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The Revised Bloom's Taxonomy: Implications for Structuring Groups in Online Classes

„Bloom's Taxonomy of Educational" Objectives has been a mainstay of educational theory for over fifty years. In 2001 the original taxonomy was revised. This article uses Bloom's revised framework to design small groups in online classes. The author draws on his extensive experience in using small groups in face-to-face classes as well as fifteen years of experience with small groups in a variety of undergraduate and graduate online classes. He particularly addresses the need to design small groups that focus on Bloom's higher order category of „Create". Suggestions for future research are also included.

Introduction

Benjamin Bloom was an American educational psychologist from the University of Chicago. In 1948, he chaired a group of colleagues from the American Psychological Association who were seeking a way to improve assessment techniques in education. The group completed their work in 1956 with the publication of *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*[1]. Since Bloom was the editor of the book, it became known in educational circles as *Bloom's Taxonomy.*

Since its publication in 1956, *Bloom's Taxonomy* has become a mainstay of the educational community not only in the United States but across the world. It has been translated into 22 languages[2].

[1] B.S. Bloom, M.D. Engelhart, E.J. Furst, W.H. Hill, D.R. Krathwohl, *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*, Longman, New York 1956.
[2] D.R. Krathwohl, *A Revision of Bloom's Taxonomy: An Overview*, „Theory Into Practice" 2002, Vol. 41, No. 4, p. 212-218.

The original taxonomy of Bloom's cognitive domain had six categories. It assumed that learning is linear and hierarchical, and that completion of higher-level categories were dependent on mastery of lower-level categories.

Lower-level categories:

1. Knowledge: Exhibit memory of previously learned materials by recalling facts, terms, basic concepts and answers.
2. Comprehension: Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating the main ideas.
3. Application: Using new knowledge. Solve problems in new situations by applying acquired knowledge, facts, techniques and rules in a different way.

Upper-level categories:

4. Analysis: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.
5. Synthesis: Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
6. Evaluation: Present and defend options by making judgments about information, validity of ideas or quality of work based on a set of criteria.

Criticisms of the Original Taxonomy

On one hand, it is difficult to criticize Bloom and his colleagues for their effort to build the first comprehensive hierarchical framework for conceptualizing educational goals. From that perspective, they did an excellent job, as evidenced by the popularity of *Bloom's Taxonomy* across the world.

Bloom's lower-level categories have been used extensively by US states to design student achievement and competency assessments. Bloom's work also helped catalyze the assessment movement in higher education[3]. Those lower-level categories were also reflected in the

[3] J. Heywood, *Assessment in Higher Education*, Jessica Kingsley Publishers, Philadelphia PA 2000.

instructional objectives movement of the 1970's and 1980's that grew out of Robert Mager's book *Preparing Instructional Objectives*[4].

Much of the criticism of the original taxonomy was focused on problems with the higher level categories. There were concerns that *Bloom's Taxonomy*, while somewhat questionable for the lower order skills, was highly questionable for the higher level skills. As Marzano and Kendall have observed, „The hierarchical structure of Bloom's Taxonomy simply did not hold together well from logical or empirical perspectives"[5]. For example, it was particularly difficult for critics to envision that those three higher level categories of Analysis, Synthesis and Evaluation were in the proper order.

The Revised Taxonomy

One of the authors of the original *Bloom's Taxonomy*, David R. Krathwohl, was an editor of the revised taxonomy that was published as *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. The same number of categories that were in the original was retained (six), but three were renamed and the problematic order of the two highest categories was reversed. The categories in the *Revised Bloom's Taxonomy* are shown below[6].

Lower-level categories:

1. Remember: Retrieving relevant knowledge from long-term memory.
2. Understand: Determining the meaning of instructional messages, including oral, written and graphic communications.
3. Apply: Carrying out or using a procedure in a given situation.

Upper-level categories:

4. Analyze: Breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.
5. Evaluate: Making judgments based on criteria and standards.

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[4] R.F. Mager, *Preparing Instructional Objectives,* Fearon Publishers, Belmont CA 1962.
[5] R.J. Marzano, J.S. Kendall (ed.), *The New Taxonomy of Educational Objective,* Corwin, Newbury Park CA 2006, p. 9.
[6] W. Anderson et al., *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*, Longman, New York, 2001, p. 67-68.

