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Recognizing the Connections Between Thinking Skills and Mastery Learning

The encouraging shift from staff development bandwagons to thoughtful approaches that integrate the best of learning research can be seen, for example, in Baltimore County, Maryland, and in East Islip, New York, where programs have effectively combined mastery learning and thinking skills.

At Oakleigh Elementary School in Baltimore, teachers use many methods to help reinforce concepts for students, including learning games, independent practice, and manipulatives, as shown here.

Photograph courtesy of Oakleigh Elementary School and Robert Harris

"What bandwagon do you suppose we'll all be riding this year?" asked Dan James, a 4th grade teacher at Mason Elementary School, as he joined three other teachers at a table in the learning resource center.

"The faculty bulletin said this meeting was about mastery learning; maybe that's it," responded Jason Smith, 6th grade teacher.

"That seems inconsistent with last year's emphasis on thinking skills, doesn't it?" asked Mary Alice Johnson, 4th grade, who had been especially pleased with the thinking skills effort. It had allowed her to learn more about an area in which she excelled, and she had been able to play a cherished leadership role in the project. "I'd hate to see thinking skills dropped," she added.

"I wish we'd stay with a topic longer than just a year or two. I really get confused when we jump from one bandwagon to another," Beth Wilson chimed in. She'd been teaching at Mason for six years now and could remember the learning styles year, the one devoted to cooperative learning, and, of course, the TESA years.

"Yeah, me too!" added Mary Alice. "I wish someone would find a way to put all this information about good teaching together."

These comments, as well as the teachers, are fictional, but the conversation is not at all unusual. Classroom teachers throughout the U.S. are asking principals, curriculum administrators, staff development coordinators, and consultants to show them how the past 15 years of research on effective teaching can be integrated and used in a way that makes sense in classrooms. Many teachers express frustration with staff development programs aimed at exposure to still another teaching model, all too frequently focused on a small segment of research. In such efforts, the apparent underlying assumption is that staff will immediately absorb the research base and conceptual framework of whatever model is being presented and will be able to integrate the new knowledge into their teaching repertoires. Our experiences indicate that only a small percentage of teachers do so with ease and confidence.

There are, however, a number of efforts in progress to synthesize classroom teaching research. For example, Marzano and his colleagues (1989; p. 17, this issue) have developed a comprehensive training program (loosely based on ASCD's *Dimensions of Thinking* [1988]) that focuses teacher decision making about learning situations from the learner's point of view (see p. 17). Jacoby (1988) has developed an integrative instructional planning process that helps teachers and administrators identify specific teaching strategies and applicable research theory for situations that commonly arise in classrooms. Hunter's (1982) "teaching as decision making" model asks teachers to consider what is known from classroom research and learning theory as they make instructional decisions. And Berliner's (Brandt 1986) concept of the "teacher as an executive" does likewise. Practical experimentation with this type of synthesis is also under way in some districts and states; for example, in a Missouri State project (Block and Guskey, in preparation) and in the Baltimore County and the East Islip school systems described in this paper.

Such integrative efforts make the necessary connections between models, explain overlaps, and help educators deal with increasing complexity in educational environments. This paper illustrates the integration of two major (and, some would say, conflicting) research areas: thinking skills and mastery learning. Here we describe the common assumptions, beliefs, and underlying purposes of the two models, provide examples of classroom situations using both types of teaching strategies, and offer a rationale for emphasizing the integration of them in staff development programs.

Mastery learning's radical yet idealistic philosophy parallels that expressed by a number of authors of thinking skills programs.

Photograph courtesy of R. C. Kinney Elementary School, East Islip School District

With her teacher's assistance, this East Islip elementary student is on her way to becoming a self-directed learner, fulfilling one of the goals of the district's mission statement.

Parallel Philosophies, Beliefs, and Assumptions

Mastery learning's radical yet idealistic philosophy parallels that expressed by a number of authors of thinking skills programs. According to this philosophy, virtually all students, regardless of their backgrounds, are capable of learning as well as our best students: D and F students like A students, slow students like fast ones, and unmotivated students like motivated ones (Block et al. 1989). In the thinking skills area, many authors have advanced similar beliefs about the modifiability of students' capacity to learn (Feuerstein and Jensen 1980; Feuerstein 1980; Gardner 1983; Lipman et al. 1980; Marzano and Arredondo 1986a, 1986b; and Sternberg 1984). Feuerstein, Jensen, Sternberg, and Gardner, in particular, have all proposed ideas similar to the mastery learning premise that virtually all students are capable of learning well. These authors also reflect a strong positive view of each student's "potential for becoming an expert learner" (Presseisen 1987, p. 1). Sternberg's and Gardner's research clearly suggest that any student's intelligence can be trained. Marzano and Arredondo have gone even further in their support of the proposition that all students can learn well. In particular, they have contended that the sorting

function of schools can largely be eliminated through the teaching of thinking skills; that the resulting changes in curriculum and instruction will find virtually all students assuming responsibility for their own learning; and that increased effectiveness and efficiency in learning will become obvious throughout school systems.

