

Case Studies in Three Domains of Learning: Cognitive, Affective, Psychomotor

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Abstract—Bloom's Taxonomy has been changed during the years. The idea of this writing is about the revision that has happened in both facts and terms. It also contains case studies of using cognitive Bloom's taxonomy in teaching geometric solids to the secondary school students, affective objectives in a creative workshop for adults and psychomotor objectives in fixing a malfunctioned refrigerator lamp. There is also pointed to the important role of classification objectives in adult education as a way to prevent memory loss.

Keywords—Adult education, affective domain, cognitive domain, memory loss, psychomotor domain.

I. INTRODUCTION

BENJAMIN S. Bloom, an educational psychologist found himself faced with a problem: preparing annual comprehensive examinations [5], [7], [12], [15]. He knew lots of measurement specialists having same difficulties. In 1949 he established a meeting and enlisted them from across the US. They met each other twice a year to consider progress, make revisions, and plan the next steps. The group separated into committees and each group was in charge of studying on one domain of three: Cognitive, Affective and psychomotor [11], [14], [16]. Bloom undertook the analysis of cognitive domain and began to develop the idea of cognitive taxonomy in 1956.

They published *Taxonomy of Educational Objectives: The Classification of Educational Goals Handbook I: Cognitive Domain* in 1956 and the classification of Educational objectives *Handbook II: Affective domain* in 1965 [11]. Despite plenty of material existed in cognitive domain to evaluate the performance and achievement, available materials in affective domain were insignificant. The committee members were unable to write a handbook on psychomotor objectives domain [1], [2].

II. DISCUSSION

Benjamin Bloom defines the word Taxonomy from Webster dictionary as: "a classification of animals and plants according to their natural relationships", We read in his book: "most of readers will have heard of biological taxonomies which permit classification into categories such as ... Biologists have found their taxonomy markedly helpful as a means of ensuring accuracy of communication about their science and as a means of understanding the organization and interrelation of the various parts of the animal and plant world. You are reading

about an attempt to build an educational taxonomy. It is expected to be a general help to all teachers, administrators, professional specialists, and research workers who deal with curricular and evaluation problems."

But the group of college examiners was not sure enough that organizing a classification of objects could be observed and manipulated firmly as is done in the natural sciences. In addition teachers who use the taxonomy might not focus on thinking and planning with regard to curriculum. On top of that some of them were afraid of atomizing educational purposes.

On the other hand they hoped that their taxonomy would be a language related to educational objectives and a suitable system for describing and ordering test items, examination techniques, and evaluation instruments. Besides educators can compare and study educational programs. Within the domains, learning at the higher levels depends on knowledge and skills obtained at lower levels. The six levels of Bloom's taxonomy motivate educators to focus on all three domains and create a more comprehensive form of education. While traditional education continues to provide skill practices in the lower-order objectives.

As we read in the second volume that was published in 1965, the classification did not have a systemic rationale of construction. As a result Lorin Anderson, one of the Bloom's students revised the original taxonomy and initiated in more systematic lines in 2001 [3], [13]. (Fig. 1) It is generally considered that the role of taxonomy to systematize a field was more important than any lack of rigor in its construction.

Some critiques of the taxonomy's cognitive domain admit that these six categories are existed, but they argue about the order and sequence between levels. Often, educators view the ranking of taxonomy and drop the lowest levels as unworthy of teaching. Others believe that learning of the lower levels enables the building of skills in the higher levels of the taxonomy. Although in the revised edition of Bloom's taxonomy Synthesis has moved to the highest level, some consider the three higher levels as parallel.

Since any cognitive task includes many processes, the distinction between the categories can be observed as artificial. In fact taxonomies of mental processes generally can come under this kind of criticism.

The levels of cognitive domain are: remembering, understanding, applying, analyzing, evaluating, and creating [3], [6], [8].

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Fig. 1. Schematic view of original and revised version of cognitive domain

III. CASE STUDY USING BLOOM'S COGNITIVE DOMAIN TO TEACH CUBOIDS PROPERTIES TO THE SECONDARY SCHOOL STUDENTS

The students were asked to bring some boxes like match or tissue box to the class. The plan was applying taxonomy to teach cuboids properties as a basic 3D shape. References [4], [9] have been inspiring in this approach.

