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The application of theories in geography

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Abstract
Relevance of theories in research endeavours in any field cannot be over emphasized because a theory is contemplative and rational type or generalizing thinking or the results of such thinking. A theory is constructed on the basis of several extensively tested hypotheses. Theories represent truly broad general principles- unifying concepts that tie together the laws that govern nature. This paper examines the application of theories in geography and observed that geography as a scientific discipline makes use of both inductive theories and deductive theories, though, since the methodological changes of geography, geographers have not been able to produce sufficient theories or laws own their own and that most theories used in geography presently are from the disciplines of Biology, Chemistry, Physics and Mathematics. The paper revealed that the major roles of theories in geographic research include orientation, conceptualization and classification, summarizing, predicting of facts and pointing gaps in knowledge. The paper concludes by noting that the emergence of geographical theories therefore, is a step taken to increase one level of understanding and comprehension of the objective environment and of the way humanity interact with and changes those environments.

Keywords: Theory, geography, applications, research

Introduction

Geography as a scientific discipline makes use of theories, models and systems analysis in carrying out research. A theory is simply a universal laid codification of experiences about a phenomenon (Ododo, 2014) [16]. Model on other hand is "a simplified structuring of a reality which presents supposedly significant features or relationship in a generalized form (Chorley & Hagget, 1967). A system is a functioning whole with various sub-systems interlinked with each other (Rana, n.d). While these three variables are relevant and important in geographical studies and research, the emphasis on this paper is on theory and its application in geography.

Geography is concerned with the analysis, interpretation and description of earth surface. That gives room for theoretical explanation. Thus the quest for an explanation is quest for a theory. The development of theory is at the heart of all explanations, and most writers in doubt of observation or description can be a theory -free (Rana, n.d). Theories represent generalizations used for explanations in all fields of study. They can make precise predictions. In geography, the quantitative techniques can be used effectively, if they are supported by carefully constructed theories. According to (Rana, n.d.) theories prove that there is "some hidden order within chaos' and the geographers' task is to search for the order (rule or cure). This order is basically arrived in two ways, namely, empirically inductive and theoretically deductive. As a scientific discipline, the process of scientific inquiry follows a pattern to arrive at a theory and this order is in this format: observation, guess, hypothesis, principle, theory and law.

Theory is usually used to explain certain conditions and events in society. According to Stewart & Klein (2016), a theory is a comprehensive explanation of some aspects of nature that is supported by a body of evidence. On the hand Rana (n.d) defined theory as "system of ideas explaining something" or "a system of ideas based on a general principles independent of the facts or phenomena to be explained" or "scientific statement or a group of scientific statements". Theories guide the enterprise of finding facts rather than of reaching goals, and are neutral concerning alternatives among values (McMurray, 1955). Theories are explanations of a natural or social behaviours, event, or phenomenon.

According to Thomas (2007), a theory can be a body of knowledge, which may or may not be associated with particular explanatory models. Thomas equally noted that to theorize is to develop this body of knowledge. It can be viewed as a collaboration between agreeing thought that has been even developed overtime. Its-location in the earth or natural sciences makes it to adopt the scientific method in the course of investigation of a problem, otherwise a research. The scientific method is simply the application of common sense in an organized and objective way. A scientist observes, makes a general statement to summarize the observation, formulates a hypothesis and develops a theory and governing scientific laws. According to Christopherson (2004), Sir Isaac Newton (1642-1727) developed this method of discovering the pattern of nature, although the term scientific was applied later.

Classical or empirical science issues from Francis Bacon in the sixteenth century, 'for whom the scientific knowledge is certain because it is based on observation, experience and measurement. The experience provided by observation and experimentation is what distinguishes science from other sources of knowledge. Because geography is a science of multiple approaches, being at the crossroad of various sciences, it takes methods from many other associated fields. For on one side, it is located amongst the Physical or Natural Sciences, from Geology to Meteorology and Biology, and on the other side, amongst the Social Sciences, from History to Economics and Sociology.

Different methodological positions exist within geographical work, mainly related to the two main branches

of geography, physical and human. While in physical geography the scientific rationale method used in natural sciences is the dominant one,' in human geography the historical, descriptive approach has been traditionally more common. This makes of geography scientific field based on both inductive and deductive principles and nomothetic explanation. It is for this reason that geographers are continually discussing about the objectives, methods and unity of geography. However, the unity cannot be methodological because it uses the methods of both natural and social sciences. This variability of orientation makes it a science very sensible to conjectural issues in relation to the need of global knowledge inherent to social workers (Bello, 2018) [1].

