

Bloom Taxonomy Of Educational Objectives And The Modification Of Cognitive Levels

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ABSTRACT

The author is of the opinion that the Bloom taxonomy of educational objectives particularly the six cognitive levels should reflect the levels of cognitive development and thinking of students. This thinking pattern would no doubt, reflect the student's environment and his genetic composition. In the light of this, Bloom's cognitive levels should not be generalised and it would be better if the six levels are collapsed into low, Medium and high cognitive process.

Key words: Bloom taxonomy, Educational objectives, Cognitive levels, Cognitive development, Students

INTRODUCTION

Bloom's Taxonomy provides an important framework for teachers to use to focus on higher order thinking and by providing a hierarchy of levels, this taxonomy can assist teachers in *designing performance tasks*, crafting questions for conferring with students, and providing feedback.

THE LEARNING DOMAINS

The Bloom's Taxonomy was created in 1956 under the leadership of Dr. Benjamin Bloom who is an Educational Psychologist and their aim was to promote higher form of thinking in education, such as analysing and evaluating rather than just remembering facts which is mere rote learning.

The three identified domains of learning on educational activities are:

- Cognitive – **mental skills or knowledge**
- Affective – **growth in feelings or emotional areas (attitude or self)**
- Psychomotor – **manual or physical skills**

If domain is referred to as categories and some people simply refer to the three categories as KSA (Knowledge, Skills and Attitude) then it would not be out of place if we conclude that the taxonomy of learning behaviour is *"the focus of the learning process"*. However, the psychomotor domain is not well dealt with by Bloom committee perhaps because their experience is limited and they have little knowledge of what goes on in say, drama or sports. But the main concern of this paper is the *cognitive domain*.

THE COGNITIVE DOMAIN

This, according to Bloom (1956) involves knowledge and the *development of intellectual skills*. There are some major categories which is from the *simplest behaviour* to the *most complex*. It is therefore logical to say that the lower or simplest ones must be mastered before the higher or complex ones.

The categories in order of hierarchy are:

- vii. Knowledge – **This has to do with real data or information. Commonly used words are: *arranges, defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.* A very good example is “itemise the steps involved in test construction”.**
- viii. Comprehension – **This has to do with *understanding* the meaning, translation, interpolation, and interpretation of instructions and problems, state a problem in one’s word. Example is when you *apply* what is learnt in the classroom into novel situation in your place of work. The use of algorithm to solve a problem is another one. Commonly used words are: *applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies and operates.***
- ix. Application – **This involves the use of concepts in a new situation and application of what was learned into a novel situation. Application of a new law to solve a problem. Commonly used words are: *applies, computes, constructs, demonstrates, discovers, manipulates, modifies and operates.***

This first three is regarded as being belong to the lower order of thinking while the last three levels are classified as higher order.

- x. Analysis – **This involves separation of material or concepts into component parts. It is also ability to differentiate between facts and inferences. A very good example is when we categorise participants and then fashion-out the type of training for each category. Commonly used words are: *analyses, break down, compares, contrast, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects and separates.***
- xi. Synthesis – **This is the building of a structure or pattern from diverse elements. Put parts together to form a whole, in order to create a new meaning or perhaps, a structure. Examples are designing a training to solve a problem, writing-out a programme for computation of results or designing a machine for specific task.**

Commonly used words are: *categorises, combines, compiles, composes, creates, devices, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarises, tells and write.*

- xii. Evaluation – **This is making judgements about the value of ideas or materials. Very good examples are: select the most effective solution or engage the most qualified/effective candidate. Commonly used words are: *appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarises and support.***

THE RATIONALE FOR MODIFICATION OF THE LEVELS

There is enough evidence to show that the original six levels of Bloom cognitive process are obsolete. According to Anderson and Krathwohl (2001) the levels could be modified to be:

- Remembering
- Understanding
- Applying
- Analysing
- Evaluation and
- Creating

This is to say that you create new information after you might have evaluated or made valid judgment.

