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Falling in Line: Curricular Alignment in a Library Credit Course

by Michael H. Aldrich

Curricular alignment is where all three parts of teaching (the learning objectives, the instruction itself and the assessment) are in congruence. In other words, there is a strong link between what instructors are trying to teach (learning objectives) and how they actually teach it (instruction), a strong link between what instructors are actually teaching (instruction) and how they determine if it has been taught (assessment) and, finally, a strong link between what instructors are trying to teach (learning objectives) and how they determine if it has been taught (assessment). (Anderson 2002)

The reasons for demonstrating curricular alignment are fourfold: one can better examine student learning in light of their schooling experience regardless of other sources of knowledge and/or skills; one can understand the differences in the effects of instruction on student success; poorly aligned curriculum can lead to our underestimating the effects of schooling on students; and curricular alignment is central to the success of accountability programs. (Anderson 2002)

One tool that has been used to determine curricular alignment is Bloom's Taxonomy, which has recently been updated in light of new knowledge and theory.

Background

In 1956, Benjamin S. Bloom and others published their *Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain*, a framework that has been used by many to examine instructional objectives, activities and assessments in light of where they fall in the cognitive continuum. This information could then be used as a basis for instructional design, test design and curriculum development (Anderson & Krathwohl 2001). The original taxonomy consisted of six major cognitive categories arranged in the following order: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. Each of these categories included subcatagories, and all were presumed to lie along a continuum, from simple cognitive abilities to complex ones and from concrete cognitive skills to abstract ones (Anderson & Krathwohl 2001, Bloom 1956).

Bloom's Taxonomy, as it became known, is still used to analyze competencies (Ven & Chuang 2005), link assessment and learning strategies (McConnell, Steer, & Owens 2003), evaluate assessment (Knecht 2001) and even analyze and improve writing (Granello 2001). The structure and ease of use of the Taxonomy make it versatile and easily used to meet a variety of needs.

If Bloom's Taxonomy works so well, why was it felt a revision was needed? That question is addressed in the preface of *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (hereafter Revised Taxonomy) where two reasons are given: to "refocus educators' attention on the value of the original *Handbook*" and also to meet the "need to incorporate new knowledge and thought into the framework." (Anderson & Krathwohl 2001, xxi-xxii)

The Revised Taxonomy makes some significant changes to Bloom's taxonomy. The most obvious change is separating the Knowledge category from the original Taxonomy into a separate dimension, thereby changing the Taxonomy from a one-dimensional framework to a two-dimensional framework that allows for more accurate classification. In this, the Revised Taxonomy recognizes that there are two parts of educational objectives, instruction

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and assessment. They generally consist of (1) subject matter (knowledge) and also (2) what is to be done with that knowledge (cognitive process) (Krathwohl 2002). Thus, if the objective is "Students will identify functional areas of the library," the subject matter is "functional areas of the library" while the cognitive process is "identify."

This new Knowledge dimension has four categories of knowledge: Factual Knowledge, Conceptual Knowledge, Procedural Knowledge and Metacognitive Knowledge. Each category has subcategories as well. The Cognitive Process dimension retains six categories, but there are substantial changes from the original Taxonomy. While still retaining the hierarchal structure in this dimension of the original Taxonomy, it is recognized in the Revised Taxonomy that there is overlap, and the strictness of the original Taxonomy is relaxed. The categories in the Cognitive Process dimension in the Revised Taxonomy are: Remember, Understand, Apply, Analyze, Evaluate and Create. (Krathwohl 2002, Anderson & Krathwohl 2001)

The two-dimensional nature of the Revised Taxonomy allows the creation of a Taxonomy Table, with the Knowledge dimension as the vertical axis and the Cognitive Process dimension as the horizontal axis. The table can provide a visual perspective of how objectives, instruction and assessment fall into place in the Revised Taxonomy. (Krathwohl 2002, Anderson & Krathwohl 2001) *See Taxonomy Table 1, at right.*

As learning objectives, instructional methods and assessments are analyzed using the Revised Taxonomy, they can be placed on the Taxonomy Table to check alignment, examine inconsistencies and look for further areas of growth.

