behaviors comes due to result ignorance.
- **Cutting Corners**: Not to give full pictures of research
- **Code of Conduct (حسن التصرف) = declaration of Helsinki (1975?, 1964)** it's about biomedical research involving human objects. Rules & regulations of society.
 - It's unethical to conduct research which badly planned or poorly executed
 - Research should be base on generally accepted scientific principles
 - Not to harm the environment and animals
 - Should contain ethical considerations
 - Not to kill animals just for research or to do clinical trials on human
 - Reports or results of experimentation not match with the principle used should not be published
 - Research should have predicable risks
- **Publication (to make public)**: the art of bring before public – periodical or fact. So it's now in public domain and not in his personal domain anymore. There is exponential expansion in research publications. It serves two purposes:
 - To facilitate building on old knowledge by making it accessible
 - To subject the findings to examination by other scientists (Falsification)
- **Critical Thinking**: is the process or method of **thinking** that "questions assumptions". It is a way of deciding whether a claim is true, false, or sometimes true and sometimes false, or partly true and partly false. The origins of critical thinking can be traced in Western thought to the **Socratic method** of **Ancient Greece** and in the East, to the **Buddhist kalama sutta** and **Abhidharma**. Critical thinking is an important component of most **professions**. It is a part of the

education process and is increasingly significant as students progress through **university** to **graduate education**, although there is debate among educators about its precise meaning and scope.

- **Sources of public information:**

1. **Bibliographies:** books about the books
 2. **Biographies**(السيرة الذاتية): Book about the people
 3. **Books (General & Specialized):** Scientific books
 4. **Dictionaries:** Books about words
 5. **An encyclopedia** (الموسوعة): is a type of reference work, a compendium holding a summary of information from **either** all branches of *knowledge* or a particular branch of *knowledge*
 6. **Index (publishing)**, a detailed list, usually arranged alphabetically, of the specific information in a publication
 7. **Maps:** أطلس
 8. **Periodical literature** (also called a periodical publication or simply a periodical) is a published work that appears in a new edition on a regular schedule basis. Fixed time period every quarter, half of year, 3rd quarter. Some publications in periodicals would be like; Conference abstracts, articles, literature reviews, editorials, letters, original articles, clinical trials,
 9. **An article:** is a written work published in a **print** or **electronic medium**. It may be for the purpose of propagating the news, research results, academic analysis or debate.
- **Bibliographic index**, a regularly updated **print** **periodical** **publication** that lists articles, books, and/or other information items, usually within a particular discipline

- **Index cards** in a rolodex or old library card catalog, early and mid 20th century technologies for maintaining such lists
- A **glossary**, also known as an **idioticon**, **vocabulary**, or **clavis**, is an alphabetical list of **terms** in a particular **domain of knowledge** with the **definitions** for those terms. Traditionally, a glossary appears at the end of a **book** and includes terms within that book which are either newly introduced, uncommon or specialized
- **Features of periodicals:**
 - **Peer reviewed or not peer reviewed:** Peer review is a process of self-regulation by a profession or a process of evaluation involving qualified individuals within the relevant **field**. Peer review methods are employed to maintain standards, improve performance and provide credibility. In **academia** peer review is often used to determine an **academic paper's suitability for publication**. (Before to the publications)-to subject the findings
 - **Local or regional or International (How to be used by public)**
 - **Impact factor & Prestige factor:** **The impact factor:** often abbreviated IF, is a measure reflecting the average number of citations to articles published in science and social science journals. It is frequently used as **a proxy** for the relative importance of a journal within its field, with journals with higher impact factors deemed to be more important than those with lower ones. The impact factor was devised by **Eugene Garfield**, the founder of the **Institute for Scientific Information (ISI)**, now part of **Thomson Reuters**. Impact factors are calculated yearly for those journals that are indexed in Thomson Reuters Journal Citation Reports. **The Prestige Factor: (PF)** database possessed a dubious and short-lived existence. In an effort to challenge the ISI IF, **in 2001** the "Prestige Factor" (PF) was launched at "PrestigeFactor.com". The PF was heralded as a superior assessment tool. It promised to measure the true value of academic journals by including original articles only and hosting a "**superior**" database compared to SCI. With only minor differences, such as the inclusion of original articles only and a three year citation count window, the underlying premise of both the IF and PF was identical. One detailed analysis of the PF's social sciences subset found essential misrepresentations and misleading data on the company's website. Concerns about the source of citations in the PF database were raised and led to doubts and competitive claim. **In 2002**, the company was forced out

of business in the wake of a threat from ISI to charge for intellectual property infringements.

