ALIGNMENT OF CURRICULAR OBJECTIVES, TEACHING & ASSESSMENT USING REVISED BLOOM'S TAXONOMY

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Abstract

Teachers have to facilitate and ensure consistency between curricular objectives (intended student learning) and actual student learning. Specifying the objectives of the curriculum and classifying them using revised Bloom's taxonomy of educational objectives provides a framework for (i) planning of teaching and (ii) performance assessment of students. Alignment refers to the degree of correspondence among the curricular objectives, teaching and performance assessment. The method of determining the degree of alignment using the Taxonomy table is illustrated in this paper.

Key words: *Curriculum, Instructional Objectives, Taxonomy and Performance assessment.*

Introduction

In any endeavor, objectives help us to focus our attention and our efforts, as they indicate what we want to accomplish. When we teach, we want our students to learn. What we want them to learn as a result of our teaching are our objectives. The objectives of a curriculum may be explicit or implicit, clearly or fuzzily conceived, easily measurable or not. In the past they were called aims, purposes and goals. Today they are referred to as content standards or curriculum standards (Kendall and Marzano, 1996[1]; Glatthorn, 1998[2]). Regardless of how they are stated and what they are called, objectives are present in all teaching.

Objectives are especially important in teaching because teaching is an intentional and reasoned act. Teaching is intentional because we always teach for some purpose i.e., to facilitate student learning. Teaching is reasoned because what teachers teach their students is judged by the educational system to be worthwhile. The reasoned aspect of teaching relates to what objectives teachers or autonomous colleges or universities select for their students. The intentional aspect of teaching concerns how teachers help students achieve the selected objectives, that is, the learning environments the teachers create and the activities, and experiences they provide. The teaching-learning activities and assessment procedures should be aligned with, or be consistent with, the selected objectives.

Usefulness of instructional objectives in technical education

Tyler, R (1964) [3] and Gagne, R.M (1965) [4] provide three reasons for specifying instructional objectives.

1. Instructional objectives provide guidance to the Teacher in planning of instruction:
   The teacher must determine at the start what the student will be able to do at the finish. A clear statement of this terminal performance enables the teacher to plan the steps the student must take to achieve it. During the planning phase the teacher will select the appropriate instructional methods and resources (materials & media) and decide on the amount of time required for instruction based on the instructional objectives and the entering behaviour of the student. Instructional procedures cannot accommodate differences in entering behaviour unless the teacher determines precisely what the student is able to do before instruction and what he is expected to do after instruction. Thus explicit statements of instructional objectives provide guidance to the teacher in planning his/ her instructional procedures.

2. Instructional objectives are useful in performance assessment:

   Clearly stated instructional objectives enable us to construct valid tests and test questions / items. The proper statement of objectives and the construction of test items interweave.

3. Instructional objectives help the student to focus his/ her attention and efforts:

   If the student knows beforehand what he must learn in any given unit / topic of instruction, he can better direct his own attention and efforts. When we consider how frequently students are unable to make even an approximate statement of what the teacher is trying to explain, the importance of this practice becomes convincing.
   A study by Mager and McCann (1961) [5] provides empirical support for the benefits students derive from knowing at the start the specific objectives they should attain. The researchers investigated three groups of engineers being trained on particular engineering tasks. In the first group the instructor selected and ordered all the content. In the second group the students selected and ordered all the content which they studied. In the third group the investigators presented the students with a detailed list of the instructional objectives, each one illustrated by the kinds of questions they were expected to answer. Mager and Mc Cann then allowed these students to instruct themselves in any order and by whatever procedures they desired; the students reported to the instructor when they were ready to demonstrate their achievement of the objectives. The investigators found that the training time for the third group was 65 percent less than that for the other groups without any loss in achievement. Thus much learning can occur when the teacher does nothing beyond presenting the student with the list of instructional objectives.

Bloom's taxonomy of objectives

The taxonomy provides a classification system for educational objectives that is analogous to the classification scheme used for plants and animals.
Bloom, B.S (1956)[6] and his associates of U.S.A. have classified educational objectives into the following three broad categories or domains.