There are four steps in using the Taxonomy Table to check alignment. The first step is to place each learning objective in the appropriate cell or cells of the Table. After the objectives are in place, then place each instructional activity in the appropriate cell or cells of the Taxonomy Table. Next, place each assessment task (or test item) in its appropriate cell or cells. Finally, compare the completed Taxonomy Tables. Alignment is indicated by the number of common cells in evidence. Complete alignment occurs when all three areas (objective, instructional activities and assessment) occupy the same cell. Partial alignment is also possible, when all three occur in the same row (type of knowledge) or the same column (cognitive process). (Anderson 2002)

Methodology & Results

In order to check the curricular alignment in the introductory course (LIBR1101), the three areas of curricular alignment will be examined: learning objectives, instructional activities, and assessment.

For the first area, learning objectives, the Learning Outcomes given in the course syllabus were used. There are seven outcomes listed:

1. Students will understand the intellectual organization of information sources and the consequences of that organization in accessing information.

2. Students will be able to identify functional areas of the library and understand their significance to the research process.

3. Students will recognize the various types of information sources they will encounter while doing research and will understand the appropriate use of the different types of information sources.

4. Students will be able to access, evaluate, and select research materials.

5. Students will learn the principles of proper documentation.

6. Students will learn the principles and techniques of using the Internet for research.

7. Students will be competent in the use of a library and its resources.

These seven outcomes were examined in light of the Revised Taxonomy. *When placed on the Taxonomy Table, they appear as shown in Table 2: Learning Outcomes on page 9.*

The heaviest area of concentration for the Learning Outcomes is in area 2B (Understand Conceptual Knowledge). Slightly less concentration was found in areas 3B (Apply Conceptual Knowledge) and 3C (Apply Procedural Knowledge).

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge						
B. Conceptual Knowledge						
C. Procedural Knowledge						
D. Metacognitive Knowledge						

Table 1: The Taxonomy Table

Instructional activities are the next to be examined. Since the class is given online, there was a measure of uncertainty regarding the instructional activities. The class requires that students read the lessons online, participate in bulletin board discussions and complete specific assignments throughout the semester. Of these assignments, which are appropriate instructional activities? Are some of the assignments that include instructional material considered instruction, are they only assessment or are they both? For this study, it was decided to only examine the lessons themselves because they comprise the clearest evidence of instruction for the course. The other aspects of instruction may be examined at a later time.

So how should the lessons be examined? Since each lesson has clearly stated objectives, those objectives were the basis for this part of the study. There are 14 lessons in the course, each with between two and five objectives, for a total of 51 objectives. Plotting that many objectives on the Taxonomy Table could be problematic or cluttered. Instead of placing each objective on the table, each lesson is represented on the table. So while Lesson 1 has five separate objectives, it only appears on the Taxonomy Table in two areas because two of the objectives fall in Area 1A (Remember Factual Knowledge) and the other three are in area 2B (Understand Conceptual Knowledge). *Table 3, at right, is the Taxonomy Table with the instructional activities placed upon it.*

The highest area of concentration is 2b (Understand Conceptual Knowledge), with 2C (Understand Procedural Knowledge) just below it and 3B (Apply Conceptual Knowledge), 1A (Remember Factual Knowledge) and 3C (Apply Procedural Knowledge) behind.

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge	Obj. 2, Obj. 3					
B. Conceptual Knowledge		Obj. 1, Obj. 2, Obj. 3, Obj. 5, Obj. 6, Obj. 7	Obj. 3, Obj. 5, Obj. 6, Obj. 7	Obj. 4, Obj. 6	Obj. 4, Obj. 6, Obj. 7	Obj. 5
C. Procedural Knowledge		Obj. 6, Obj. 7	Obj. 4, Obj. 5, Obj. 6, Obj. 7	Obj. 6	Obj. 6, Obj. 7	
D. Metacognitive Knowledge						

Table 2: Learning Outcomes

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge	L1, L3, L5, L8, L9, L11					
B. Conceptual Knowledge		L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14	L6, L7, L9, L10, L11, L12, L14	L2	L2, L13	
C. Procedural Knowledge		L2, L3, L4, L5, L6, L7, L7, L9, L10, L11, L12, L14	L2, L4, L5, L6, L7, L9	L5	L5, L13	L5
D. Metacognitive Knowledge						