- **An abstract:** is a brief summary of a research article, thesis, review, conference proceeding or any in-depth analysis of a particular subject or discipline, and is often used to help the reader quickly ascertain the paper's purpose. When used, an abstract always appears at the beginning of a manuscript, acting as the point-of-entry for any given academic paper or patent application. Abstracting and indexing services for various academic disciplines are aimed at compiling a body of literature for that particular subject. **(Would appear in electronic database – should has all key words)**
- **The terms précis(المخلص) or synopsis (الخلاصة)** are used in some publications to refer to the same thing that other publications might call an **"abstract"**. In management reports, an executive summary usually contains more information (and often more sensitive information) than the abstract does.
- **A summary, synopsis, or recap is** a shorter version of the original. Such a simplification highlights the major points from the much longer subject, such as a text, speech, film, or event. The purpose is to help the audience get the idea in a short period of time.
- **A review:** is an evaluation of a publication, a product or a service, such as a **movie** (a **movie review**), **video game**, **musical composition** (music review of a composition or recording), **book** (**book review**); a piece of hardware like a **car**, **home appliance**, or **computer**; or an event or performance, such as a live music concert, a play, musical theater show or dance show. In addition to a critical evaluation, the review's author may assign the work a **rating** to indicate its relative merit. More loosely, an author may review current events, trends, or items in the news. A compilation of reviews may itself be called a review. **The New York Review of Books**, for instance, is a collection of essays on literature, culture, and current affairs. **National Review**, founded by **William F. Buckley, Jr.**, is an influential **conservative** magazine, and **Monthly Review** is a long-running **socialist** periodical.
- **An editorial:** is an **opinion piece** written by the senior editorial staff or publisher of a **newspaper** or **magazine**. Editorials are usually unsigned and may be supposed to reflect the opinion of the periodical. In the UK, these unsigned columns are known as "leading

articles". In Australian and major United States newspapers, such as the **New York Times** and the **Boston Globe**, editorials are often classified under the heading "opinion".

- A report is a textual work (usually of writing, speech, television, or film) made with the specific intention of relaying information or recounting certain events in a widely **presentable form**.
- A manuscript or handwrite is written **information** that has been manually created by someone or some people, such as a hand-written **letter**, as opposed to being printed or reproduced some other way. The term may also be used for information that is hand-recorded in other ways than writing, for example **inscriptions** that are chiselled upon a hard material or scratched (the original meaning of **graffiti**) as with a knife point in plaster or with a **stylus** on a waxed tablet (the way Romans made notes), or are in **cuneiform writing**, impressed with a pointed stylus in a flat tablet of unbaked clay. The word manuscript derives from the **Medieval Latin** manuscriptum, a word first recorded in 1594 as a latinisation of earlier **Germanic** words used in the **Middle Ages**: compare **Middle High German** hantschrift (c. 1450), **Old Norse** handrit (bef. 1300), **Old English** handgewrit (bef. 1150), all meaning "manuscript", literally, "handwritten".
- In **publishing** and academic contexts (السياقات), prior to submission for publication an article is called a "**manuscript**" is the text submitted to the publisher or printer in preparation for publication, usually as a typescript prepared on a **typewriter**, or today, a printout from a **PC**, prepared in **manuscript format**:
 1. **Title page/running title**
 2. **Abstract:**
 3. **Introduction:**
 4. **Method:** (Subjects, animals, microorganism, equipment, apparatus, chemicals, reagents and procedures)
 5. **Results:**
 6. **Discussion:**
 7. **References**
 8. **Appendices:**
 9. **Footnotes & author notes**
 10. **Tables**
 11. **Figure captions/legends**
 12. **Figures**

- **After publication most articles (tidy, Clear and well organized) will have:**
 1. **Titles:** (Informative-Concise; no extra words-Focus: all key words included)-this is what appear in database.
 2. **Abstract/Summary:** the abstract should be briefly describe the study and its findings, permitting readers to ascertain what the article is about so as to decide whether it is of interest and should be read more carefully. It should include all elements of the research report. (*Its appears in database of journal, more than one format, appear first but written last*)-(Key words)-informative, concise, focus.
 3. **Introduction:** (state your rationale for the study); states the research question and discussion prior research with the direct relevance to his work, not a review. Define the gaps, not too long or too short. It ends usually with statement about the research question, objectives, and aims. References should cited nicely like Smith (1980) stated and or in a previous report (Smith 1980) stated. Hypothesis, question, and statement should follow smoothly. Provide evidence and convince the readers that your work is important. (the use of subtitles is recommended to ease understanding of paragraphs) – (Explanation should be very well) – 2nd paragraph should be intended half inch
 4. **Materials & Methods:** describes exactly how research was performed/carried out. All physical aspects of the study to be described in detail. Should have enough information. Sometimes it's a reference to the method details). It should allow the reader to replicate the work. (Subjects/participants involved in the study, chemicals, reagents in details including their sources, solutions and their concentration and way of preparations. Equipments and procedures (steps involved)
 5. **Results:** tell what was found, statistical tests description used. Descriptive data should be used. Figures and tables are presented with clear numbering way. (P-value, % significant)