6. Create: Putting elements together to form a novel, coherent whole or make an original product.

It is the highest level, „Create", that is of primary interest when designing groups in online classes.

Importance of the „Create" category

The *Revised Bloom's Taxonomy*, with its emphasis on „Create", coincides with recent findings in the field of neuroscience. Previously, it was thought that the human brain stopped growing at a relatively young age. „But research is beginning to show that this view of the brain is too pessimistic: the adult brain is flexible, it can grow new cells and make new connections, at least in some regions, such as the hippocampus. ... The brain's plasticity – its capacity to adapt continually to changing circumstances – depends critically on how much it is used"[7].

The implications of such research for education have been neglected, according to Blakemore and Frith: "There is a vast amount of brain research of direct relevance to education practice and policy. And yet neuroscience has had little impact on education. This might in part be due to a lack of interaction between educators and brain scientists. This in turn might be because of difficulties of translating the neuroscience knowledge of how learning takes place in the brain into information of value to teachers"[8].

Although there is no neuroscience studies (as yet) specifically focused on brain growth and online classes, there is substantial evidence that mind-stretching activities are a causal factor in brain growth[9]. This present article argues that properly constructed group activities can logically be assumed to cause brain growth especially if they focus on creating a novel product as the „Create" category entails. In that regard, this article is in agreement with Van Tassell who said, „A primary purpose of education is to stimulate more pathways in the brain so that more neurons are used and pathways are able to handle additional traffic"[10].

This paper argues that the way to achieve that stimulation is through what management guru Harold Leavitt calls „hot groups". „A hot group is just what the name implies: a lively, high-

[7] S. Blakemore, U. Frith, *The Learning Brain: Lessons for Education: A Precis*, „Developmental Science" 2005, Vol. 8, No. 6, p. 459.
[8] Ibidem, p. 460.
[9] Ibidem, p. 459; J. Driemeyer, J. Boyke, C. Gaser, C. Bochel, A. May, *Changes in Gray Matter Induced by Learning—Revisited*, „PLoS ONE" 2008, Vol. 3 No. 7, p. 1.
[10] G. Van Tassell, *Neural Pathway Development*, http://www.brains.org/path.htm.

achieving, dedicated group, usually small, whose members are turned on to an exciting and challenging task. … Although hot groups are almost never consciously planned, they can turn up in just about any setting: social, organizations, academic, or political. When the conditions are right, hot groups happen, inspired by the dedication of their members to solve an impossible problem or beat an unbeatable foe"[11].

It is important that students have a hot group experience as part of their education (whether you call them „hot groups" as this article does is immaterial). In addition to forming new neural pathways in individual minds, „hot groups" are important for organizational survival. As Leavitt says: „Twenty-first century organizations will require the capacity to keep up with an intense pace of change as well as the capacity to reshape themselves continually. No longer can we build our organizational houses on the obsolete assumption that they will last for 100 years"[12]. This brings us to the question of how to construct online group projects to enhance educational processes.

Guidelines for setting up the „Create" Online Groups

„Create" is the highest category of the *Revised Bloom's Taxonomy*. Not all online classes need to incorporate the „Create" category. Most first and second year undergraduate classes, for example, will utilize Bloom's lower-level categories rather than the upper levels. On the other hand, third and forth year undergraduate classes, as well as graduate classes, should be utilizing Bloom's upper-level categories, including the highest level of „Create." Again, the definition of „Create" is „Putting elements together to form a novel, coherent whole or make an original product" [13].

To implement the „Create" category, there are two interrelated goals that online groups should meet: (1) development of new neural pathways, and (2) teaching the content of the course via „hot groups" as described above. Both goals are important. The question is how to set up groups in online classes to accomplish the dual goals of developing neural pathways and teaching content via „hot groups".