The evolution of the New Terms from the Original Terms was coined in the work of Pohl (2000).

It is necessary to mention that Lorin Anderson was a former student of Bloom and the most remarkable modification he made in the mid-nineties was the change of the six categories from **noun** to **verb** forms and slightly rearranging them.

This new taxonomy was seen **as reflecting a more active form of thinking and is perhaps more accurate.**

It is necessary to note that if we want to move with time particularly with knowledge explosion, I see the original and new domain as not well suited to the operation of what goes on in the teaching and learning situation. It is very necessary to **applaud** the effort made by some members of academia by deeming it fit to condense the six levels into three that is; **Knowledge, Understanding** and **Thinking**. My personal opinion about this arrangement is that knowledge is simply based on regurgitation of information and anchored on rote learning, understanding cannot stand the test of time because **understanding** is reflected under **comprehension** in the six categories when we marry Bloom and Anderson levels and comprehension is under the lower level of cognitive process. The implication of this is, understanding/comprehension, are in the middle cognitive thinking process. Are we then saying that once a student understands, he or she can **apply** and **analyse**. This is not possible.

The last category, **Thinking** cannot be all encompassing. What the category is saying is that once you can think, you can **apply, analyse, synthesize, evaluate** and with the new domain, **create**. This is not humanly possible.

MY OWN CONTRIBUTION

The idea of having to replace **synthesis** with **evaluation** and making **creating** to replace **evaluation** is not acceptable to me as we have in the new domain of Lorin Anderson.

If we remember that Bloom is referring to cognitive learning process, then the six levels of Bloom could still stand but for it to be more meaningful and fit favourably well with the cognitive process, we can then collapse the six levels into three as shown below:

Six Levels of Bloom		Modified Form
1.	Knowledge	1 & 2 (Lower Order)
2.	Comprehension	
3.	Application	3 & 4 (Medium Order)
4.	Analysis	
5.	Synthesis	5 & 6 (Higher Order)
6.	Evaluation	

NOTE that the order refers to cognitive process; problem solving and critical thinking belongs to **Higher Order Cognitive Process**.

Lorin Anderson et al Category

Original Domain			New Domain	
1.	Knowledge	→	Remembering	
2.	Comprehension	→	Understanding	
3.	Application	→	Applying	
4.	Analysis	→	Analysing	
5.	Synthesis	↘	Evaluating	
6.	Evaluation	↗	Creating	

You could notice that *knowledge* and *remembering* are synonymous according to the new domain. The same applies to *comprehension* and *understanding*.

BLOOM TAXONOMY ACTION VERBS

Some of the revised action verbs are:

1. **Remembering:** Exhibit memory of previously learned material by recalling facts, concepts and answer
2. **Understanding:** Demonstrate understanding of facts and ideas by organising and comparing
3. **Applying:** Solve problems to new situation by applying acquired knowledge, facts and rules in different ways
4. **Analysing:** Examine and break information into parts by identifying motives or causes, make inference.
5. **Evaluating:** Present and defend options by making judgement about information, validity of ideas
6. **Creating:** Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.

Verbs

1. Choose, Define, Find, How, Label
2. Classify, Compare, Contrast, Demonstrate, Explain, Illustrate
3. Apply, Build, Choose, Construct, Identify, Develop
4. Analyse, Assume, Categorise, Classify, Compare, Contrast, Distinguish, List
5. Agree, Appraise, Assess, Award, Choose, Criticise, Decide, Deduct, Determine, Estimate, Evaluate
6. Adapt, Build, Change, Combine, Compile, Construct, Create, Design, Develop, Discuss, Modify, Predict

The modification made by Lorin Anderson and his group is unwieldy and it is loaded with some repetitions in a way, the more reason why we should have a manageable three levels which would be direct and easier to identify and cope with.