6. **Discussion/Conclusion:** Interpretation of data and results. Start usual with brief non-technical summary of the results. What authors believe about the results obtained? Then to related the results from his study or previous study (focus logic is used). Describe any weakness in the study and way to overcome on them. How to test hypothesis adequately?.Future direction should be highlighted.
 7. **References:** each reference mentioned in his article should be included into this section and via versa. Uniform style should be adopted.
- **Some guidelines that may be applicable to most manuscripts include:**
 1. One inch margins (all sides)
 2. **Double spaced text**
 3. A single, clear, **12-point** typeface
 4. **No extra space** between paragraphs
 5. An indented first line for each paragraph (half inch)
 6. Information identifying the **author** and **title** of the manuscript on every page
 7. **Page numbers**

There are several reasons for these requirements.

- Manuscripts are not defined by their contents, which may combine writing with mathematical calculations, maps, explanatory figures or illustrations. Manuscripts may be in **book** form, **scrolls** or in **codex** format. **Illuminated manuscripts** are enriched with pictures, border decorations, elaborately engrossed initial letters or full-page illustrations.
- **Research synthesis:** a process in which previous facts and findings are analyzed, sifted, classified, simplified and synthesized to draw conclusions. (papers related to snake)
- **Research synthesis:** systematic and un-systematic
- **Research synthesis:** Identification of **primary sources** (actual studies that are published in professional journals concerning the topic), identification of **secondary sources** (review, periodical review, and bibliography), overcoming **selection bias** (Does I included all papers related to your subject from Pubmid for example), and **focusing on literature** search.

- **Fugitive literature:** reports of the research not published in professionally recognized journals. Could be used as primary sources like e.g. dissertation, theses and course paper, paper presentations, technical report, Interim report, rejected manuscripts, and uncompleted research manuscripts reports.
- Publications now govern by guidelines determined by each journals independently
- **Features of Scientific Writings:**
 - Well straightforward structure
 - Logic, clarity, precession (السبق)
 - Interesting topic
 - Well writing, simple, short sentences and paragraphs , direct, and specific
 - Well presented graphics
 - Well told story
 - Language richness, concrete language
 - Use active voice rather than passive voice in the sentence
 - Precise, familiar, and short words
 - Avoid abbreviation
 - Write nouns and verbs not adjectives and adverbs
- **George Orwell's rule:**
 - Never use a long word where a short one would do
 - If it is possible to cut a word do so
 - Never use the passive when you can use the active
 - Never use foreign phrases use simple words
 - Break any of these rules rather than say something barbarous
- **Paragraph (كل فقرة فكرة) :** is the unit of information. Has 1 idea. Compose of :
 - **Beginning:** should give idea about the whole paragraph
 - **Middle:** development of argument, repeat the key words, keep parallel ideas parallels, use linking words to link argument and ideas,
 - **End:** conclude the paragraph and should link you know to next paragraph
- **Linking words:** because, moreover, firstly, secondly, thirdly, however, indeed, despite, for example, therefore, but, especially, nevertheless, furthermore, and although.

- Primary source of information: Journals, thesis, and dissertation.
- Secondary source of information: review journals, and periodical reviews

Characteristics	Induction logic	Deduction logic
Principle of Operation	Remain close to empirical data	Uses rational thoughts to initiate
Theory development	Theory is developed last	Theory develop first
Data Collection nature	Data are collected first	Data collected at the end
Movement "way"	Specific to general	General to specific
Testing	Theory is formed in systematic fashion	To see if the results of testing is upholding the theory purposed
Assumption	"The theory is correct" or valid due to empirical evidence	The <u>validity</u> of theory is increase after testing or falsification
Conclusion	Research question to ask	Good for making statement or deduction, prediction or hypothesis testing
Bias on researcher	No Bias	Researcher may be biased to prove their theory right
E.g.	DUNUM LLC	HD-Method by Karl popper

- The essence of experimentation is control.
- True experiments should always have: control condition, random selection of individual sample from population, and equal treatment of both groups (experimental and control) = assignment.
- **Polit testing:** done on small group which helps in modifying and simplifying the questions, which increase internal validity.
- Simple but not simpler ?

