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EPISTEMOLOGICAL CONSIDERATIONS OF EDUCATIONAL OBJECTIVES

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ERRATA

p. 5, l. 18: 'Criti-' not 'Crit-'

p. 9, l. 23: Add 'It is manifested by rating entities.'

INTRODUCTION

That an educational process includes objectives for bringing persons to know is patent. That there have been efforts toward adequate classification of such objectives also is patent. It is the intent in this paper to show that a more adequate classification of such objectives is available through pedagogical epistemology rather than through educational psychology or through the structure of knowledge. In the United States, the best known and widely used classification of cognitive educational objectives is that of Benjamin Bloom and his associates.[1] A classification by Michael Scriven which reduces overlap in Bloom's categories is also receiving notice.[2] Bloom's classification is based on psychology, while Scriven's is based on logic. In this paper I shall compare my classification based on pedagogical epistemology with Bloom's and Scriven's classifications.

The paper is divided into two parts. In the first part, I set forth my development of dimensions of knowing which constitute what I call, "pedagogical epistemology."[3] In the second part of the paper, my classification of cognitive educational objectives is presented and compared with those of Bloom and Scriven.

PART I: DIMENSIONS OF KNOWING

Since my purpose is concerned with teaching, i.e. bringing someone to know, knowing is viewed in the light of tutorial requirements. Only those knowings to which a teacher has access, which the teacher can bring to a learner, and which a learner can communicate in some way to the teacher are taken seriously.

From an epistemological perspective, knowing can be divided into knowing that one, knowing that, knowing how to do, and knowing what to do. Knowing that one and knowing that arise from the distinction between

sic and non-basic knowing. Definitions of 'basic' and 'non-basic
lowing' are taken from Lehrer and Paxson.[4] 'Basic knowing' is defined
s true belief that is completely justified and which justification
does not depend upon any other statement or belief. Truths of basic
knowledge are manifested through the outcomes of acting on such beliefs.
For example, a soothsayer can be said to know basically when the fore-
cast event does happen without exception.

Since basic knowing is atheoretical (not subject to justificatory evidence), it has relevance to the unique rather than the general. The cognitive status of basic knowing is that of knowing that one rather than of knowing that. Since what characterizes a unique entity are its qualities, basic knowing yields qualitative knowledge. There are three types of qualitative knowledge: recognitive, acquaintive, and appreciative. When these knowings are considered from the perspective of the teacher, definitions specify the necessary and sufficient conditions that enable a teacher to judge that a learner has come to know.

In order that a teacher (T) judge that a learner (X) recognizes a public state of affairs (Q), X recognizes Q by selecting that which is Q from that which is not-Q and that which is not-Q from that which is Q, and T must discern that recognition. In educational processes a learner might be called upon to recognize objects or symbols and their relationships or to recognize a fitting inclusion in an argument or to recognize the force of evidence in an argument. In recognizing objects and symbols and their relationships, correspondence rules must be applied. Recognizing fitting inclusions in arguments requires proper use of coherence rules. To recognize the evidential force of arguments requires joint application of coherence and correspondence rules. It is

patent that typologies of such rules must be explicated for various subject matters so that pedagogical competence in discrimination learning can be maximized.

If T is to judge that X is acquainted with Q, X experiences Q at first hand, X recognizes Q, X is familiar with Q, and T must know that these conditions with respect to X hold. Knowing by acquaintance comes by and through personal experience. It is the kind of knowing exhibited in children's learning to speak in their native language. Acquaintance is a lexicon of particulars peculiar to a given object, person, or universal. Knowing by acquaintance is communicated by ostensive use of language or by enactive representation.

Enrichment experiences in classrooms and on field trips utilize the condition of firsthandedness necessary for acquaintance. Usually these experiences do not contain sufficient time or repetition necessary for coming to know by acquaintance. Such experiences also lack sufficiency of detail. They are used as occasions for exemplifying universals rather than for noting qualities of the unique. Clearly educational procedures for coming to know by acquaintance must be explicated.

