Course: Educational Research (837)
Semester: Spring, 2022

Assignment No. 01

Q.1 Write a detailed note on scientific method.

The scientific method is an empirical method of acquiring knowledge that has characterized the development of science since at least the 17th century (with notable practitioners in previous centuries). It involves careful observation, applying rigorous skepticism about what is observed, given that cognitive assumptions can distort how one interprets the observation. It involves formulating hypotheses, via induction, based on such observations; experimental and measurement-based testing of deductions drawn from the hypotheses; and refinement (or elimination) of the hypotheses based on the experimental findings. These are principles of the scientific method, as distinguished from a definitive series of steps applicable to all scientific enterprises.[1][2][3]

Although procedures vary from one field of inquiry to another, the underlying process is frequently the same from one field to another. The process in the scientific method involves making conjectures (hypothetical explanations), deriving predictions from the hypotheses as logical consequences, and then carrying out experiments or empirical observations based on those predictions.[a][4] A hypothesis is a conjecture, based on knowledge obtained while seeking answers to the question. The hypothesis might be very specific, or it might be broad. Scientists then test hypotheses by conducting experiments or studies. A scientific hypothesis must be falsifiable, implying that it is possible to identify a possible outcome of an experiment or observation that conflicts with predictions deduced from the hypothesis; otherwise, the hypothesis cannot be meaningfully tested.[5]

The purpose of an experiment is to determine whether observations agree with or conflict with the expectations deduced from a hypothesis. Experiments can take place anywhere from a garage to a remote mountaintop to CERN's Large Hadron Collider. There are difficulties in a formulaic statement of method, however. Though the scientific method is often presented as a fixed sequence of steps, it represents rather a set of general principles.[7] Not all steps take place in every scientific inquiry (nor to the same degree), and they are not always in the same order.

The ubiquitous element in the scientific method is empiricism. This is in opposition to stringent forms of rationalism: the scientific method embodies the position that reason alone cannot solve a particular scientific problem. A strong formulation of the scientific method is not always aligned with a form of empiricism in which the empirical data is put forward in the form of experience or other abstracted forms of knowledge; in current scientific practice, however, the use of scientific modelling and reliance on abstract typologies and theories is normally accepted. The scientific method counters claims that revelation, political or religious dogma, appeals to tradition, commonly held beliefs, common sense, or currently held theories pose the only possible means of demonstrating truth. There are different ways of outlining the basic method used for scientific inquiry. The scientific community and philosophers of science generally agree on the following classification of method components. These methodological elements and organization of procedures tend to be more characteristic of experimental sciences than social sciences. Nonetheless, the cycle of formulating hypotheses, testing and analyzing the results, and formulating new hypotheses, will resemble the cycle described below.

The scientific method is an iterative, cyclical process through which information is continually revised. It is generally recognized to develop advances in knowledge through the following elements, in varying combinations or contributions:

- Characterizations (observations, definitions, and measurements of the subject of inquiry)
- Hypotheses (theoretical, hypothetical explanations of observations and measurements of the subject)
- Predictions (inductive and deductive reasoning from the hypothesis or theory)
- Experiments (tests of all of the above)

Each element of the scientific method is subject to peer review for possible mistakes. These activities do not describe all that scientists do but apply mostly to experimental sciences (e.g., physics, chemistry, biology, and psychology). The elements above are often taught in the educational system as "the scientific method"

The scientific method is not a single recipe: it requires intelligence, imagination, and creativity. In this sense, it is not a mindless set of standards and procedures to follow, but is rather an ongoing cycle, constantly developing more useful, accurate, and comprehensive models and methods. For example, when Einstein developed the Special and General Theories of Relativity, he did not in any way refute or discount Newton's Principia. On the contrary, if the astronomically massive, the feather-light, and the extremely fast are removed from Einstein's theories – all phenomena Newton could not have observed – Newton's equations are what remain. Einstein's theories are expansions and refinements of Newton's theories and, thus, increase confidence in Newton's work.