Geography is one of the major subjects of study in the field of human endeavour. It is one of the oldest disciplines of study that its root dates back in the works of early Greek philosophers and scholars such as Plato, Aristotle, Strabo, Ptolemy, Eratosthenes, amongst others. The word geography comes from two Greek words; geo which means earth and graphia which means to write or describe. So the word geography simply means 'describing the earth. It is the study of the earth's landscape, its people, its environment and places. Geography is the systematic study of the spatial patterns of all phenomena on or near the earth's surface. It is also considered largely as a subject that studies the interactions of all physical and human phenomena and "landscapes created by such interactions.

Geography is important because it helps us to understand the world around us and the people who live in it. In travelling overseas, geography is useful because it helps people to know where other countries are, how far away they are from their own home country, and in what ways they differ from others. For most of human history, people did not know that the earth was round or where all the places on the earth were but through geography that have been uncovered. Thus, it was not until the nineteenth century that every place on earth was accurately mapped because one-of the most important tools of geographers is map.

As a scientific discipline that employs scientific approach in the description of the earth's surface, theory is indispensable. In this paper, attempts will be made to investigate the uses of theories in geography and geographic research. These theories help geographers to have a better perspective of events occurring in the surface of the earth.

Conceptual Clarifications

Concept of Geography

The concept of geography underscores what is geography as a scientific discipline including its meaning, nature, scope, branches and importance. Generally, geography is regarded as the study of places, people and the natural, and built up environments they occupy. It is all about earth's surface description, analysis and interpretation. According to the American Heritage Dictionary of the English Language (2005), geography is a field of science devoted to the study of the lands, features, inhabitants, and phenomena of the earth and planets. The word geography comes from two Greek words: geo which means earth and graphia which means to write or describe. So the word geography roughly means describing the earth. It is the study of the earth's landscape, its people, its environment and places According to Wikipedia, the free encyclopedia, the first person to use the word geography was Eratosthenes (270-194BC). Geography is an all-encompassing discipline that seeks an understanding of earth and its human and natural complexities-not merely where objects are but also how they have changed and come to be.

Geography is often defined in terms of two branches which are human geography and physical geography. Human geography deals with the study of people and their communities, cultures, economics and interactions with the environment by studying their relations with and across space and place (Johnson, 2000) [10]. Physical geography on the other hand deals with the study of processes and patterns in the natural environment like atmosphere, hydrosphere, biosphere and geosphere. According to Puttison (1990), the four traditions in the geographical research are spatial analysis, of natural and the human phenomena, area studies of places and regions, studies of human –land relationships, and the earth sciences. On earth science tradition, geography sees the earth as home to humans, looks at the natural or physical world' studies process, cycles, patterns and systems that alter the physical world; make field observations and analyses them; and investigate soil fertility, climate change and river dynamics. On area studies tradition, geography studies region, physical regions like desert; cultural areas like the Middle East, Latin America; South East Asia, and etcetera and when most people think of a geography class, this is why what they think of. On spatial tradition, geography looks at spatial analysis, data centred, location, maps and others. On Human-Environment Tradition geography examines the relationship between humans and their environment; and as well as human impact on nature.

As a result of its broad nature, geography has been called *"the world discipline*" and the bridge between human and the physical sciences (Bonnet, 2003 and Dorm, 1991) [2]. As a world discipline, it cut across several areas of study such as geology (Geomorphology), Meteorology (Climatology), Hydrology (Oceanography), Pedology (Soil Geography) Environmental Science (Environmental /Integrated Geography), Astronomy (Astronomical Geography), Surveying (Geodesy), Biology (Biogeography), Statistics (Quantitative Techniques in Geography), Economics (Economic Geography), Demography (Population Geography & Settlement), Political Science (Political Geography and Geopolitics), Sociology (Social Geography), Anthropology (Cultural Geography), Sociology (Social Geography) and Anthropology (Historical Geography).

Concept of Theory

A theory is a universal law of codification of experiences about a phenomenon. (Ododo, 2014) [16]. This is most realistic in the physical sciences. A theory is a creation of human mind made up of system of statements. A scientific theory is a set of sentences expressed in terms of specific vocabulary. It could be a primitive, axiomatic statement or a derivative sentence or theorems. The basic aim of theory development or building is to correct ideas or laws to develop coherent model, which will explain geographical patterns and processes. Unfortunately, however, geography has not yet got such universal laws or theories. The empirical laws, particularly in physics are statements of simple expressed in mathematical terms that can be demonstrated time and time again, for example, Albert Estienne theory of relativity.