Development of neural pathways comes from having each student actively engaged in the „Create" category of the revised taxonomy. It is safe to say that if students are not participating in

[11] H.J. Leavitt, J. Lipman-Blumen, *Hot Groups*, „Harvard Business Review" 1995, July-August, p. 109.
[12] Ibidem, p. 116.
[13] W. Anderson et al., op.cit., p. 68.

a project which has as its main purpose the creation of new neural pathways, that no such pathways will be created in their brains. Therefore, the prerequisite for generating those new neural pathways is securing the active participation of all students in the „hot groups".

This is easier said than done because some students do not actively participate in groups. The reasons for non-participation are varied. Some students are naturally shy. Others are afraid that other members of their group will not like their ideas. Other students are content to sit back and let others do the heavy lifting. Some students may not care if they get a poor grade. Other students have good intentions, but get busy with other classes, jobs, sports, or other activities that university students may find more enjoyable than class work. Regardless of the reason, it is the instructor's responsibility to do everything possible to get them engaged.

Here are some guidelines for setting up a „hot group" for a capstone project that the author has developed through fifteen years of teaching graduate and advanced undergraduate online classes.

1. Use small groups of five to seven students.

2. Tell students in advance they will have ten days for each group project. For the first seven days, students prepare a draft, after which the instructor provides detailed feedback. On days eight, nine and ten, the group prepares the final version. Also tell students that the instructor might modify group membership during the ten day period.

3. Since the object is to maximize the participation of each student, the groups are set up based on homogenous levels of participation. In other words, students who have demonstrated they are highly participative in previous exercises would be placed in the same group, those that are low on a participation scale would be in their group, etc. The rationale for grouping together those students in low participation is that they are „forced" to actively participate because there are no high participation students to rescue them.

4. Prior to setting up the „hot group" design project at the end of the semester, conduct several discussions forums or group activities to classify each student as having a high, average or low level of participation.

5. Prepare the directions for the (nearly) impossible „hot group" task. Tell students that they will receive feedback on their draft at end of day seven. The feedback is important. Since it such a novel, difficult task, it is unlikely that the group's initial draft will be acceptable. The goal

of the feedback is to hold the students' feet to the fire and make sure they are actively engaging in a mind stretching design.

6. Monitor group progress during the first four days of the seven days allotted for preparing the draft. If any student is not actively participating at the end of day four, move that student out of their original group into a new group set up for those students were not participating. Then send emails and make phone calls to those non-participating students to let them know they must participate in their new group.

Example

Edward K. is teaching an online class of thirty junior and senior level undergraduate students. Edward uses a „capstone" project to (a) build neural pathways, and (b) to have students design a „product" that requires the use of the concepts taught earlier in the class. Edward knows that toward the end of the semester he will need to set up „hot groups" for the capstone project that will engage all students in the design activity. Prior setting up the capstone project, Edward knows it is important to execute several warm-up activities to get students used to working in a group and to classify each student as having a high, average or low participation level.

Step 1: In looking over the class list at the start of the term, Edward realizes he does not know any of the students on the class list. So he designed a discussion forum in the first week to get a preliminary assessment of each student's level of participation. He tabulated the number of posts, and post length, to identify those who were high, medium and low on participation.

Step 2: Warm-up Group Project #1. Using the participation levels identified in Step 1, Edward set up five groups of six students in a warm-up group project. He opened the group project on a Sunday and had the draft due the following Saturday. On Sunday morning he provided feedback to each group, and had the final version due the following Wednesday. Because it was early in the semester, he did not move students out of their group if their performance was poor, but used email and phone calls to clarify his expectations for their performance in group projects. He updated his initial estimate of the participation level of each student.

Step 3: Warm-up Group Project #2. Using his updated estimate of the participation level of each student, Edward set up five groups of six students with the objective of having groups with homogenous levels of participation. He paid particular attention to students with low

participation factors on previous exercises and sent them an email or phoned them to make sure they understood his expectations for their active participation in Group Project #2. (This is important to communicate those expectations because some students may have had prior experience in online classes that did not require a high level of participation.) At the conclusion of Project #2, he updated his initial estimate of the participation level of each student.

Step 4: The capstone design project. Using his updated estimate of the participation level of each student, Edward set up five „hot groups" of six students. He then constructed the directions for the (nearly) impossible design exercise for the groups. Once again, he opened the group project on a Sunday and had the draft due the following Saturday. For this project he issued a new instruction: Any student not participating in the discussion by midnight Wednesday would be moved out of their group.