An iterative, pragmatic scheme of the four points above is sometimes offered as a guideline for proceeding:

- Define a question
- Gather information and resources (observe)
- Form an explanatory hypothesis
- Test the hypothesis by performing an experiment and collecting data in a reproducible manner
- Analyze the data
- Interpret the data and draw conclusions that serve as a starting point for a new hypothesis
- Publish results
- Retest (frequently done by other scientists)

The iterative cycle inherent in this step-by-step method goes from point 3 to 6 back to 3 again.

The scientific method depends upon increasingly sophisticated characterizations of the subjects of investigation. (The subjects can also be called unsolved problems or the unknowns.)[A] For example, Benjamin Franklin conjectured, correctly, that St. Elmo's fire was electrical in nature, but it has taken a long series of experiments and theoretical changes to establish this. While seeking the pertinent properties of the subjects, careful thought may also entail some definitions and observations; the observations often demand careful measurements and/or counting.

The systematic, careful collection of measurements or counts of relevant quantities is often the critical difference between pseudo-sciences, such as alchemy, and science, such as chemistry or biology. Scientific measurements are usually tabulated, graphed, or mapped, and statistical manipulations, such as correlation and regression, performed on them. The measurements might be made in a controlled setting, such as a laboratory, or made on more or less inaccessible or unmanipulatable objects such as stars or human populations.

The measurements often require specialized scientific instruments such as thermometers, spectroscopes, particle accelerators, or voltmeters, and the progress of a scientific field is usually intimately tied to their invention and improvement.

Measurements in scientific work are also usually accompanied by estimates of their uncertainty. The uncertainty is often estimated by making repeated measurements of the desired quantity. Uncertainties may also be calculated by consideration of the uncertainties of the individual underlying quantities used. Counts of things, such as the number of people in a nation at a particular time, may also have an uncertainty due to data collection limitations. Or counts may represent a sample of desired quantities, with an uncertainty that depends upon the sampling method used and the number of samples taken.

Q.2 Discuss the main characteristics of Scientifics research in detail.

The nine main characteristics of science are the following: Objectivity, verifiable, ethical neutrality, systematic exploration, reliability, precision, abstraction and predictability.

Objectivity

Scientific knowledge is objective. Simple objectivity means the ability to see and accept facts as they are, not as one might wish they were. To be objective, one has to protect oneself against one's own prejudices, beliefs, desires, values and preferences. Objectivity requires that one should set aside all kinds of subjective considerations and prejudices. If you are afraid that your work will not be objective enough, then you can ask us to "**write my essays**" or order proofreading.

Verifiable

Science rests on sensory data, that is, data collected through our senses: eye, ear, nose, tongue and touch. Scientific knowledge is based on verifiable evidence (concrete objective observations) so that other observers can observe, weigh or measure the same phenomena and verify the observation to verify its accuracy.

Is there a god? Is the Varna system ethical or the questions related to the existence of the soul, heaven or hell are not scientific questions because they can not be treated objectively? The evidence regarding its existence can not be gathered through our senses. Science has no answers for everything. Deal only with those questions about which verifiable evidence can be found.

Ethical neutrality

Science is ethically neutral. It only seeks knowledge. How this knowledge will be used, is determined by the values of society. Knowledge can be used for different uses. Knowledge about atomic energy can be used to cure diseases or to wage an atomic war.

Ethical neutrality does not mean that the scientist does not have values. Here it only means that you should not allow your values to distort the design and conduct of your **research proposal**. Therefore, scientific knowledge is value-neutral or value-free.

Systematic exploration

A scientific investigation adopts a certain sequential procedure, an organized plan or a research design to collect and analyze data about the problem under study. In general, this plan includes some scientific steps: formulation of hypotheses, compilation of facts, analysis of facts (classification, coding and tabulation) and generalization and scientific prediction.

Reliable or reliable

Scientific knowledge must occur under the prescribed circumstances not once but repeatedly. It is replicable in the indicated circumstances in any place and at any time. The conclusions based on casual memories are not very reliable.