In order that T judge that X appreciates Q, X is acquainted with Q, X can select the elements $Q_i, \ldots, Q_j$ appropriate to Q, X can select the relations $R_i, \ldots, R_j$ appropriate to Q, and T must know that these conditions with respect to X hold. Current epistemic confusion in educational literature results from conflating prizing and discerning in the meaning of the term 'appreciation'. Prizing is a judgment of worth, while discerning is a judgment of worthwhileness. Discerning judgment is that of an expert who appraises the adequacy of part-whole entities and connections. Such judgment is made

manifest through reliability of judging things of a certain kind and quality. It does not seem that discerning judgment can be taught only through verbal exposition. Such judgment is very much a matter of experience.

It seems evident that learning to appreciate something involves more than that which is explicitly stated of objects, persons, or universals. There are experiential aspects necessary for coming to such knowing. An adequate classification of cognitive educational objectives would contain items relevant for bringing someone to such qualitative judgment.

Again paraphrasing Lehrer and Paxson, non-basic knowing is characterized as true belief that is completely justified and that justification is not defeated by any other justifying statement or belief.[5] There are three types of non-basic knowing which can be defined from a tutorial perspective. They are: testimonial knowing, structural knowing, and criterial knowing.

In order that T judge that X knows that Q through testimony, X has adequate authority for Q, and T must know that X has such good authority for Q. It is patent that what constitutes adequate authority is a problem, nor is that problem overcome by having learners discover for themselves. No substitution of reference alters the condition of authoritativeness necessary for bringing someone to know. A teacher is behind every reference reading, every class discussion, and every project or experiment. Initially, the strongest evidence a learner can offer is the teacher's agreement with the learner's knowledge claims. It appears that a clear understanding of the evidence of testimony rests on an adequate social theory of knowledge. Moreover,

it is clear that such knowledge is not merely a matter of recalling what one was taught.

If T is to judge that X knows the structure of Q, X must present an evidential argument the force and reach of which X can explicate, and T knows that this condition holds. Knowledge of structures assures a cognitive grasp which is more than parroting. Much has been done in explicating structures of knowledge for pedagogical purposes, but little has been done to determine the conditions for a learner's being able to explicate or exhibit the force and reach of the theories he has learned and of hypotheses that worked. Nevertheless, a classification of cognitive educational objectives which omits such items is deficient.

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re modeling

In order that T judge that X knows criteria for Q, X must present justificatory arguments on the credibility of Q, and T must know that this condition holds. The knowledge domain of criterial knowing is that of describing or explicating standards governing arguments. In its most common characterization, such knowledge is philosophical. However, there is justification within as well as of discourse. Criticism in the knowledge domains of art as well as science are domains of criterial knowledge. In the United States, it is common for educational theorists to view criterial matters as merely valuational and not also truth functional. As a consequence, educational objectives with reference to criterial matters are taken as non-cognitive and treated as instances of attitude and preference. Little attention, therefore, is given to justificatory arguments and their adequacy. Such neglect of the nature and function of criterial knowledge ought not continue in classifications of cognitive educational objectives.

Principles, Rules, Eg. Logic, math

The distinction between propositional knowing and procedural knowing has been scrutinized carefully in epistemological research. The distinction has met with difficulty in that someone always was able to present an example that crossed the boundaries set in the distinction. D. G. Brown has offered a solution through linguistic analyses of the two usages of the expression 'knowing how'.[6] Brown showed that the standard usage of knowing how was procedural in all instances, whereas the English usage of the expression was quasi-procedural in usage overlapping propositional and procedural senses of knowing. It has the propositional sense of knowing what to do as well as the procedural sense of knowing how to do something. Following D. G. Brown's distinctions, I have characterized two kinds of procedural knowing, protocolic and conventional, and two kinds of quasi-procedural knowing, innovative and creative. As before, conditions for such knowing are given from a tutorial perspective.