On Wednesday night, four students were not participating at an acceptable level. Edward moved those four students to a new group he set up specifically for those with low levels of participation. He reminded those students that they were in day five of the ten day project, with the same instructions, and same high expectations, for the design assignment. That new group was monitored closely, and Edward provided individual nudging with emails and phone calls to make sure that all four students in the group were aware that they need to actively participate rather than letting others do the work. The group was not told they were in the dog house, but rather were told that they were in a new group, equal to the others, and one that would give all of them an excellent opportunity to actively participate in the project.

On Saturday night when the group drafts were posted, Edward provided specific feedback to all groups. Feedback was tailored to their unique designs, and encouraged additional mind stretching activities, plus referring them to material covered earlier in the class.

Step 5: Grading. At the conclusion of the project, the projects were graded. All students had satisfactory levels of participation, with over half of the class exceeding expectations. All groups completed the task. Two of the six groups did exceptionally well and received an „A". Two groups received an „A-", including the group that was formed on Wednesday. Two groups received a „B+." In general, Edward was pleased with the outcome of the project, although he was somewhat disappointed that two groups did not produce better products. He is reviewing the directions for the project with the goal of improving them for the next time the class is offered.

Conclusion

The *Revised Bloom's Taxonomy* now has the highest category – that of „Create," which is putting elements of the content of the class together to make an original design or product. The „Create" category fits with recent findings from the field of neuroscience which point to the fact that intense experiences can develop new neural pathways (rather than running more traffic through existing pathways). Although neuroscience has not developed to the point where we can „see" the growth of neural pathways caused by novel creative exercises, this paper argues that upper levels of undergraduate education, and graduate programs, should have at least some classes that have a primary focus the expansion of neural pathways in students' brains. In lieu of being able to directly measure the effect of small groups involved in a highly creative process, existing research suggests that a novel, mind-expanding creative exercise using „hot groups" quite likely would create new neural pathways in students' brains.

The author described his approach to that objective via the use of carefully structured small groups. If the goal is to maximize the creation of new neural pathways in as many students as possible, then the set-up of groups is critical because it requires that they maximize the participation of even the most shy or otherwise reluctant student.

The author described his approach to constructing small groups of five to seven students according to how actively they participated in the warm-up activities. The goal is to have high levels of participation from all students in order to stimulate neural growth in students' brains. By monitoring the participation of individual throughout the semester and making adjustments to the groupings, the „hot group" projects toward the end of the semester had a high level of participation even from those who initially could have been described as „slackers".

Future research efforts should focus on how emerging neuroscience techniques could be used to better understand how the grouping of students in online classes can enhance the development of new neural pathways.

References

W. Anderson et al., *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* Longman, New York, 2001.

S. Blakemore, U. Frith, *The Learning Brain: Lessons for Education: A Precis*, „Developmental Science" 2005, Vol. 8, No. 6.

B.S. Bloom, M.D. Engelhart, E.J. Furst, W.H. Hill, D.R. Krathwohl (eds.), *Taxonomy of Educational Objectives: The Classification of Educational Goals. Handbook I: Cognitive Domain*, Longman, New York 1956.

J. Driemeyer, J. Boyke, C. Gaser, C. Bochel, A. May, *Changes in Gray Matter Induced by Learning-Revisited*, „PLoS ONE" 2008, Vol. 3, No. 7.

J. Heywood, *Assessment in Higher Education*, Jessica Kingsley Publishers, Philadelphia PA 2000.

D.R. Krathwohl, *A Revision of Bloom's Taxonomy: An Overview*, „Theory Into Practice" 2002, Vol. 41, No. 4.

H.J. Leavitt, J. Lipman-Blumen, *Hot Groups*, „Harvard Business Review" 1995, July-August.

R.F. Mager, *Preparing Instructional Objectives*, Fearon Publishers, Belmont CA 1962.

R.J. Marzano, J.S. Kendall (ed.), *The New Taxonomy of Educational Objective*, Corwin, Newbury Park CA 2006.

G. Van Tassell, *Neural Pathway Development*, http://www.brains.org/path.htm.

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