Accuracy

Scientific knowledge is precise. It is not vague as some literary writings. Tennyson wrote: "Every moment a man dies; Every moment that one is born, it is good literature but not science. To be a good science, it should be written as: "In India, according to the 2001 census, every tenth, on average, a man dies; every fourth second, on average, a baby is born «. Accuracy requires giving the exact number or measure. Instead of saying "most people are against marriages for love," says a scientific researcher, "ninety percent of people are against marriages for love."

Accuracy

Scientific knowledge is precise. A doctor, like a common man, will not say that the patient has a mild temperature or that he has a very high temperature, but after measuring with the help of the thermometer, he will declare that the patient has a temperature of 101.2 F.

Precision simply means truth or correction of a statement or description of things with exact words as they are without jumping to unjustified conclusions. Every **essay helper** on our team always works by this rule.

Abstraction

Science proceeds on a plane of abstraction. A general scientific principle is highly abstract. He is not interested in giving a realistic image.

Predictability

Scientists not only describe the phenomena that are studied, but also try to explain and predict. It is typical of the social sciences that have a much lower predictability compared to the natural sciences. The most obvious reasons are the complexity of the subject and the insufficiency in the control, etc

Q.3 In which areas, educational research should be done in Pakistan? Discuss in detail.

A research area is what a research topic is placed into, but is much broader than the scope of the topic. For example a research area can be human physiology, computer science (as you mentioned) or even relate to a specific field within these broader terms such as cardiac electrophysiology or machine learning respectively.

A research topic would be a specific question, hypothesis or problem you wish to investigate and answer which is under the scope of your research area. That is to say, my research area is in neuroscience/neurophysiology and my research topic is investigating the mechanisms of neuronal communication, as an example.

Educational research is a type of systematic investigation that applies empirical methods to solving challenges in education. It adopts rigorous and well-defined scientific processes in order to gather and analyze data for problem-solving and knowledge advancement.

J. W. Best defines educational research as that activity that is directed towards the development of a science of behavior in educational situations. The ultimate aim of such a science is to provide knowledge that will permit the educator to achieve his goals through the most effective methods.

The primary purpose of educational research is to expand the existing body of knowledge by providing solutions to different problems in pedagogy while improving teaching and learning practices. While educational research can take numerous forms and approaches, several characteristics define its process and approach. Some of them are listed below:

- It sets out to solve a specific problem.
- Educational research adopts primary and secondary research methods in its data collection process. This means that in educational research, the investigator relies on first-hand sources of information and secondary data to arrive at a suitable conclusion.
- Educational research relies on empirical evidence. This results from its largely scientific approach.
- Educational research is objective and accurate because it measures verifiable information.
- In educational research, the researcher adopts specific methodologies, detailed procedures, and analysis to arrive at the most objective responses.
- Scientists from a wide variety of fields come to the ALS to perform experiments. Listed below are some of the most common research areas covered by ALS beamlines. Below each heading are a few examples of the specific types of topics included in that category. Click on a heading to learn more about that research area at the ALS.

Applied Sciences

Optics, extreme ultraviolet (EUV) lithography, metrology, instrumentation, detectors, new synchrotron techniques.

Biological Sciences

General biology, structural biology.

Chemical Sciences

Surfaces/interfaces, catalysts, chemical dynamics (gas-phase chemistry), crystallography, physical chemistry.

Earth & Environmental Sciences

Earth and planetary science, bioremediation, climate change, water chemistry.

Energy Sciences

Photovoltaics, photosynthesis, biofuels, energy storage, combustion, catalysis, carbon capture/sequestration.

Materials Sciences

Correlated materials, nanomaterials, magnetism, polymers, semiconductors, water, advanced materials.

Physical Sciences

Atomic, molecular, and optical (AMO) physics; accelerator physics.

Q.4 Write a detailed note on applied research.

Applied research is a type of research design that seeks to solve a specific problem or provide innovative solutions to issues affecting an individual, group or society. It is often referred to as a scientific method of inquiry or contractual research because it involves the practical application of scientific methods to everyday problems.