Table 3: Instructional Activities

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge	7	4				
B. Conceptual Knowledge	4	16	1	3	4	
C. Procedural Knowledge		2	3	2	5	
D. Metacognitive Knowledge						

Table 4: Assessment

The last area to examine is assessment, in this case the final exam. The first step is to determine where each question on the final exam would be classified in the Taxonomy Table. After that was determined, a notation was made in the appropriate area of the table, so that total number of questions in an area are represented in each cell of the table. *The result was Table 4, above, which shows the number of*

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The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual Knowledge	LO-2 IA-6 A-7	A-4				
B. Conceptual Knowledge	A-4	LO-6 IA-14 A-16	LO-4 IA-7 A-1	LO-2 IA-1 A-3	LO-3 IA-2 A-4	LO-1
C. Procedural Knowledge		O-2 IA-12 A-2	LO-4 IA-6 A-3	LO-1 IA-1 A-2	LO-2 IA-2 A-5	IA-1
D. Metacognitive Knowledge						

Table 5: The Combined Table

questions that fell in each appropriate area.

The highest area of assessment is 2b (Understand Conceptual Knowledge), with 1A (Remember Factual Knowledge) and 5C (Evaluate Procedural Knowledge) with far fewer.

Once the Taxonomy Tables have been completed for all three areas, the final step is to compare the tables. *The combined information, plotted onto one Taxonomy Table, is shown above in Table 5.*

On this table, LO represents Learning Objectives, IA is Instructional Activities and A is Assessment, with the number of each given as a number in each cell. There is obviously great overlap among the three, with each having the highest number in area 2B (Understand Conceptual Knowledge). Overlap exists among all three areas in nine of the cells, with four other cells only containing one area (two for assessment, one each for learning outcomes and instructional activities).

Discussion and Conclusion

Overall, the results of this examination show strong alignment among the three areas under consideration. This indicates that there is a strong connection between what is expected to be learned, what is taught and what is assessed. Learning is demonstrated that relates to what is expected to be taught, teaching is recognized as relating to what is being tested, and accountability is shown by providing students with the opportunity to learn and to meet the standard related to the course. (Anderson 2002)

Results for some areas do not show strong alignment. These areas of concern are the four out of 13 areas that produced no overlap. Each area produces a different concern, depending on which curricular area is involved. Areas 1B (Remember Conceptual Knowledge) and 2A (Understand Factual Knowledge) have only assessment items in them. This omission could lead to the supposition that areas are being assessed or tested that have not been taught and might be areas that students are not expected to learn from the course. A closer examination of test questions in this area may lead to change in what is tested or how it is tested in order to bring alignment to the assessment.

Area 6B (Create Conceptual Knowledge) has only a learning outcome in it, with no instruction or assessment. This would indicate an area that is an unnecessary outcome, or it may indicate a need to reconsider instruction to include teaching the outcome to students, then assessing it appropriately.

Finally, area 6C (Create Procedural Knowledge) is only taught to students, without being recognized as an outcome or being subsequently assessed. This could indicate wasted teaching time, which could be better used to teach more necessary concepts. Since it is also not assessed, it could undermine the instructor's standing with the students; he/she is wasting students' time with material not necessary for them to know to succeed in the class.

If it is determined that what is being taught in this area is necessary, a re-evaluation of the outcomes would be in order as well as a way to assess the teaching.

The other factor to consider is that this study only examined the final exam of the course as the assessment. There were other assessment activities (worksheets, application assignments, midterm and semester project) that would influence the outcome of curricular alignment. These areas would be fruitful for further study, keeping in mind that an instructor uses worksheets as instructional materials as well as assessment.

The process of examining curricular alignment using the Taxonomy Table can better equip educators with the understanding of the relationship between what they say is taught (objectives), what they actually teach (instruction) and what they test on what we teach (assessment). This understanding can lead to clearer objectives, more focused teaching and improved assessment, all of which benefit students. ⏭

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