

Replication, a Must: Verifiable and Unverifiable

In the discussion of science placing a high value on the fact that a given event can be repeated or replicated, we will look at the difference between:

- One: Verifiable and unverifiable positions
- Two: Public and private evidence
- Three: Direct and indirect evidence

The soundest strategy we have today to approach the study of a new set of events is to deal with the more simple occurrences first. In various sciences this has allowed the establishment of basic principles. This has been accomplished in the procedures of the laboratory where the attempt is made to simplify the investigation by manipulating one condition (independent variable) to observe its effect upon some other condition (dependent variable). Complications are avoided by insuring that other conditions (extraneous variables) which could act as independent variables do not influence the outcome; though, in everyday life, various independent variables may act simultaneously. The physicist did not study gravity by studying falling leaves from a tree, but studied gravity under controlled conditions. Similarly, for example, if one wished to observe, in what is called operant conditioning, the effect of the number of reinforcers (the independent variable), he would have to keep the amount of reinforcement constant.

Later in a science, be it physics or psychology, after the basic principles have been established by means of laboratory experimentation, more complex sets of interacting variables may be considered. Ultimately, after the basic principles have been verified in more complex situations, the principles and procedures developed may be applied to the solution of important practical real life problems. Eventually the practical applications may suggest to the scientist areas of needed investigation at a basic level.

This type of development appears, finally, to be taking place in the experimental study of the effect of environmental occurrences (independent variables) on behavior (dependent variables). Only in the last hundred years have we seen utilization of this strategy in psychology. In life there are complex environmental variables acting on complex behaviors. To separate these relationships and discover the basic principles, experimental psychology turned to laboratory simplification. This has meant that experimental psychology was long restricted largely to the study of simpler organisms, simpler situations, and simpler behaviors.

From these investigations; however, has emerged a set of principles which, although neither entirely complete nor without controversy, seem to form the basis of the type of development which has been described.

S.B. 19-1

Braithwaite¹ states that, in applying a related set of principles, there are several types of verification.

1) The individual principle involved may receive direct verification in an experiment. When this occurs the experimental support applies not only to the

specific principle involved, but also indirectly to the other related principles.

2) When a learning principle which has been established with lower organisms is verified with human behavior, the principle may be said to have received support.

3) In addition; however, the verification suggests also that other behaviors are learned and that other basic learning principles are also relevant to other behaviors of humans.

4) As principles are verified under the new conditions, the confidence in the principle is increased as well as the generality of the principle.

(1) Braithwaite. Scientific Explanation, Cambridge Press, 1955.

19-1 Certain statements or proposals are capable of being confirmed or rejected. If a statement cannot be confirmed or accepted, we say that it is unverifiable. The proposition that "elves dance on the head of a pin" when no one can see or in any way observe them is a/an _____ statement.

- A. verifiable
- B. unverifiable (B)

19-2 The statement that "Human beings have minds, but the mind is unobservable and its existence must be taken on basic trust," has little scientific value because the existence of a mind is:

- A. verifiable
- B. unverifiable (B)

19-3 If someone says that there is an intangible, invisible, inaudible, or unobservable being inside each of us called the true "conscience" which "tells us" what is right and what is wrong, this statement is _____.

- A. verifiable
- B. unverifiable (B)

19-4 Above all else, the aim of science is to _____.

- A. study humans as just any other animal
- B. discover new and useful information in the form of verifiable data
- C. make naturalistic observations of behavior in its natural setting
- D. understand the inner causes of behavior rather than to predict and control it. (B)

S.B. 19-2

19-5 If everything in the entire universe is expanding at a constant rate, instruments of measurement would also be expanding at the same rate; therefore, the statement, "Everything in the entire universe is expanding" is:

- A. verifiable
- B. unverifiable (B)

- 19-6 A distinction exists between verifiable in principle and verifiable in practice. By "verifiable in practice" we mean that we have the means to verify a statement. By "verifiable in principle" we mean that we may, someday, have the means even if we do not yet have them. On the Planet "X" a substance exists that can never be studied. The statement is unverifiable in _____.
- A. principle
 - B. practice
 - C. both principle and practice (C)

Science relies on publicly verifiable observation. Evidence which is private to an individual or unverifiable is of little value. Useful arguments in science results when agreement exist among observers of an event/term. This does not mean that those things we consider private (e.g. thinking, conscience, self-control, E.S.P., etc.) are not the subject matter of science, the issue is that they are studied with alternate methods, i.e. the methods of scientific inquiry.

- 19-7 Useful argument in science results only when
- A. we are dealing with theory
 - B. we move from complex to simple
 - C. all inference and speculation are eliminated
 - D. agreement among observers exists concerning facts (C,D)

PUBLIC AND PRIVATE EVIDENCE

- 19-8 We should also distinguish between public and private verification. An assertion is publicly verifiable when it can be verified by more than one person. Suppose a person says, "I see pink elephants on the wall," when no one else can see them. The observation is not an adequate verification of the existence of pink elephants, since it is not _____ evidence.
- A. private
 - B. public (B)

- 19-9 Evidence which might be obtained equally well by any of a number of observers, or evidence which two or more observers can record at the same time is called _____.
- A. introspective
 - B. private or subjective
 - C. inferred evidence
 - D. public or objective (D)

S.B. 19-3

- 19-10 If a chemist reports the results of his/her experiments, and if no one of his/her colleagues is able to observe the same results upon repeating the experiment, then this report is likely to be disallowed. This is because his/her assertions cannot be _____ verified.
- A. publicly
 - B. privately (A)

Replication

DIRECT AND INDIRECT VERIFICATION

19-11 We must distinguish between direct and indirect verification. A thing or event is directly verifiable when it can be observed, for example, the presence of a table in your room is:

- A. directly verifiable
- B. indirectly verifiable (A)

19-12 Certain things are not directly observed, but they can be indirectly observed by means of their effects. For example, an electron is too small to be observed; however, we can observe its effects, e.g., its path in a Wilson cloud chamber. Thus, it can be _____ verified.

(indirectly)

19-13 Heart rate and papillary dilation are _____ measures of behavior.

- A. non psychological dependent
- B. independent
- C. direct
- D. indirect (C)

19-14 Suppose a cumulative recorder keeps a record of the number of times an experimental subject pushes a given button. If the experimenter sees only the record and not the activity of pushing the button, he/she does not verify directly that the button was pushed, but he/she does verify this fact _____.

- A. directly
- B. indirectly (B)

19-15 An indirect measure of behavior is one that _____.

- A. describes the resulting effect from the behavior.
- B. requires instrumentation for effective measurement
- C. is derived from a theoretical position
- D. is only physiological (A)

Indicate whether each of the following has been, (A) directly, or (B) indirectly verified.

19-16 A soldier's shooting as observed by a fellow soldier. (A)

19-17 A soldier's presence as evidenced by his footprints in the snow. (B)

19-18 A soldier's performance as evidenced by historical documents. (B)
S.B. 19-4

19-19 A measurement of speech sound. (Note: Not muscle movements involved in speech) (B)

19-20 The following is/are examples of a direct measure of behavior:

- A. time taken to solve a problem
- B. score on an examination
- C. an arrow in the bull's eye of a target
- D. a student raising his hand (D)

