The increasing trend toward the formulation of student learnings in goal-based rather than textbook-based organizations, and the steadily growing concern for openness and flexibility in education have created a pressing need for a comprehensive, validated system for classification of knowledge, process, and value student learnings. Such a system serves as a means of communication and as a framework for educational research and development. The insights and end products of a two-year program of cooperative research which has involved public school teachers, evaluators, curriculum specialists, and university researchers in an effort to design and test such a system are described. (Author)
TOWARD A COMPREHENSIVE, VALIDATED SYSTEM OF CLASSIFICATION
OF KNOWLEDGE, PROCESS, AND VALUE STUDENT LEARNINGS

by

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The Portland, Oregon, goal development project involves 55 school districts in a three county area. Its principal product is a set of goals (learning outcome statements) for grades K-12. Currently, goals are available in separate volumes for twelve major areas of instruction (e.g., math, language arts, music). To facilitate interdisciplinary planning and other specialized educational concerns, the full set of over 20,000 goals will soon be stored in a computer, with multiple bases for retrieval of specific goals.

Classification systems devised for organizing and retrieving goals are of two basic types: (1) content taxonomies specific to each collection; (2) coding systems applied uniformly to goals in all collections. This report focuses on three classification systems of the second type; in particular, on efforts made to construct valid systems for coding and retrieving goals according to the types of knowledge, processes, and values they represent or develop.

I. Knowledge Classifications

In developing knowledge classifications (Exhibit A), the work of Gagné, Bloom, Walbesser, and others provided useful starting categories. This was especially true of Bloom's Handbook I.

The present categorization was developed in response to logical insights and empirical evidence accumulated over two years of writing, coding, using, and revising goals in all subject areas.

Departures from Bloom may be noticed, both in organization and in naming of categories. For example, the knowledge categories do not deal with knowledge of generalizations as a basic category, but rather assume that any goal representing a generalization must also deal with one or more of the basic categorizations. Generalizations as a class of knowledge are therefore given superordinate status and divided into two classes: principles and laws, and simple generalizations. Also, notice there is no category of
knowledge of specific facts as found in Bloom, for we have been able to subsume all such goals under the basic ten categories. New categories not found in Bloom include knowledge of properties, parts, characteristics, features, elements, dimensions; knowledge of contexts, locations, orientations; knowledge of operations, methods, functions; knowledge of causes and effects including costs and benefits, advantages and disadvantages; and knowledge of relationships that are not cause-effect.

II. Process Classifications

In developing and classifying a list of processes, it was first necessary to identify those processes which are teachable. As commonly used by psychologists and educators, the term "process" may refer to: (1) mental operations or psychological processes, usually considered to develop hierarchically through the interaction of hereditary and environmental factors; or (2) conventional, standardized, and formalized processes: procedures, techniques, methods devised by humans as efficient applications of mental processes; skills humans learn from each other.

Educators obviously cannot teach psychological processes; educators can influence their development in an individual by passing on cultural and disciplinary skills and providing opportunities for the individual to apply them meaningfully.

It became apparent to teachers, consultants, evaluation specialists, and administrators involved in the project that the process categories drawn by Bloom, Gagné, and most other authorities were more descriptive of psychological than of teachable processes. A scheme was sought which would more appropriately organize processes of the second type.

Major classes of teachable processes were tentatively identified as inquiry/problem solving, human relations, and production. The most challenging major class of process was inquiry/problem solving. It was decided to characterize this field as that set of processes that involve the acquisition, verification, interpretation, use, and communication of information. This classification system with its major headings and subheadings is shown in Exhibit B.

Many adjustments were made in the classification system as goals were written and coded. The probability that important elements were omitted is very small indeed. The classification categories, which are purposefully pragmatic and educator-oriented, still lack the support of precise definitions.
Most terms and phrases used to describe these classification elements have a fairly self-evident meaning to teachers: evaluating authoritativeness of sources, ordering and sequencing, comparing and contrasting, associating, relating, equating, generalizing, theorizing and predicting, testing hypotheses, making decisions, etc. It is assumed that for every category in the system there exists at least some standardized or formalized processes which can be taught, learned and replicated.

Although the process classifications are general, goals which relate to them may be quite particular and quite different within a category. For example, the general meaning of the term "to analyze" is to examine the component parts of an entity in an effort to understand the whole. Standard processes of analysis occur in the analysis of literature according to conventional criteria, or in the analysis of chemical composition, the parts of speech in a sentence, or the logic of an argument. Any of these types of analysis might be represented as goal statements within the different fields of study in which they are normally taught. Each formal process of analysis taught in these respective settings would be expected to contribute to the overall ability of a student to employ general analytic processes. In other words, there is no single process of analysis that can be taught, but rather many techniques found useful in a variety of problem situations. In the collection of course goals created by the Portland project, all goals that appear to contribute to the process of analysis are coded and could be retrieved by that code irrespective of the subject under which they are classified. The same is true of all other process categories.