In order that T judge that X knows how to do protocolic performance P, X must have the capacity to do P, X must have the facility to do P, X must execute P smoothly, P must be a single-pathed performance, and T knows that these conditions for X's doing P hold. From the condition of the single-path, it is evident that I have used the term 'protocolic' to denote those doings that are so restricted. Such performances as walking about in canoes, opening combination locks, or running mazes exemplify protocolic performances. Extant classifications of educational objectives reduce protocolic performance to motor skills. Such a reduction fails to take into account the anticipatory character of a performance such as walking about in a canoe. The cognitive aspect of knowing how to do something, hence, is reduced to the reactive character of motor conditioning.

For T to judge that X knows how to do conventional performance P, X must have the capacity to do P, X must have the facility for doing P, X must choose to do P, X must execute P smoothly, P must be a multi-pathed performance, and T knows that these conditions for doing P hold. I use the term 'conventional' to denote performances for which there are alternative pathways all of which are accessible to the teacher and through the teacher to the learner. Societal custom and mores often produce preferential binding that restricts alternatives. If such binding permits only one manner of doing which makes a condition of choice non-operative, a conventional performance is reduced to a protocolic one. Pervasive reduction of conventional performances to protocolic ones suggests the need for careful delineation of protocolic and conventional performances and for noting effective reduction of conventional performances.

Although I can offer little by way of explicating conditions for knowing what to do, I can clarify a distinction between innovative and creative knowing. Since knowing what to do is both procedural and quasi-procedural, there are certain propositional requirements necessary for them that are not necessary for strictly procedural knowings. Knowing what to do with respect to P requires knowing that C of P as well as knowing how to do P. For example, a poet not only can write a poetic expression, he can recognize one, he is acquainted with poetic expression, and he can make discerning judgments of the works of other poets. A poet not only knows how to do poetry, he knows what procedures to follow in producing poetry. In other words a poet has know how with poetic expression. To characterize such innovative or creative knowledge as a matter of style, for instance as "cleverness,"[7] surely is to mistake the manner of doing something for the substance of its doing.

If T is to judge that X knows how to innovate with respect to P, X must have the capacity to do P, X must appreciate P, X integrates some performance P_m into some performance P_n where P includes P_n and P_m is not equivalent to P_n, and T knows that these conditions for X's innovation with respect to P hold. An innovative procedure is one in which a part or whole of one performance is integrated into the whole of another performance. Learning to innovate is coming to know how to transfer pathways of one performance into another. It is patent that one cannot innovate protocolic performances. From the propositional side innovative know how is setting forth procedural rules for doing some given thing in a different way. Suggestions for classification of innovative knowing what to do abound in copyright and patent offices the world over. Items for such classifications can be obtained through content analysis of copyright and patent grants.

In order that T judge that X knows how to create with respect to P, X must have the capacity to do P, X must appreciate P, X must transform $P_{(m, \ldots, n)}$ into P_z where $P_{(m, \ldots, n)}$ are elements of P and P_z is not included in P, and T knows that these conditions for X's creating with respect to P hold.

Since innovative and creative procedures are open-ended, like the advance of knowledge, they cannot be taught only realized. What can be taught are the structures of realized invention and creation. Such knowings should not be relegated to preferential attitudes or styles of behavior. At least one can be taught conditions for knowing and general conditions for tutorial knowing are presented in Schema 1.

Appendix B

~~PART II~~: CLASSIFICATION AND ADEQUACY *

The classification of educational objectives based upon the dimensions of knowing is presented as follows.

1. Knowing That One

Knowing that one is completely justified true belief of the quality of a singular state of affairs. Such knowledge is manifested by prophecy or enaction in the absence of justificatory statements or beliefs.

1.1. Recognitive knowing

Recognitive knowing is discrimination of an entity as such. It is manifested by denoting or selecting a singular object, person, universal, representation, or category.

1.2. Acquaintive knowing

Acquaintive knowing is discrimination of qualitative entities and their connections that uniquely constitute the configuration of a singular whole. It is manifested by iterating or selecting related parts that are peculiar to a singular object, person, universal, representation, or category.