When conducting applied research, the researcher takes extra care to identify a problem, develop a research hypothesis and goes ahead to test these hypotheses via an experiment. In many cases, this research approach employs empirical methods in order to solve practical problems.

Applied research is sometimes considered to be a non-systematic inquiry because of its direct approach in seeking a solution to a problem. It is typically a follow-up research design that further investigates the findings of pure or basic research in order to validate these findings and apply them to create innovative solutions.

Types of Applied Research

There are 3 types of applied research. These are evaluation research, research and development, and action research.

Evaluation Research

Evaluation research is a type of applied research that analyses existing information about a research subject to arrive at objective research outcomes or reach informed decisions. This type of applied research is mostly applied in business contexts, for example, an organisation may adopt evaluation research to determine how to cut down overhead costs.

Research and Development

Research and development is a type of applied research that is focused on developing new products and services based on the needs of target markets. It focuses on gathering information about marketing needs and finding ways to improve on an existing product or create new products that satisfy the identified needs.

Action Research

Action research is a type of applied research that is set on providing practical solutions to specific business problems by pointing the business in the right directions. Typically, action research is a process of reflective inquiry that is limited to specific contexts and situational in nature.

Applied research is used in business to build knowledge and develop product solutions. It enables organisations to identify the peculiar needs of target markets and this would help them to create different business strategies that would allow them to satisfy these needs.

In addition, conducting contractual research would help business owners to get insightful feedback on product gaps that may have, otherwise, been ignored. This is a great way to get first-hand information on target market reactions which can inform brand decisions.

Applied research also helps employers of labour to identify and address the productivity needs of their workforce. For instance, an organization may carry out applied research in order to measure the effectiveness of its recruitment practices or of its organisational structure.

In education, applied research is used to test pedagogic processes in order to discover the best teaching and learning methods. It is also used to test educational policies before implementation and to address different issues associated with teaching paradigms and classroom dynamics for a better learning experience.

Educational applied research attempts solving a problem by gathering data from primary sources using a combination of qualitative and quantitative data collection methods. This data serves as empirical evidence which is then subjected to rigorous analysis and description in order to arrive at valid conclusions.

The goal of this research methodology is to determine the applicability of educational theory and principles by way of subjecting hypotheses to experimentation within specific settings. Applied research in education is also more utilitarian as it gathers practical evidence that can inform pragmatic solutions to problems.

Q.5 Write in detail the type of research that inspires you the most and why?

Inspiration is a motivational state that compels individuals to bring ideas into fruition. Creators have long argued that inspiration is important to the creative process, but until recently, scientists have not investigated this claim. In this article, we review challenges to the study of creative inspiration, as well as solutions to these challenges afforded by theoretical and empirical work on inspiration over the past decade. First, we discuss the problem of definitional ambiguity, which has been addressed through an integrative process of construct conceptualization. Second, we discuss the challenge of how to operationalize inspiration. This challenge has been overcome by the development and validation of the Inspiration Scale (IS), which may be used to assess trait or state inspiration. Third, we address ambiguity regarding how inspiration differs from related concepts (creativity, insight, positive affect) by discussing discriminant validity. Next, we discuss the preconception that inspiration is less important than "perspiration" (effort), and we review empirical evidence that inspiration and effort both play important—but different—roles in the creative process. Finally, with many challenges overcome, we argue that the foundation is now set for a new generation of research focused on neural underpinnings. We discuss potential challenges to and opportunities for the neuroscientific study of inspiration. A better understanding of the biological basis of inspiration will illuminate the process through which creative ideas "fire the soul," such that individuals are compelled to transform ideas into products and solutions that may benefit Describing his creative process, Mozart observed, "Those ideas that please me I retain in memory, and am accustomed, as I have been told, to hum them to myself. If I continue in this way," he writes, "it soon occurs to me how I may turn this or that morsel to account so as to make a good dish of it… All this fires my soul" (Harding, 1948). Mozart's depiction of inspiration possesses all of the core elements of the modern scientific inspiration construct—appreciation of new or better possibilities ("ideas that please me"), passive evocation ("it…occurs to me"), and motivation to bring the new possibilities into fruition (turning a morsel into a dish; "fires my soul"). Like Mozart, writers, artists, and other creators commonly emphasize the importance of inspiration in the creative process (Harding, 1948). Despite this, until recently, scientists have given little attention to inspiration.

