An updated version of the classic Bloom's Taxonomy emphasizes learners' cognitive processes and points toward technology-enhanced activities.

By David Cochran and Jack Conklin with Susannah Modin

A New Bloom:

When Susannah Modin wanted to engage her students in a multicultural pen pal experience, she thought of it on two levels. She not only wanted them to understand the similarities and differences between the students in Tampere, Finland, and her fifth graders at Woodrow Wilson School in Neptune City, New Jersey, but she also was interested in using technology as a catalyst for higher-level thinking.

At the project's start, she posted a survey on her school's Web site asking the students various questions about Finland and its people. To help familiarize the students with Finnish culture, she also posted links for the students to visit, to read about Finnish life, and view virtual tours of Finland. Communication among pen pals was facilitated through individual school e-mail accounts. For many of her students, this was an introduction to e-mail, and the pen pal project motivated them to learn the technology. Both the Web links and e-mail

Level	Original	New
1 (low)	Knowledge	Remember
2	Comprehension	Understand
3	Application	Apply
4	Analysis	Analyze
5	Synthesis	Evaluate
6 (high)	Evaluation	Create

Table 1: Original and New Bloom's Taxonomies

Transforming Learning

correspondence provided a starting point for the students to get better acquainted.

Modin wanted to have her students gain maximum understanding from this experience, so she used Bloom's Taxonomy as a basis for structuring the collection survey information from students. Modin felt that she could help students get beyond the "what" questions associated with lower-level thinking into the "how" and "why" associated with higher-level thinking.

The work of Benjamin Bloom and his colleagues has led to substantive thinking about planning and evaluation for more than half a century. Anderson and Krathwohl have developed a new design for the classic Bloom's Taxonomy, and it can be used to evaluate learners' technology-enhanced experience in more powerful and critical ways, as illustrated by Modin's project. The New Bloom's Taxonomy incorporates contemporary research on learning and human cognition into its model. The original taxonomy created consensus about how to use important vocabulary as it helped educators make use of the hierarchical nature of knowledge in teaching, learning, and curriculum development. It helped teachers use objectives as tools to promote and evaluate student learning. Bloom and his colleagues created a workable and valuable way for educators to think about objectives, talk to each other, and create curriculum.

The new paradigm updates this classic taxonomy and has some very important changes that help technology-using educators even more (See Table 1). During the past half-century, many educators—including Bloom himself—have raised both conceptual and empirical concerns with the original hierarchy. Despite its similar appearance to the old hierarchy, the New Bloom's Taxonomy modifies the old vocabulary to make each word more consistent with how it should be used; the new levels are now listed as verbs. Although they may seem small, these changes are significant.

Focus on Behavior

Using verbs helps us focus on the behavior of the learner as opposed to the content of the material. It also does a better job of reflecting what Ralph Tyler recommended when he asked educators to look at a student's behavior at the end of an instructional sequence rather than focusing on the content of the lesson. Remembering, through processes such as recalling or recognizing, is a behavior that students can demonstrate at the end of a lesson and educators can use in their evaluations of student progress. In the new model we automatically look at what a learner will be able to do rather than the content or material to be learned.

Anderson and Krathwohl switched and modified these levels based on the many empirical studies that had been conducted on the taxonomy. Their own meta-analysis on those studies recommended the reversal of the former highest levels: synthesis and evaluation. They noted that there was also a need to change the term *synthesis* to the new term *create* because for a synthesis to be demonstrated there needed to be a new creation. They also noted that to evaluate involved inductive thinking, which is a lower-level cognitive task than the deductive thought that is required when a person creates, thus the recommended shift of the two levels.

Metacognitive Emphasis

These changes are not the only changes that were recommended, however, as the new paradigm creates a new way to think about the levels themselves. They have broadened the old model to emphasize learners' cognitive processes by including metacognitive, declarative, and procedural thought processes (See Table 2). The New Bloom now requires that as we plan for instruction or new curriculum, we must think about how learners process information and how they think about their own cognition. We need to con-

Knowledge Dimension	Cognitive Process Dimensions					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual						
Conceptual						
Procedural						
Metacognitive						

Table 2: Knowledge and Cognitive Dimensions

Original Taxonomy	Questions	New Taxonomy	Knowledge Dimensions
Knowledge	List five things you now know about fifth graders from Finland.	Remember	Factual & Conceptual
Comprehension	What did you learn about Finland's schools?	Understand	Conceptual
Application	What questions did you want to ask your Finnish pen pal?	Apply	Procedural
			Metacognitive
Analysis	How are Finns the same as you? How are Finns different from you?	Analyze	Factual & Conceptual
			Metacognitive
Synthesis	If you took a trip to Finland, what would you do there? What did you learn from having a pen pal in Finland about using the computer for international e-mail?	Evaluate	Metacognitive
			Conceptual
			Metacognitive
Evaluation	How did you feel about having a pen pal in Finland? What are the most important things you learned from the project? If you did the project again, you would like to…? You would have liked the project more if…?	Create	

Table 3: Questions in the Original and New Taxonomies

sider how learners regulate their own thinking. Flavell informs us that in both planning and evaluating we need to consider both the learners' sense of self-efficacy and their own sense of cognitive strategy. Most recently, Israel, Bauserman, and Block demonstrate how necessary metacognitive skill is in learning to read. Planning for and evaluating metacognition is a part of the New Bloom. The different ways that learners process declarative (both factual and conceptual) and procedural knowledge can also be addressed.