1.3. Appreciative knowing

Appreciative knowing is discrimination of the qualitative order of a singular entity with respect to relevant standards of qualitative ordering or with respect to a rank order of singular entities within a class of entities. It is manifested by rating entities.

2. Knowing That

Knowing that is undefeated completely justified true belief of existential attributes of general states of affairs. Such knowledge is manifested by witness, evidential argument, or proof.

2.1. Testimonial knowing

Testimonial knowing is assertion warranted by good authority and establishes a person's right to be sure. It is manifested by referencing adequate authority as backing for truth claims.

2.2. Structural knowing

Structural knowing is assertion that is warranted by evidential argument. It is manifested by assertions that characterize the force and reach of evidential claims.

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* G.S. Maccia, Epistemological Considerations of Educational Objectives. Paper presented to XVth World Congress of Philosophy, Varna, Bulgaria, 1973.

2.3. Criterial knowing

Criterial knowing is assertion of adequacy of evidential argument, proof, or witness. It is manifested by assertions that characterize the force and reach of justificatory claims.

3. Knowing How To Do

(Knowing how to do) is smoothly executing some specified performance. It is manifested by completion of a performance in an appropriate manner and can be repeated.

3.1. Protocolic knowing

Protocolic knowing how to do is smoothly executing a single-pathed performance. It is manifested by goal attainment through invariant sequences of movement.

3.2. Conventional knowing

Conventional knowing how to do is smoothly executing a multi-pathed performance. It is manifested by goal attainment through adaptive sequences of movement.

4. Knowing What To Do

(Knowing what to do) is specifying the manner by which some performance is altered in realizing a goal. It is manifested by mapping or iterating sequences for executing novel performances.

4.1. Innovative knowing

Innovative knowing is transferring elements of one performance into another such that the latter performance is altered. It is manifested by improvising or inventing different ways for realizing the same goal.

4.2. Creative knowing

Creative knowing is transforming elements of performances such that a uniquely novel performance is realized. It is manifested by uniting disparate ways of realizing goals.

Utilizing criteria stated in 1972 by Elizabeth Steiner Maccia, I shall show that the above classification of cognitive educational objectives is more adequate than one drawn from an educational psychological perspective or from a logical one. Comparison will be in terms of completeness, reducibility, and strength. A classification (C_1) is

more complete than another classification (C_2) if and only if (iff)

> C_2 is derivable from C_1, and
> C_1 describes events which are not described by C_2.

C_2 can be reduced to C_1 iff

> the conjunction of C_1 and R includes C_2 when R is a set of translation rules matching expressions in C_1 and C_2.

C_1 is a strong alternative to C_2 iff

> C_1 includes all those data, phenomena, or events that C_2 includes,
> C_1 and C_2 are empirically inconsistent, and
> C_1 has higher empirical content than C_2.

Only those categories in Bloom's and Scriven's classification denoted as cognitive or conceptual are utilized in the comparison, for my classification is only of knowing. In evaluating categories of cognitive objectives, reference will be made to Appendix I and Appendix II. Appendix I contains Bloom's classification drawn from an educational psychological perspective. Appendix II contains Scriven's classification drawn from a logical perspective.

Bloom's category 1.00. Knowledge is derivable from my category 2. Knowing That. Bloom's categories 1.10. Knowledge of Specifics and 1.30. Knowledge of Universals and Abstractions in a Field are derivable from my category 2.1. Testimonial knowing. Bloom's category 1.20. Knowledge of Ways and Means of Dealing with Specifics is ambiguously written so that it could be derivable both from my category 2.1. Testimonial knowing and my category 2.2. Structural knowing. However, Bloom's definition of 'knowledge' in 1.00 makes 1.20 derivable from my 2.1. For Bloom, to know singulars, particulars, and universals is recalling what was learnt. He treats knowing of theoretical entities

and their relations and knowing of justificatory grounds for knowledge claims as also matters of recall. Hence, it is patent that parts of Bloom's classification are derivable from mine. Yet it is not the case that my classification is simply more complete than Bloom's. Some of Bloom's categories are inconsistent with mine. An inconsistency is Bloom's category 5.00. Synthesis and my category 4.2. Creative knowing. Thus, my classification is a stronger alternative than Bloom's classification.