1. Cognitive Domain (Thinking)
2. Affective Domain (Feeling and Attitudes)
3. Psychomotor Domain (Acting or Doing)

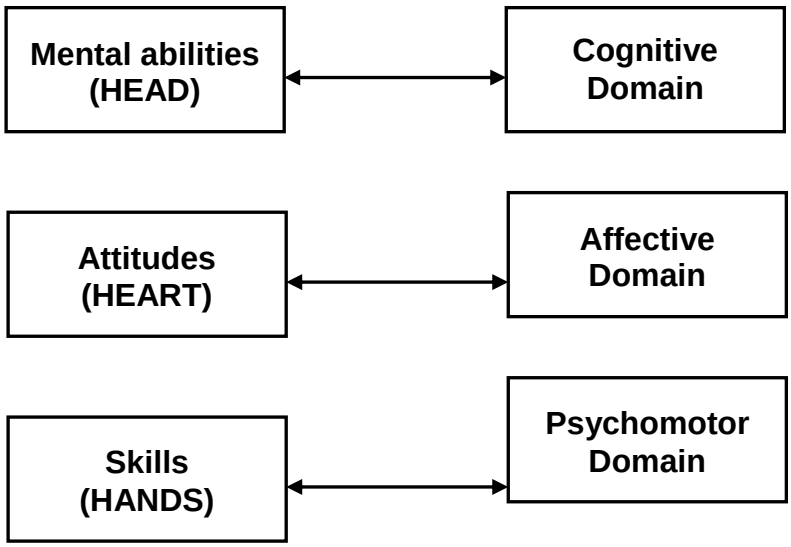

Figure 1: Main Categories of Human Behaviour

When learning takes place the first activity is a mental process trying to understand, analyse, synthesize and link up the new information with something already known. This thought process comes under the "Cognitive domain".

At the second stage, the knowledge acquired begins to produce changes in the interest, attitudes and feelings of the learners. The objectives describing these changes are classified under "Affective Domain".

Finally the change in attitudes and feelings results in a change in physical activities. Objectives describing these activities are categorized as belonging to the "Psychomotor Domain".

Each of the three domains mentioned above can be further split up into categories, which are also in a hierarchical order.

Categories in the Cognitive Domain (B.S. Bloom, 1956):

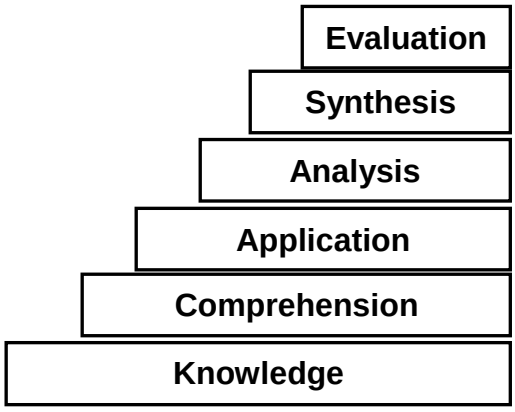

Figure 2: Hierarchical order of the categories in the Cognitive Domain

The six categories listed above are arranged in order of increasing complexity. They begin with the relatively simple recall of factual information, go to the lowest level of understanding (comprehension) and then proceed through the increasingly complex levels of application, analysis, synthesis and evaluation. This scheme for classifying student behaviour is, thus, hierarchical in nature i.e., the more complex behaviours include the simple behaviours in the lower categories.

Revised bloom's taxonomy

Taxonomy is a special kind of framework. In taxonomy the categories lie along a continuum. The continuum becomes one of the major organizing principles of the framework. A statement of an objective contains a verb and a noun. The verb generally describes the intended *cognitive process*. The noun generally describes the *knowledge* students are expected to acquire. Consider the following example: "The student will learn to differentiate (*the cognitive process*) between rational numbers and irrational numbers, (*the knowledge*)".

In contrast with the single dimension of the original Taxonomy proposed by Bloom, B.S (1956) [6] the revised framework of Anderson, L.W. et al (2001) [7] is two-dimensional. The two dimensions are cognitive process and knowledge. We refer to their interrelationships as the Taxonomy table (see Table 1). The cognitive process dimension (i.e., the columns of the table) contains six categories: Remember, Understand, Apply, Analyze, Evaluate, and Create. The continuum underlying the cognitive process dimension is assumed to be cognitive complexity; that is, Understand is believed to be more cognitively complex than remember, apply is believed to be more cognitively complex than understand, and so on.

Table 1: The Taxonomy Table

The Knowledge Dimension	The Cognitive Process Dimension					
	1.Reme-mber	2.Under-stand	3.Ap-ply	4.Ana-lyze	5.Eval-uate	6.Cre-ate
A. Factual Knowledge						
B. Conceptual Knowledge						
C. Procedural Knowledge						
D. Meta-Cognitive Knowledge						

Source: Anderson, L.W. et al (Ed) 2001 P. 28

The knowledge dimension (i.e., the rows of the table) contains four categories: Factual, Conceptual and Procedural and Metacognitive. These categories are assumed to lie along a continuum from concrete (Factual) to abstract (Metacognitive). The Conceptual and Procedural categories overlap in terms of abstractness, with some procedural knowledge being more concrete than the most abstract conceptual knowledge.

