

## The Nature of Taxonomy

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### Article:

The Winter 1986 issue of IMAGE contained a timely and much needed critical analysis of NANDA Nursing Diagnosis Taxonomy I. In this article, Porter identifies the major problem of the NANDA Nursing Diagnosis Taxonomy I—its lack of logical consistency. However, her discussion of the problem reflects some general misunderstanding within nursing about the nature or characteristics of taxonomy and the methods that may be used to develop a taxonomy.

### The Nature of Taxonomy

A taxonomy may be natural or artificial and hierarchic or non-hierarchic. The terms 'natural' and 'artificial' refer to the nature of the taxonomic criteria by which individuals are classified. A taxonomy is *natural* when the criteria used to group or divide individuals (or entities) are based on some characteristic that is fundamental to those individuals (Phillips, 1955; Hempel, 1952). For example, rags are sorted according to the type of material from which they are made, they are sorted according to a characteristic that is fundamental to each individual and cannot be changed: they are made of wool, silk, cotton, etc. The taxonomy is *artificial* when the criteria used for grouping or dividing are based on an accidental or arbitrarily determined quality of the individuals (Phillips, 1955). A taxonomy that specifies cleanliness uses an accidental and/or arbitrarily determined criterion.

The terms *hierarchic* and *non-hierarchic* refer to the structure specified by the taxonomy. A *hierarchic taxonomy* specifies that individuals should be arranged into classes that are more and more inclusive. As these classes become more inclusive they also become more general and fewer attributes define the class (Lowery, 1981). A hierarchic taxonomy is used to classify animals and plants: they are organized into species, genus, family, order, class, phylum and kingdom. The genus contains one or more species, the family one or more genera, the order one or more families, etc. Each grouping is more general and more inclusive with fewer attributes defining the group. In contrast, a *non-hierarchic taxonomy* uses one attribute or one set of attributes to group individuals (Lowery, 1981; Jardine & Sibson, 1968). A taxonomy that organizes books by authors' last names, in alphabetical order (one attribute) or by page size, color of cover, and thickness (one *set* of attributes) is non-hierarchic.

Porter (P. 136) and others in nursing assume that a taxonomy must be hierarchically ordered. For example, Kritek (1986) seems to equate a hierarchy with taxonomic structure but the alphabetic ordering as a list. This is not the case. The first ordering of nursing diagnoses was a legitimate form of taxonomy: they were arranged alphabetically. (Admittedly, this was probably not the most efficient ordering in terms of communication, but it was legitimate.)

### Approaches to Taxonomic Development

A taxonomy is a system of labeled groups, classes, or sets. The labels are concepts that represent the characteristics of subgroups or subsets contained in the group or sets. Individuals contained in the subgroups or subsets are also represented by concepts (Hempel, 1952). Since it systematically organizes these concepts and links them according to some criterion, a taxonomy may be considered a type of conceptual framework.

The development of a taxonomy involves the formation of concepts and statements of relationships between those concepts (Hempel, 1952). For this reason, the development of a taxonomy is a theoretical operation. As with any other theoretical work, inductive and deductive approaches may be used to develop a taxonomy (Walker & Avant, 1983). An inductive approach begins with ordering and arranging objects or events into groups or sets based on some criterion. Individual elements are examined for characteristics that may be used as the basis for grouping. After the elements are classified, the classification may be used as the basis for inductively developing conceptual labels for the various groups in the classification and specifying the relationships between those groups. A 'taxonomy' may then be inductively developed to specify the rules, principles, and procedures for classifying. Although this discussion emphasizes an intellectual exercise in the inductive classification of individuals, it should be noted that computer techniques such as cluster analysis may also be used. For more on this, see Blackwelder [1967], Sneath & Sokal [1973], and Mezzich [1980].

In contrast, a deductive approach uses an existing conceptual framework, theory, or theories as the basis for developing the conceptual labels for groups and the criteria by which individual entities are to be classified or assigned to those groups (Griffiths, 1969). The taxonomy may be examined (or tested) by actually using it to classify the phenomena for which it was developed.

These are the two methods, then, of developing a taxonomy. But when should the inductive method and the deductive method be used? Logically, this is related to the nature of the entities to be classified. Using natural criteria requires that essential characteristics of the entities be used to classify them. Since an inductive approach in developing a taxonomy uses characteristics of the entities, this would seem to be the most appropriate approach when the essential characteristics of the entities have been identified.

In contrast, artificial criteria are based on "superficial resemblances or external criteria" (Hempel, 1952). In this instance (especially when the criteria are external) it would seem that the taxonomy should be deductively established; i.e., the arbitrarily imposed criteria should be established.

These should not be considered hard and fast rules. In the context of discovery (Walker & Avant, 1983, p. 10) an inductive approach in taxonomic development may be used even when the nature of the entities to be classified is poorly understood. A deductive approach may be useful for elaborating a "theory" of what a specific taxonomy should be like: the taxonomy may be "justified" by using it to classify the focal entities.

For Porter, only inductive developmental methods are appropriate. She says: "Developing a taxonomic structure according to a theoretical framework negates the purpose of the classification exercise; to identify the intergral relationships of entities" (p. 137), and "A bona fide taxonomy is created inductively when empirical relationships are the basis for differentiation" (p. 138).