Each group put its box on the desk. There were cubes, cuboids and cylinders.

Remembering: At the end of the session students will be able to answer these questions:

- Do you know what are these shapes called in geometry?
- Can you recall the cuboids' properties that you have learned in elementary school and share with your classmates?
- **Understanding:** At the end of the session students will be able to answer these questions:
 - How do you identify the cubes from cuboids?
 - Can you give a few examples of other cuboids shaped objects in the class?
- **Applying:** At the end of the session students will be able to answer these questions:
 - Can you show faces of cuboids to the class?
 - How do you measure the edges using a ruler?
 - How many corners do cuboids have?
- **Analyzing:** At the end of the session the students will be able to answer these questions:
 - Can you distinguish the length and width of a face?
 - Can you compare the surface area of faces and tell the

class what do you infer?

- **Evaluating:** At the end of the session students will be able to answer these questions:
 - How do you support your opinion?
 - What is the formula for measuring cuboids' Total Surface Area?
- **Creating:** At the end of the session students will be able to answer these questions:
 - Can you make a model of a hospital by using the boxes?
 - Can you think of another approach to this task?

IV. APPLICATION TO ADULT EDUCATION

Teachers who work with adults are aware of the importance of using the Taxonomy to formulate their curricula as well as teachers who work with students [17]. Yet there is a considerable difference between these two fields of education. Unlike working with students, adult training needs to distinguish what the trainees know and what they need to know. Educators and trainers are supposed to provide the learning to fill that gap and the standard set of guidelines of Taxonomy prepares those learning objectives.

In the Diploma in Adult Education program offered by St. Francis Xavier University (Halifax, Canada), for instance, the curriculum refers to the knowledge, skills, attitudes, or KSAs, sought by the learners to bridge the gap between their present state of affairs, PSA, and the desired future state of affairs, FSA. The KSAs correspond to the three domains of learning: the cognitive with knowledge or intellectual skills (K); the psychomotor with physical skills (S), and the affective with attitudes (A). Every learning objective must be associated with one of these three domains. The educator or trainer should know what the learners want to know or to do or to feel at the end of the education or training program [10].

If the learning objective is that the learner obtains certain information, the lowest level of cognitive skills is enough. Accordingly, when the learner completed the program he or she should be able to repeat or summarize that information and the tests of evaluating are on this basis. Similarly, if the goal of the program is that the learner can solve problems or make decisions learning occurs at a higher level of the cognitive domain. The learner must be able to demonstrate specific application of the information along appropriate testing instruments.

The development of learning objectives in the affective domain is as difficult for educators and trainers as it was for the research team to develop their taxonomy. Reference [1], shows the affective domain is arranged from simple feelings to more complex feelings such as: receiving, responding, valuing, organizing, and internalizing values.

V. USING AFFECTIVE DOMAIN IN A CREATIVE WORKSHOP FOR WOMEN

A creative workshop occurred in a volunteer center at YWCA Montreal, Canada. Participants eagerly gathered around a table to do all kinds of art. The teacher showed them a map of Montreal and gave some instructions to make a map

by themselves. She cut the map into 15 pieces and asked everybody to select one and paint.

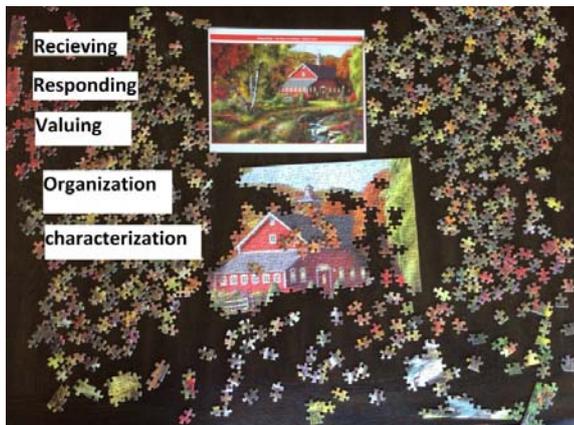


Fig. 2 Schematic view of effective domain

Receiving: Participants will be able to:

- select a piece of map and follow the instructions to work on it.