Because of the importance of inquiry and problem solving processes both in science and in the social sciences, it was found useful to develop for these collections entire sections dealing exclusively with process. In all types of science it was found appropriate to classify such goals under two major taxonomic headings: "universal processes of inquiry and problem solving" and "conventional processes used in the discipline." In the goals for biological and physical science, subheadings for processes used in the discipline include measurement, using equipment, using scientific vocabulary, using models, and using mathematics.
III. **Value Classifications**

Another major effort in classification was associated with the attempt to assign concept and value words to goals in the collections. Teachers who produced goals were asked to indicate if a goal being stated seemed to contribute in any way to the development of a concept or a value. Several thousand goals were produced under this procedure, and teachers attempted to designate the values and concepts they believed each goal to be associated with. The result of all this, as one might imagine, was a very diverse set of concept and value words, even though some words deemed as "good examples" of concepts and values were provided the goal writers by the project leaders. This achieved little uniformity in the types of words used to designate values and concepts. What did result, however, was a very rich collection of words which could be grouped for purposes of analysis and classification.

Efforts to classify concept words were complicated by many of the same definitional problems encountered in classifying processes. The list of concept words is still being refined, and categories have not yet been established.

Value word classification proved somewhat more fruitful. It was possible to identify groupings which are sufficiently homogeneous to warrant separate categories. While granting that such an empirically derived classification system may have its logical deficiencies, groupings of words with apparently distinctive characteristics were achieved, and the terms used to describe them communicate those distinctions rather well.

Values education is currently focused on two main concerns: (1) teaching students ways of clarifying their own values, understanding the values of others, and resolving value conflicts; (2) clarifying the values to which schools are committed; the values which educators reinforce or teach deliberately and accidentally through their interactions with students, and through their curricular, methodological, and organizational decisions.

Goals which relate to the first concern are included in all revised collections, grouped taxonomically under the heading "Value Clarification." They include knowledge and process goals, and are coded accordingly. They represent the kinds of information and skills with which individuals may evaluate, restructure, expand, and appropriately apply their own value systems. They do not deal with specific values to be taught or reinforced by educators, or acquired and applied by students.
Exhibit C contains descriptors of specific values and is addressed primarily to the second main concern of values education. It provides a useful frame of reference for educators attempting to identify legitimate affective goals, and to structure their instruction so that individuals are supported in the development of personal values that meet their own needs and the needs of society.

As goal collections are revised, the value classifications are being used in two ways:

1. To guide the writing of affective goals appropriate to each discipline, grouped taxonomically under headings such as "valuing conditions which promote scientific inquiry."

2. To code with appropriate value words the knowledge, process, or valuing goals in all collections which may be useful in dealing instructionally with particular values.

The use of the three major categories, "Environment: Related Values," "Society and Culture: Related Values," and "Personal Functioning: Related Values" should be explained. All values are personal; hence the category "Personal Functioning: Related Values" refers to values which are characteristic of an effectively functioning person. The category "Society and Culture: Related Values" concerns the personal valuing of ideals, institutions, laws, processes, language, and other societal and cultural inventions. The category "Environment: Related Values" concerns the personal valuing of the environment and means of understanding it, coping with it, and communicating about it. Certainly these classifications are arbitrary, but most of the homogeneous groupings of value words produced by teachers in the project seem to fit reasonably well within them and their several subcategories.

In attempting to validate this classification scheme, project participants accepted the general propositions that values develop in answer to basic human needs, and that circumstances and individual differences lead to the development of widely differing values to satisfy essentially similar needs. In the last analysis, valid values and value systems are those which, appropriately applied, satisfy basic human needs.

The validation process was necessarily subjective and exploratory; terms and headings used in the classification system were reviewed in relation to the hierarchical levels of basic human needs defined by Dr. Abraham
Maslow (i.e., physiological, safety and security, love and belonging, status, self-esteem, and self-actualization needs).

All of the values identified within the classification system can be logically related to the satisfaction of one or more basic needs. Some of the category headings relate obviously to one particular level of need, e.g., "Qualities that enhance personal and social relationships" (3.2) and the love and belonging needs; "Social regulators" (2.5) and the security needs. Most categories, however, relate to various need levels, e.g., "Using environmental resources" (1.4) and the physiological, security, status, self-esteem, and self-actualization needs.

All three classification systems described in this report are subject to revision, and we welcome any criticisms and suggestions that would assist us in making further refinements.
Exhibit A

-Knowledge Categories-

G1 Principles and Laws

G2 Simple Generalizations

K1 Conventions: Names and Nomenclature

K2 Conventions: Symbols, Rules, Standardized Processes, Definitions

K3 Properties, Parts, Characteristics, Features, Elements, Dimensions

K4 Trends and Sequences

K5 Similarities and Differences, Discriminations, Classifications

K6 Contexts, Locations, and Orientations

K7 Operations, Methods of Dealing with, Functions

K8 Cause and Effect Relationships (Costs and Benefits)

K9 Criteria or Standards

K10 Non Cause-Effect Relationships

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-Inquiry-Problems Solving Processes-

P1  **Input**  

**Acquiring Information**
- P11  Viewing
- P12  Hearing
- P13  Feeling (tactile)
- P14  Smelling
- P15  Tasting
- P16  Using sense extenders
- P17  Using internal sensors of emotion