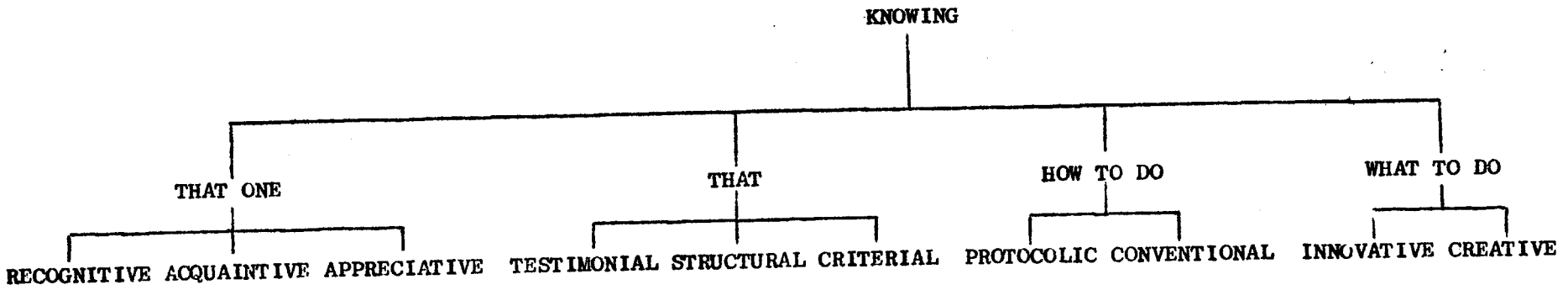
Since the difference between intellectual abilities and skills is not stated clearly in Bloom's classification and since he conflates propositional affairs with procedural ones, no further comparisons will be made. It seems clear that a classification of events which confuses epistemological distinctions is not adequate.

The overlap and confusion in Bloom's categories are not present in Scriven's. With Bloom, however, Scriven conflates knowing that one with knowing that. Scriven's categories 1. Knowledge, of and 2. Comprehension and Understanding, of, can be derived from my category 2. Knowing that. His category 1a. Knowledge of items of specific information and 1b. Knowledge of sequences or patterns of items of information can be derived from my category 2.2. Structural knowing. By attaching to Scriven's phrase 'knowledge of' the phrase 'adequate authoritative sources of' Scriven's categories 1a and 1b are derivable from my category 2.1. Testimonial knowing. By attaching to 'comprehension and understanding of the phrase 'evidential argument for', Scriven's categories of comprehension and understanding 2a, 2b, and 2c are derivable from my category 2.2. Structural knowing.

Because Scriven's classification does not treat criterial knowing nor knowing that one, my classification describes more epistemic events than does Scriven's classification. Consequently, my classification is more complete than Scriven's.

In conclusion, I trust that the intention of this paper has been realized. Regardless of the ultimate status of my classification of cognitive educational objectives, I believe that I have shown that a more adequate classification of such objectives is possible through a pedagogical epistemological perspective than through an educational psychological or a logical one.

SCHEMA 1: DIMENSIONS OF KNOWING



GENERAL CONDITIONS OF TUTORIAL KNOWING

T knows that X knows that Q basically
iff
1. X believes that Q
2. X is completely justified in believing that Q
3. No other statement or belief justifies X's belief
4. T knows that conditions 1, 2, and 3 hold

T knows that X knows that Q non-basically
iff
1. X believes that Q
2. X is completely justified in believing that Q
3. No statement or belief defeats X's justification that Q
4. T knows that conditions 1, 2, and 3 hold

T knows that X knows how to do P
iff
1. X has the capacity to do P
2. X has the facility to do P
3. X executes P smoothly
4. T knows that conditions 1, 2, and 3 hold

T knows that X knows what to do with respect to P
iff
1. X has the capacity to do P
2. X appreciates P
3. X modifies P
4. T knows that conditions 1, 2, and 3 hold

APPENDIX I[8]

Condensed Version of the Taxonomy of Educational Objectives

Cognitive Domain

KNOWLEDGE

1.00 Knowledge

Knowledge as defined here, involves the recall of specifics and universals, the recall of methods and processes, or the recall of pattern, structure or setting. . . . . .