Responding: Participants will be able to:

- Discuss about the project, aid each other using tools and cutting papers. Use appropriate colors to paint and proper materials to decorate.

Valuing: Participants will be able to:

- demonstrate their cultural diversities when they work. Join to share and explain their piece of art to each other.

Organizing: Participants will be able to:

- adhere the limitation of time and complete their task. Combine the pieces and organize them like the original map.

Internalizing values (Characterization): Participants will be able to:

- propose a few sentences about the quality of their work and listen to other members while influenced by being a part of mosaic of the city where they live. (Fig. 4)

The objective of the learning program is to produce a change in the attitudes, values, or appreciation of the learners. While designing and doing is possible, the challenge is to create instruments that accurately evaluate learning. The learner should demonstrate that some changes and transformations have happened. If the program fails to achieve learning in the affective domain, the accomplishments in either or both of the cognitive and psychomotor domains may be failed.

With psychomotor learning, the learner should be able to perform some physical or motor skill as a result of the training program. The levels of psychomotor domain are: imitation, manipulation, precision, articulation, naturalization [1]. (Fig. 3)

VI. USING PSYCHOMOTOR DOMAIN TO REPAIR A MALFUNCTIONED FRIDGE LAMP

Imitation: The amateur mechanic will be able to:

Use the information from a website to troubleshoot

refrigerator, enter model number into the search box to find the right part that will fit the fridge [18].

Manipulation: The amateur mechanic will be able to:

Consider the possibility of a broken filament. Otherwise the socket needs to be checked.

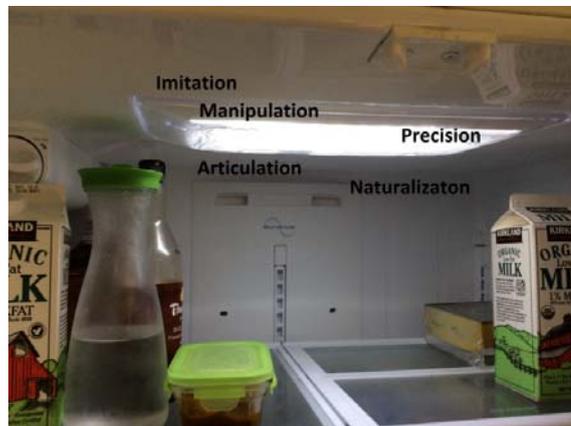


Fig. 3 Schematic view of psychomotor domain

Precision: The amateur mechanic will be able to: Replace the bulb and make sure it is “just right”. If there is a damaged socket removing the power is necessary.

Articulation: The amateur mechanic will be able to:

Combine a series of skills and create new strategies.

Naturalization: The amateur mechanic will be able to:

Invent new ways of problem solving and develop his style. Send a feedback to the helpful website.

VII. CONCLUSION

Although there were critical points when Bloom developed the taxonomy, five decades later it continues to guide educational practices. However it is believed that considering the classification of educational objectives in adult education is crucial. Adults, who do not suspend learning, keep their memories fresh for a long time. In the other words the more they keep their learning level higher according to the taxonomy the later experience memory loss.



Fig. 4 An illustration of the map of Montreal by participants of a creative workshop at YWCA Montreal, Canada - November 2013

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The Three Domains of Learning. The committee identified three domains of educational activities or learning (Bloom, et al. 1956): Cognitive: mental skills (knowledge). Domains may be thought of as categories. Instructional designers, trainers, and educators often refer to these three categories as KSA (Knowledge [cognitive], Skills [psychomotor], and Attitudes [affective]). This taxonomy of learning behaviors may be thought of as "the goals of the learning process." That is, after a learning episode, the learner should have acquired a new skill, knowledge, and/or attitude. While the committee produced an elaborate compilation for the cognitive and affective domains, they omitted the psychomotor domain. Although learning can involve cognitive, affective, and psychomotor aspects, the latter (which refers to motor skills learning) has been hardly considered when providing personalized support within... Cite this entry as: Santos O.C. (2016) Beyond Cognitive and Affective Issues: Designing Smart Learning Environments for Psychomotor Personalized Learning. In: Spector M., Lockee B., Childress M. (eds) Learning, Design, and Technology. Springer, Cham.