This stance assumes that the goal of all taxonomic work is theory building. This is not the case. The goal of taxonomic work is improved communications, based on achieving an economy of memory and easing manipulation of the phenomena of concern (Sokal, 1974). Economy of memory is achieved by placing individual cases in groups or sets so that descriptions of individuals may be subsumed in the description of the group. This facilitates communication by allowing discussion of groups instead of each of the individual cases contained in the groups. Also, information regarding individual cases may be stored and retrieved according to group membership.

It is quite possible that individual cases may go unnoticed for one reason or another. This does not mean that they may not be classified: on the contrary, they provide a way of testing the usefulness of a deductive taxonomy by using it to classify the unnoticed cases. Similarly, if an inductive approach has been used, a previously unnoticed case may be included in previous groupings or used as the basis for forming new groups. The inability of a taxonomy (whether inductively or deductively developed) to incorporate previously unnoticed cases suggests the need to revise (and sometimes scrap) the taxonomy. In any event a taxonomy should serve as

a heuristic device (Sokal, 1974). Taxonomies should not be considered as set in stone. The very nature of taxonomies and their development suggests that they will be ever changing.

### **Problems in the Development of Taxonomy I**

The major problem in Taxonomy I is logical inconsistency. Where is that inconsistency and how is it related to mis-understanding regarding the nature and development of taxonomy? A look at the history of the development of classifications of nursing diagnoses is one way of demonstrating the problem.

At the First National Conference on the Classification of Nursing Diagnosis, in 1973, 31 categories of nursing diagnoses were identified (Gebbie & Lavin, 1975). The methods for developing these categories was inductive. The initial classification system used to order the individual diagnoses was non-hierarchical: grouping in alphabetical order. At this point, however, the inductive method of classifying the nursing diagnoses was abandoned. It should have been continued.

The categories could have been arranged in larger groups based on characteristics that were similar for various categories. These groups could then have been subsumed into larger, more general groups and so on, creating a hierarchical classification of nursing diagnoses. This classification would then be used as the basis for inductively developing the conceptual labels for the various categories of groups and the groups contained in those categories and for specifying the relationships between those groups. This would lead to the development of an initial taxonomy that would specify the rules, principles, and procedures for classifying any individual nursing diagnosis.

However, this is not what happened. As noted by Porter (p. 136), the alphabetical grouping was considered unscientific. From the beginning, a hierarchical ordering was considered necessary for a taxonomy and it was considered a necessity that this taxonomy be based on some 'scientific' principle of ordering (Gebbie & Lavin, 1975, p. 13). (Indeed, a system producing a hierarchical ordering would be most useful for communication about nursing diagnosis.) NANDA's Nurse Theorist Group thought that the nine patterns of unitary man provided an organizing principle for nursing diagnoses (Porter, P. 136). A taxonomic tree was developed for these nine patterns of unitary man (renamed "Human Response Patterns"), and accepted nursing diagnoses were classified in terms of this tree. The system was accepted as Taxonomy I at NANDA's Seventh Conference in 1986 (Kritek, 1986).

The problem is that Taxonomy I is *not a taxonomy of nursing diagnoses*. It is a taxonomy of "Human Response Patterns" that was *deductively* created. *Inductively* created nursing diagnoses were then classified using this 'Taxonomy of Human Response Patterns'. The question, of course, is "Are human response patterns the same as nursing diagnosis"? By no means is there consensus that human response patterns are the same as nursing diagnosis even though this is the position of the ANA's Social Policy Statement (1980). For more on this, see Hall & Allan (1986) and Suppe and Jacox (1985).

If they are not the same, we do not have a taxonomy of nursing diagnoses and it is inappropriate to use Taxonomy I to classify nursing diagnoses. This is not to say that a 'Taxonomy of Human Response Patterns' should be "thrown out the window". It would, no doubt, be a useful taxonomy for the discipline of nursing. If the inductive method had been consistently followed, there would be a more consistent classification of the accepted nursing diagnoses. This classification most probably would not have resulted in a taxonomy based on human response patterns.

A more fundamental problem concerns the nature of the accepted nursing diagnoses. Are these truly nursing diagnoses? Serious questions have been raised about the usefulness of the current nursing diagnoses in all settings where nursing occurs (Williams, 1980; Shamansky & Yanni, 1983). This suggests that the true nature of what nurses diagnose has yet to be elaborated. Until this is done, the logic of inductively developing a taxonomy based on the essential characteristics of nursing diagnoses is questionable, at best.

Porter suggests that what nurses diagnose is "specific human-environment interactions" (p. 138) and says that these may be the phenomena that should be classified. This seems to be a fruitful area for taxonomic work, especially since this may provide a unique nursing perspective and overcome some objections to the present nursing diagnoses.

But before human-environment interaction is accepted as the phenomenon that nurses diagnose, it must be critically analyzed and tested to determine whether or not it is truly what nurses diagnose in all practice settings. For the present, it may be more fruitful to develop deductively the nature of nursing diagnosis based on actual and theoretical nursing practice.

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