If the motive of Bloom is 'cognitive', it then becomes necessary to have an in-depth knowledge of this word in order for us to know how students can operate within himself and in a testing situation after the intervention with a teacher.

Cognitive concerns with the act or process, knowing and perceiving. This is to say precisely that there is **cognitive development** and **cognitive functioning**. It therefore relates to the mental processes of perception, memory, judgement and reasoning and looking at this critically, it is more or less the summary of Bloom's level of cognitive development.

COGNITIVE DEVELOPMENT

This refers to a large group of private house or apartment houses often of similar design, constructed as a unified community especially by a real **estate developer** or government organisation. The developer in academic community like ours is the **teacher**. The development of low, medium or higher order cognitive skill by the student is dependent on the student himself or herself and the teacher output.

Cognitive development therefore is a field of study in neuroscience and psychology focusing on a child's development in terms of **information processing, conceptual resources, perceptual skill, language learning** and other aspect of brain development, ability to think and understand.

The Piagetian cognitive development or Genetic epistemology is now obsolete. It is now replaced by **Information Processing Theory, neuro-Piagetian theories of cognitive development**, which aim to integrate Piaget's ideas with more recent models and concepts in development and cognitive science; theoretical cognitive neuroscience and social constructivist approaches.

For the purpose of this paper, I will like to make a deduction as to whether the cognitive development is based on **nature** or **nurture** and finally further make case for the collapse of the Bloom's six levels into three that is, lower, medium and higher order cognitive processes or skills as the case may be.

Thus, is the cognitive development dependent on individual innate (nature) ability or on their personal experience (nurture)? It is my candid opinion that no matter the experience a teacher provides for a student, his genetic composition would play an important function. Student cannot be made to perform higher cognitive process if his nature cannot cope with it no matter the method adopted by the teacher. Therefore, both nature and nurture are important in any cognitive task.

In his Book on Human Cognitive Abilities, Carroll (1993) devoted chapter 15 to Higher Order Cognitive factors, chapter 16 to three-stratum theory of cognitive abilities and chapter 17, Outline of the implications of such a theory for problems of **nature** and **nurture**. The categorisation of cognitive skills is further corroborated by Uri Zoller & Georgios Tsaparlos (1997) in their paper on Higher and Lower Order Cognitive Skills: The case of chemistry.

It could be observed that the above references are a pointer to the fact that the three cognitive processes or skills i.e lower, medium and higher are what students adopt when they are confronted with any task in an education enterprise. It is therefore of paramount importance to condense the six levels, be it of Bloom or Lorin Anderson et al into three levels which are logically related to student's cognitive process which they adopt whenever they are confronted with any task.

THE PROCESS AND RATIONALE FOR THE CATEGORISATION OF THE TASK

Although, the tasks could fall into any of the cognitive levels of Bloom's but it is the cognitive development level of students that would determine the actual level of the task. A student

could find a task under application level difficult and consequently, categorises the task as high cognitive task.

This is why a teacher should have question bank which is usually compiled along with the lesson plan. These questions are expected to be tried during lessons and the responses of students determine whether the questions should be modified or even reframed. It now becomes the prerogative of the teacher to categorise the question into low, medium or high cognitive task. The categorisation of these tasks would depend on the students' cognitive level and his environment together with his genetic composition.

Students from developed countries of the world are not expected to think the same way as those from developing countries. The Bloom cognitive levels should not be generalised and in my own opinion, the levels should pave way for the new categorisation of cognitive tasks into Low, Medium and High cognitive levels. In this new arrangement, problem solving and critical thinking could still maintain their high cognitive level

CONCLUSION

The cognitive levels of Bloom and his group is a good contribution to teaching and learning and the modification made by Lorin Anderson et al is also commendable particularly in the usage of the verbs but because the genesis of the level is cognition, it is better to collapse the six levels into three to reflect the order of cognition expected of students in performing tasks. This is exactly what I did in this paper.

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