In modem science, the term 'theory' refers to scientific theories, a well-confirmed type of explanation of nature, made in a way consistent with specific method and fulfilling the criteria required by modern science. Such theories are described in such a way that scientific tests should be able to provide empirical support for, or empirically (contradict 'falsify') it. Scientific theories are the most reliable rigorous and comprehensive form of scientific knowledge (Schafersman, n.d.). This is contrast to more comrqon uses of the word "theory" that imply that something is unproven or speculative (which is formal terms is better characterized by the word "hypothesis" (NAS, IOM, 2008). Scientific theories are distinguished from hypotheses, which are individual empirically testable conjectures, and from scientific laws, which are descriptive accounts of the way nature behaves under certain conditions.

According to Ododo (n.d.), McMurray (1955), and Wacker (1998) [25] the following include the functions of theories:

1. Theories help us to predict relationships between variables, which imply that we can control what happens to one variable by regulating another variable.
2. Theories help summarize large amount of data instead of having to know hundreds of pieces of data about the cause of an event.
3. Theories help in making generalizations of concepts and relationships to many Phenomena and summarize knowledge in particular area. (Theories represent generalizations used for explanations).
4. Theories help us understand how and why already observe regularities occur
5. Theories help to generate additional research areas by suggesting new relationships.
6. Theories guide the enterprise of finding facts rather than of reaching goals, and are neutral concerning alternatives among values.
7. Theories provide a framework for analysis
8. Theories provides an efficient method for field observation; and so on.

Key Features of a Good Theory

According to Wacker (1998) [25], the followings constitute the virtues and key features of a good theory

1. **Uniqueness:** That is, being distinguishable from others;
2. **Conservatism:** A theory persists until a superior theory replaces it;
3. **Generalizability:** The greater the area a theory can be applied to, the more powerful it is
4. **Fecundity:** A theory that is more fertile in generating new models and hypotheses is better than one that generates fewer;
5. **Parsimony:** Other things being equal, the fewer the assumptions the better;
6. **Internal consistency:** A theory that has identified all the relationships on the basis of which adequate explanations are rendered;
7. **Empirical riskiness:** Any empirical test of a theory should be risky; refutation must be possible for a good theory; and
8. **Abstraction:** The theory is independent of time and space, usually achieved by adding more relationships.

Types of Theories in Geographic Studies

Theories can be categorically classified into two types depending on the logic behind their formulations. They include

1. Inductive Theories: These set of theories are formulated from particular instance to general principles. In inductive reasoning, geographers use specific instances or occurrences to draw conclusions about entire classes of objects or events" (De Vos *et al.,* 2005: in Imenda, 2014) [9]. In this approach, one starts from observed data and develops a generalization which explains the relationship between the objects observed. The inductive theory is, therefore, a means by which general principles are developed from specific observations. It forms the basis upon which the Conceptual framework is built (Liehr and Smith, 1999).

2. Deductive Theories: Deduction moves from the general laws to a specific case scenario. "It moves from a pattern that might be logically or theoretically expected to observations that test whether the expected pattern actually occurs" (De Vos *et al.,* 2005: in Imenda, (2014) [9]. Thus a researcher following a deductive approach starts by specifying the theory guiding the study - in the process, citing the main points emphasized in the theory, and illustrating how the main aspects of the theory relate to the research problem (Imenda, 2014) [9], Deductive theories are, therefore, means by which specific expectations of hypotheses are developed on the bases of general principles or laws.

Geographic Laws and its Relationship with Theories

Onokerhoraye (1994) [17] noted that a number of human geographers such as Bunge, Haggett and Harvey have pioneered the argument that laws can be conceived and applied in human geography as most of the existing laws used in physical geography are from disciplines like Physics, Chemistry and Biology. By implication, Taws' are simply universal generalization of classes of facts hence, they are discovered and not created and are used in the explanation of phenomena. In general, laws are derived from theories on the basis of data gathered. In other words, theory may be defined as embodiments of systematic laws and facts that are used in structuring the problems under investigation. From the arguments presented above; we can conclude that a theory is the building block upon which geographic researches are conducted. That building block must have a framework in research execution. Then what is a theoretical framework?

Theoretical Framework

Imenda (2014) [9] defined a theoretical framework "as the application of a theory, or a set of concepts drawn from one and the same theory, to offer an explanation of an event, or shed some light on a particular phenomenon or research problem". In theoretical framework, the defining characteristic of a scientific theory is that it makes falsifiable or testable predictions - the relevance and specificity of which determine how potentially useful the theory is. Accordingly, a purported theory that makes no predictions which can be studied or systematically followed through is of no use (Imenda, 2014) [9]. From the foregoing,

a theoretical framework of a geographic study relates to the philosophical basis on which the research takes place, and forms the link between the theoretical aspects and practical components of the investigation undertaken.