Perhaps it is not surprising that inspiration has received little attention within the scientific community, given the numerous challenges that the inspiration concept has presented. Among these challenges have been (a) a lack of clarity about the meaning of inspiration; (b) difficulty of operationalization; (c) ambiguity about whether inspiration is distinct from related constructs; (d) preconceptions that inspiration is unimportant relative to "perspiration," and (e) a variety of barriers to neuroscientific investigation. The overarching goal of this article is to address each of these challenges and to point to opportunities for expanding upon the emerging scientific literature on inspiration. We address the first challenge, ambiguity of definition, in the next section.

Inspiration may be conceptualized not only in terms of the characteristics of the inspired state, but also in terms of the temporally and functionally distinct processes that compose an episode of inspiration. Thrash and Elliot (2004) argued that inspiration involves two distinct processes—a relatively passive process that they called being inspired by, and a relatively active process that they called being inspired to. The process of being inspired by involves appreciation of the perceived intrinsic value of a stimulus object, whereas the process of being inspired to involves motivation to actualize or extend the valued qualities to a new object. For example, one might be inspired by a breathtaking sunrise, or by the elegance of a new idea that arrives during an insight or "aha" moment. Thereafter one might be inspired to paint or undertake a new research project. The individual can, at any time, look to (or recall) the evoking stimulus for motivational sustenance. Thrash and Elliot (2004) further proposed that the process of being inspired by gives rise to the core characteristics of evocation and transcendence, whereas the process of being inspired to gives rise to the core characteristic of approach motivation.

These component processes are posited to be present across diverse manifestations of inspiration. Thrash and Elliot (2004) asked participants to produce narratives recalling either a time when they were inspired or a baseline experience (control condition). The inspiration narratives spanned topics such as becoming animated by a scientific or artistic insight, discovering one's calling, being influenced by a role model to succeed or live virtuously, and realizing that greatness is possible in response to an unexpected success. Despite superficial differences in narrative content, the inspiration narratives shared the underlying themes of having one's eyes opened during an encounter with a person, object, event, or idea (i.e., being inspired "by"), and wishing to express or actualize one's new vision.

The general inspiration construct as conceptualized above may be applied straightforwardly to the specific domain of creative activity. From the perspective of the tripartite conceptualization, the general characteristic of transcendence takes the form of creativity—the new or better possibilities are appreciated specifically for their creative potential. Regarding the component process conceptualization, the process of being inspired by is prompted by the emergence of creative ideas in consciousness, often during a moment of insight. Under optimal conditions (e.g., if the idea is actionable, and the person has the capacity for approach motivation), the process of being inspired by gives way to the process of being inspired to, which motivates action. Regarding the transmission model, creative inspiration often takes a specific form of transmission called actualization (Thrash et al., 2010b), in which one is inspired to bring a creative idea into fruition (i.e., the desirable features of the elicitor are transmitted from a seminal idea to a completed product).

We emphasize that, according to our conceptualization, inspiration is not posited to be the source of creative ideas. Instead, inspiration is a motivational response to creative ideas. Thus inspiration explains the transmission, not the origin, of creativity. This distinction is critical for at least three reasons. First, claiming that creativity comes from inspiration would not aid scientific understanding, much as attributing creativity to a "muse" would be an exercise in labeling a mysterious cause, not a scientific explanation. Second, scientists have already developed a variety of scientific constructs and theories to explain the origins of creative ideas, which include situational, dispositional, self-regulatory, cognitive, historical, and neurological processes