P2  **Input Verification**  

**Insuring Validity and Adequacy**
- P21  Evaluating authoritativeness of sources
- P22  Evaluating logical consistency and accuracy
- P23  Evaluating relevance to desired learning purposes
- P24  Evaluating adequacy for acting or deciding (comprehensiveness and depth)

P3  **Preprocessing**  

**Organizing Information**
- P31  Labeling, naming, numbering, coding
- P32  Recording, listing
- P33  Classifying, categorizing, grouping, selecting according to criteria
- P34  Ordering, sequencing
- P35  Manipulating, arranging, transforming, computing
- P36  Estimating
- P37  Summarizing, abstracting

P4  **Processing I**  

**Interpreting Information (drawing meaning from data)**
- P41  Decoding verbal and nonverbal symbols (reading and literal translating)
- P42  Inferring, interpolating, extrapolating
- P43  Analyzing
- P44  Associating, relating, equating
- P45  Comparing, contrasting, discriminating
- P46  Synthesizing
- P47  Testing against standards or criteria
- P48  Generalizing

P5  **Processing II**  

**Using Information to Produce New Information**
- P51  Theorizing, predicting
- P52  Formulating hypotheses
- P53  Testing hypotheses
- P54  Revising hypotheses
P6 Output I

Acting on the Basis of Information

P61 Reacting
P62 Making decisions
P63 Solving problems
P64 Restructuring values (adapting, modifying)
P65 Restructuring behavior (adapting, modifying)
P66 Encoding verbal and nonverbal symbols prior to communication
P67 Creating on the basis of knowledge and process

P7 Output II

Communicating Information

P71 Vocalizing (nonverbal)
P72 Gesturing, moving
P73 Touching
P74 Speaking
P75 Writing
P76 Using art media (painting, drawing, sculpting, constructing, etc.)
P77 Dramatizing
P78 Singing, playing instruments
P79 Dancing

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Exhibit C

Values Classifications

1. Environment: Related Values
   1.1 Qualities of environment
       Complexity
       Diversity
       Order (regularity)
       Unity
   1.2 Coping with environment: activities
       Exploring
       Inquiring
       Modifying
       Adapting
       Predicting
       Planning
   1.3 Coping with environment: modes
       Fantasy
       Logic
       Research
       Experimentation
       Prayer
       Mysticism
       Invention
   1.4 Using environmental resources
       Knowledge of resources
       Access to resources
       Maintenance of resources
       Preservation of resources
   1.5 Representing the environment
       1.5.1 Forms of representation
           Images
           Symbols
           Models
1.5.2 Qualities of objective representations
   Clarity
   Accuracy
   Logical consistency
   Relevance
   Comprehensiveness
   Predictive validity
   Adequacy as basis for action or decision

1.5.3 Qualities of artistic representations
   Techniques
   Form
   Harmony
   Dissonance
   Symmetry
   Rhythm
   Grace
   Style
   Eloquence
   Integrity
   Individuality

2. Society and Culture: Related Values
   2.1 Social ideals
      Justice
      Democratic process
      Rule of law
      Equality
      Freedom
      Brotherhood
      Social morality
      Social responsibility
      Peace
      Productivity
      Security, collective
      Unity of purpose
      Pluralism
      Stability
Progress
Honor
Literacy

2.2 Social processes
Working
Communicating
Assembling
Participating
Sharing
Cooperating
Competing
Educating
Problem solving
Planning
Policy making

2.3 Social rights
Freedom of speech
Freedom of assembly
Freedom of inquiry
Voting
Dissenting
Assenting
Privacy
Ownership of property
Equal protection under law

2.4 Social institutions
Family
Schools
Government
Religious institutions

2.5 Social regulators
Mores
Laws
Policies
Regulations (rules)
2.6 Cultural heritage (social conventions)
   Language
   Tools
   Cultural arts
   Cultural beliefs
   Cultural knowledge
   Cultural skills

3. Personal Functioning: Related Values

3.1 Qualities that contribute to personal effectiveness
   Curiosity
   Rationality
   Resourcefulness
   Perseverence
   Innovativeness
   Initiative
   Ingenuity
   Imaginativeness
   Creativity
   Commitment
   Adaptability - flexibility
   Judgment
   Insight
   Knowledgeability
   Responsibleness
   Efficiency
   Craftsmanship
   Self-discipline
   Openness
   Aesthetic responsiveness

3.2 Qualities that enhance personal and social relationships
   Tolerance
   Appreciativeness
   Trust
   Thoughtfulness
   Sensitivity
   Respectfulness
   Compassion
   Love
Individuality
Humility
Dignity
Faithfulness
Empathy
Courage
Integrity
Humor
Morality
Cooperativeness
Social concern
Social sensitivity
Friendliness
Honesty

3.3 Conditions of self-esteem and self-actualization
Personal growth and development
Competence
Self-knowledge
Self-confidence
Self-respect
Self-reliance
Self-direction
Self-expression
Self-fulfillment

3.4 Self-actualizing responses to environment
Curiosity
Concern
Respect for life
Wonder
Reverence
Awe
Satisfaction
Enjoyment

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