Theoretical framework plays an important role in guiding the entire process of the geographic research. It is, therefore, regarded as a structure that provides "guidance for the researcher as study questions are fine-tuned, methods for measuring variables are selected and analysis are planned" (Liehr & Smith, 1999). Without a theoretical framework, a study lacks proper direction and a basis for pursuing a fruitful review of literature, as well as interpreting and explaining the findings accruing from the investigation (Evans, 2007). Theoretical framework provides a context for examining a geographic problem, in essence, theoretical rationale for (i) developing hypotheses, (ii) a frame of reference and base for observations, and (iii) serves as a guide to systematically identify logical, precisely defined relationships among variables. Once geographic data are collected and analyzed, the theoretical framework issued as a mirror to check whether the findings agree with the framework or whether there are some discrepancies; where discrepancies exist, a question is asked as to whether or not the framework can be used to explain them (Imenda, 2014) [9]. It establishes orderly connections between observations and facts. Theoretical framework specifically helps to stimulate the direction of geographic research and the extension of knowledge. Theoretical framework is the skeleton on which the entire research body is built on.

Theories in Geography

Theories are highly utilized in geography whether in human geography or physical geography. According to Ododo (2014) [16] since the methodological changes of geography, geographers have not been able to produce sufficient theories or laws of their own. Thus most theories used in geography presently are modified from sister disciplines, especially the science subjects (physics, chemistry, biology and mathematics). The only known theory developed by a geographer is the theory of diffusion of information/innovation by Torston Huggerstrand (Ododo, 2014) [16]. Some of most commonly theories used is geographic research either in human geography or physical geography is outlined below. Whether indigenous or derivative these theories include

1. Von Thunem Theory of Rural Land Use or Agricultural Location (1926).
2. The Theory of Innovation -Diffusion by Torston Hagarstrand (1952).
3. Walter Christallar Central Place Theory (1933).
4. Burges Urban Concentric Theory of Urban Structure (1923).
5. Homer Hoyt Sector Theory (1936
6. Harris and Ullman Multiple Nuclei (Multi-centred Theory, 1945)
7. Perroux Francis Growth Pole Theory (1964).
8. Boserup's Agriculture Intensification Theory
9. Alfred Weber's Industrial Location Theory (1909)
10. Dependency theory (Industrial Economic Development Theory).
11. Halford Mackinder Heartland Theory (1904)
12. Nichols Spyman Rim Land Theory (1942).
13. Domino Theory
14. Alfred Thayer Mahan Sea Power Theory
15. Wallersteins World Systems Theory
16. Gimbutasindo-European Origin Theory
17. Refrewindo-European Origins Theory
18. Land - Rent Theory
19. General System Theory
20. Cumulation Causation Theory
21. Endogenous Growth Theory
22. Profit (Product Cycle Theory)
23. Growth Machine Theory
24. Export Case Theory
25. Flexible Specialization Theory
26. Network Theory

These theories help to put a geographic research into scientific perspective. These perspectives guide the individual researcher in terms of specific research questions, hypotheses or objectives- leading to a better directed review of literature, the selection and identification of appropriate research method and interpretation of results (Imenda, 2014) [9].

Conclusion

The subject of theory is a key to research exercise. Science has a goal and geography as a scientific discipline. To this end it helps to understand and explain the real world phenomena and reasoned that although geography is short on theories and long in facts, yet development of theory seems to be vital both to satisfactory explanations and the identification of geography as an independent field of study. To this end therefore, it is true that theory can be used to frame and understand as an infallible law independent from space and time, coming before everything else. Theory therefore in research is then a helpful tool to reality, not something reality but conforms to. Geographical theories for most the part has evolved from theories in other disciplines but it is not a simple matter to add geography into those pre-existing theories and models. The essence of geography is variation. The emergence of geographical theories therefore is a step taken to increase our level of understanding and comprehension of the objective environment and of the way humanity interact with and changes those environments.

Therefore, theory in research is then a helpful must conform to. There is need therefore for heads of department of geography in our universities and other institutions of higher learning to take the issue of theory in research endeavours seriously. Theories should be properly stated and related to the study. The lecturers and supervisors of student's theses, dissertations and projects should take the issue of theoretical framework in their studies very seriously. The students should be able to know the import of the theory used in the study and should as well be able to convince the academic community the reason(s) behind applying a particular theory or set of theories in their research work. While theory can be used to frame and understand phenomena, it cannot be understood as an infallible law independent from space and time, coming before everything else. Theory of research is then a helpful tool to interpret reality, not something reality must conform to.

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