Metacognition is especially important in the use of technology. Students need to determine the best tools to use and how to attack complex problems using them. In Modin's project, the students spent time considering what to do and how to communicate with people they didn't know.

With the inclusion of metacognition, procedural, conceptual, and factual knowledge, the new model looks like Table 3.

If we look at Modin's project, we can see the similarities and differences between the original and new taxonomies. Both models create more thoughtful reflection on the experience than one might normally achieve, but it is important to note that the new model evokes more action, especially at the higher level, making it easier to generate alternative assessments.

Similarly, the new taxonomy points toward contemporary lessons using technology. The verbs used can easily be associated with technology-enhanced activities. Students can make a chart with spreadsheet software to help analyze, or they can create a presentation to show their understanding.

Modin's students were able to communicate with Finnish students, find similarities and differences between the cultures, and create new knowledge that was much fresher and more exciting than one would traditionally acquire. More important, they were

able to have multiple contacts with students to ask new questions, clarify issues, and draw deeper conclusions than they might have otherwise.

Neither the taxonomy nor the technology was the center of this project, but both proved invaluable in structuring the experience. If we look at this project on a metacognitive level, Modin used technology as a tool, the method of facilitating the communication. She used Bloom as a way to ensure that students got beyond the simple answers and were thinking more deeply. Her objective was multicultural understanding, and her process reflected 21st century practice.

Technology provides a fertile medium for teaching higher-level thinking skills, and when it is combined with the New Bloom's Taxonomy, we have a powerful tool to help students move projects to new, deeper levels. When learners have a good grasp of their own thinking strategies, it changes the way they tackle anything new, includ-

Questions	
What do you recall about Finland?	
What are the characteristics that make a country a country?	
What steps would you use to create a pen pal from Sri Lanka?	
When you "hit a roadblock," what did you say to yourself or think about to stay on task?	
Draw a chart to show how Finns are both similar to and different from you.	
How did learning about the Finns make you want to learn more about them or other people of the world? What did you do beyond the class project to find out more?	
What did you learn about yourself and your thinking that would help you in future lessons?	
What things about the schools in Finland did you like or not like? Should our school adopt those ideas?	
If you did the project again, what would help you to be more effective in your learning? You would have liked the project more if…?	
Pretend you are part of a company that plans trips to schools in Finland. Create an itinerary of what you would do there. With a small team of your classmates, build a process that a student can use to create an e-mail pen pal in another country.	

ing technology-enhanced projects. That knowledge makes them more effective and efficient as they work in these arenas. The New Bloom helps teachers focus on multiple dimensions of learning, and with the aid of technology they can level and raise the playing field for all students.

Resources

Anderson, L. W., & Krathwohl, D. (Eds.) (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives* (Complete Edition). New York: Addison Wesley Longman (There is also an abridged soft-cover edition of this book. ISBN 0-8013-1903-x)

Bloom, B. S. (Ed.), Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. New York: Longman.

Bloom, B. S. (circa 1971) *Some suggestions for chapters III, IV, V.* Unpublished and undated manuscript. In L. W. Anderson & D. Krathwohl, (Eds.), *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives* (Complete Edition). New York: Addison Wesley Longman.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive developmental inquiry. *American Psychologist, 34*, 906–911.

Israel, S. E., Bauserman, K. L., & Block, C. C. (2005). Metacognitive assessment strategies. *Thinking Classroom: A journal of the International Reading Association, 6*(2), 21–28.

Kauchak, D., & Eggen, P. (2005). *Introduction to teaching: Becoming a professional* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Marzano, R. J., & Pickering, D. J. (1997). Dimensions of learning: Teacher's edition (2nd ed.). Alexandria, VA: ASCD.

Tyler, R. W. (1949). *Basic principles of curriculum and instruction.* Chicago: University of Chicago Press.

David W. Cochran, EdD, is an assistant professor and lead faculty in the master of arts in Instructional Technology program at Georgian Court University, Lakewood, New Jersey. He is also the representative to ISTE for the New Jersey Association for Educational Technology.

Jack Conklin, PhD, is an assistant professor in the School of Education at Georgian Court University, and professor emeritus at Massachusetts College of Liberal Arts.

Susannah Modin, MAIT, is the computer teacher at Woodrow Wilson School in Neptune City, New Jersey. Her award-winning masters' thesis at Georgian Court University provided the background for this article.