To see how the Taxonomy Table helps us understand objectives, consider the aforementioned objective regarding categories of numbers. The verb-"differentiate"-provides clues to the desired cognitive process. "Differentiate" is associated with the cognitive process category Analyze. The noun phrase-"rational and irrational numbers"-which are numerical categories gives clues to the desired type of knowledge. "Numbers" signify conceptual knowledge because categories are concepts. In terms of the Taxonomy Table, then, the objective involves Analyze and Conceptual knowledge. In the Taxonomy Table, the objective is placed in the cell where the row labeled Conceptual knowledge intersects the column labeled Analyze.

Uses of taxonomy of objectives

Taxonomy of objectives is useful in tackling the following four issues:

1. What is important for students to learn in the limited time available? (the curriculum question)

2. How does one plan and deliver instruction that will result in high levels of learning for large numbers of students? (the teaching question)

3. How does one select or design assessment instruments and procedures that provide accurate information about how well students are learning? (the assessment question)

4. How does one ensure that curricular objectives, teaching and assessment are consistent with one another? (the alignment question)

Curricular Objectives and Instructional Time:

One of the most common and long-standing curriculum questions is What is worth learning? This is the first issue to be addressed. If the curricular decisions are not made about what is worth learning, then teachers are likely to simply run out of time.

Looking through the lens of the Taxonomy Table, teachers can see more clearly the array of possible objectives as well as the relationships among them. Thus, when we analyze all or part of a curriculum in terms of the Taxonomy Table, we can gain a more complete understanding of the curriculum. Rows, Columns and Cells that have numerous entries become evident, as do those that have no entries at all. An entire row or column that has no entries can alert us to the possibility of including objectives that heretofore had not been considered.

The Taxonomy framework obviously can't directly tell teachers what is worth learning. But by helping teachers translate standards into common language for comparison with what they personally hope to achieve and by presenting the variety of possibilities for consideration, the Taxonomy provides some perspective to guide curriculum decisions.

Objectives and Teaching:

Once an objective has been placed into a particular category in the Taxonomy, we can begin systematically to attack the problem of helping students achieve that objective. Thus, the second issue involves teaching. For this issue we have to consider the following two aspects:

1. Different types of objectives require different instructional approaches, that is, different learning activities, different resource materials and different teacher and student roles.

2. Similar types of objectives-regardless of differences in the topic or subject matter-may require similar instructional approaches (Joyce and Weil, 1996) **[8]**.

Given particular kinds of instructional goals, Romizowski (1981) [9], for example, lists a variety of instructional characteristics that facilitate their achievement. Classifying a particular objective within the framework of the taxonomy, then, helps teachers systematically plan a way of effectively facilitating students learning of that objective.

Objectives and Assessment:

The two aspects in the proceeding section (6.2) apply to assessment as well, which brings us to the third issue. Different types of objectives (that is, objectives in different categories of the taxonomy) require different approaches to assessment. Similar types of objectives (that is, objectives in the same category of the taxonomy) require similar approaches to assessment.

Aligning Objectives, Teaching & Assessment

Alignment refers to the degree of correspondence among the objectives, teaching and assessment. It is an important issue to be tackled. Alignment refers to the degree of correspondence among the curricular objectives, teaching and assessment. Planning for teaching is "Objective-driven", the Teaching process is "Activity-driven", and Assessment process is "Test-driven". Mapping of all the three processes in the Taxonomy Table will help us to identify misalignments. Misalignments can cause problems which will affect the effectiveness and efficiency of the educational process.

If, for example, instruction is not aligned with assessments, then even high-quality instruction will not likely influence student performance on those assessments. Similarly, if assessments are not aligned with objectives, then the results of the assessments will not reflect achievement of those objectives.

The degree of alignment is determined by comparing curricular objectives with assessment, objectives with teaching and teaching with assessment. The taxonomy table provides an important framework to facilitate comparisons. The taxonomy is a kind of touchstone; its carefully defined terms and organization provide precision across the three comparisons. Thus, a taxonomy table can be prepared using different notations for objectives, for teaching and for assessments as each is classified in the cells of the table. By determining whether notations for all three – objectives, teaching activities and assessments – appear together in the individual cells of the table (strong alignment), or some cells contain only two of them (weaker alignment), or many cells contain only one of them (weakest alignment), we gain a deep insight of alignment. Such an insight will facilitate ensuring consistency between intended student learning and actual student learning.

Conclusion

The need for and usefulness of specifying instructional objectives in the Curriculum document has been highlighted in this paper. Classifying instructional objectives using Revised Bloom's Taxonomy will ensure alignment among Curriculum, Classroom teaching and Assessment. In view of the above the following recommendations are made:

1. Curriculum document should include specific instructional objectives of each course.

2. The objectives of the curricula have to be classified using Revised Bloom's Taxonomy.

3. Curriculum developers, teachers and question paper setters should be trained in specifying and classifying objectives in order to make the teaching, learning and evaluation process effective and efficient.

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