1.10 Knowledge of Specifics

The recall of specific and isolable bits of information. The emphasis is on symbols with concrete references. . . . . .

1.20 Knowledge of Ways and Means of Dealing with Specifics

Knowledge of the ways of organizing, studying, judging and criticizing. . . . . .
It does not so much demand the activity of the student in using the materials as it does a more passive awareness of their nature. . . . . .

1.30 Knowledge of Universals and Abstractions in a Field

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. . . . . .

INTELLECTUAL ABILITIES AND SKILLS

Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. . . . . .
The abilities and skills objective emphasize the mental process of organizing and reorganizing material to achieve a particular purpose. . . .

2.00 Comprehension

This represents the lowest level of understandin. . . . . .
The individual knows what is being communicated and can make use of material or idea being communicated without necessarily relating it to other material or seeing its fullest implications . . . . . .

3.00 Application

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules of procedure, or generalized methods. The abstractions may also be technical principles, ideas, and theories which must be remembered and applied. . . . . .
. . . . . .

4.00 Analysis

The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. . . . . .
. . . . . .

5.00 Synthesis

The putting together of elements and parts so as to form a whole. . . . in such a way as to constitute a pattern or structure not clearly there before. . . . . .
. . . . . .

6.00 Evaluation

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. . . . . .
. . . . . .

APPENDIX II[9]

11.1 CONCEPTUAL DESCRIPTIONS OF EDUCATIONAL OBJECTIVES

1. Knowledge, of

   a. Items of specific information including definitions of terms in the field.

   b. Sequences or patterns of items of information including sets of rules, procedures or classifications for handling or evaluating items of information (we are here talking about mere knowledge of the rule or classification and not the capacity to apply it).

2. Comprehension or Understanding, of

   a. Internal relationships in the field,[8] i.e. the ways in which some of the knowledge claims are consequences of others and imply yet others, the way in which the terminology applies within the field; in short what might be called understanding of the intrafield syntax of the field or subfield.

   b. Interfield relations, i.e. relations between the knowledge claims in this field and those in other fields; what we might call the interfield syntax.

   c. Application of the field or the rules, procedures and concepts of the field to appropriate examples, where the field is one that has such applications; this might be called the semantics of the field.

[8]Typically, "the field" should be construed more widely than "the subject" since we are very interested in transfer from one subject to related ones and rate a course better to the extent it facilitates this. In rating transfer, we can range very far, e.g., from a course on psychology to reactions to commercials showing white-coated men.

FOOTNOTES

1. Bloom, Benjamin S., et. al., Taxonomy of Educational Objectives; Handbook I: Cognitive Domain, David McKay Company, Inc., New York, 1956.

2. Scriven, Michael, "The Methodology of Evaluation," Perspectives of Curriculum Evaluation, ed. by Ralph Tyler, Rand McNally & Company, New York, 1967.

3. Maccia, George S., "Contributions of Epistemology Toward a Science of Education," paper presented to the International Association for the Advancement of Educational Research, University of Paris, September, 1973.

4. Lehrer, Keith and Paxson, Jr., Thomas, "Knowledge: Undefeated Justified True Belief," Journal of Philosophy, Vol. LXVI, No. 8, April, 1968.

5. Ibid., p. 227.

6. Brown, D. G., "Knowing How and Knowing That, What," Ryle: A Collection of Critical Essays, ed. by O. P. Wood and G. Pitcher, Doubleday and Co., New York, 1970.

7. Scriven, op. cit., p. 73.

8. Bloom, op. cit., pp. 201-207.

9. Scriven, op. cit., p. 74.