Given these similar and highly optimistic beliefs and assumptions about student learning, the Mason Elementary administrators and teachers quoted in our opening scenario would probably be interested in putting thinking skills and mastery learning strategies together within their instructional program. Such integration would enable the school to meet community demands for better learning outcomes and at the same time respond to the growing pressures to serve an increasingly diverse student population. In short, it would allow staff to pursue both excellence and equity in learning, not to sacrifice one for the other.

And, indeed, when well implemented separately, both mastery learning and thinking skills programs appear to improve student learning. Despite contentions to the contrary (Slavin 1987, Brandt 1988a), mastery approaches almost always produce greater student achievement when compared to nonmastery ones regardless of the subject, grade level, or instructional period. For example, a 50th percentile achiever in a nonmastery class can reasonably be expected to move to somewhere between the 65th and 85th percentile, and most likely to the 77th, in a comparable mastery class (Block et al. 1989). Similarly, some fairly persuasive evidence exists to document improvements among less able, average, and more able students (Nickerson et al. 1985) when teachers focus instruction on student thinking. In fact, today's educators seldom question that they ought to be teaching thinking; for example, 84 percent of 1,144 teachers polled by the National Center for Education said that teaching reasoning and analytical skills was the most important goal of education (Stacy 1986).

A more important question is whether thinking skills and mastery learning models can be integrated during implementation, and, if so, what the impact will be on student learning. Bloom (1988), Soled (1986),

Integrating Thinking Skills and Mastery Learning in Baltimore County

Joan D. Kozlovsky

In 1980, Baltimore County Public Schools implemented mastery learning as part of a statewide school improvement model introduced by the Maryland State Department (Kozlovsky 1986, Roberts and Kenney 1986, and Roberts et al. 1986). Three 3rd and 4th grade teachers at Oakleigh Elementary School received intensive training in how to administer mastery learning in mathematics. During the 1981–82 school year, these teachers' students showed gains of seven months to one year on norm-referenced mathematics tests, three months more than their normative peers.

Because of attention gained from this achievement, school staff subsequently acquired block grant funding to continue the project. As a result, mastery learning expanded from one school and three teachers to more than 50 schools and hundreds of elementary teachers in various disciplines. The staff development model included those components shown to be effective in bringing about change (Joyce and Showers 1983).

Then, in September 1984, the coordinator of the mastery learning project decided to launch a thinking skills project. Staff at five volunteer schools received training in improving student thinking. As the two projects developed, it became clear to us that the basic premise of the mastery learning paradigm—that given time and appropriate instruction, all students will learn well—was similar to the underlying assumption of the thinking skills movement—that students can learn to think better if schools teach processes for thinking. It became equally clear that these two projects shared the objective of giving teachers the means, and the opportunity, to teach both content knowledge and thinking processes.

Recognizing this overlap, we began to include thinking skill strategies throughout all phases of the mastery model. As the staff introduced the thinking strategies, we flagged inclusive skills such as classifying, assessing relevant information, questioning, and elaboration within the existing scope and sequence of the curriculum. This emphasis on thinking served to remind teachers that specific thinking skills were being addressed and, therefore, highlighted the need for these skills to be taught and reinforced throughout the content areas. "Thinking is both age-free and discipline-free" became our motto.

Next, teachers received an overview of the mastery and thinking strategies, practiced them, and designed implementation plans for their classrooms. Between the three- to five-day training sessions, teachers taught the strategies to their students and used them to teach content material. As the projects progressed, we found that two key ideas were critical to their success: (1) both the teachers and the students needed numerous trials with the strategies or skills in order to achieve mastery and executive control; and (2) the content and the thinking processes could not both be new in one lesson (i.e., teachers needed to introduce a new thinking skill or process with generic or familiar content). [These points have since been validated (Showers et al. 1988)].

Figure 1 (p. 7) shows an example of strategies that have been translated into lessons focused on thinking within content objective mastery. It is important to remember, however, that throughout the training period, generic strategies were presented to teachers. The teachers then taught these strategies directly to their students and later revised and adapted them for incorporation into content areas. Only the final phase is depicted here. Like other educators, we in the Baltimore County Schools have recognized that if teaching and learning are to be successful, we must elicit thinking from students, directly teach thinking processes, and use thinking skills within the content areas.

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and especially Mevarech (1989) have found that when teachers focus on higher mental processes (problem solving, application of principles, analytical skills, and creativity) within the mastery format, both thinking skills *and* the knowledge levels of students improve. And, in a slightly different vein, Cohen, Hyman, and Stone (1985) have successfully used mastery learning ideas to teach Feuerstein's (1980) Instrumental Enrichment. But while this research appears promising, it does not conclusively demonstrate that increased learning results directly from the *integration* of thinking skills and mastery learning.

Whether such integration becomes a reality under more widespread conditions will ultimately depend on the resolution of the larger debate about the relative importance of content and process in the teaching of thinking. A number of educators examining the connections between content knowledge and thinking skills (Brandt 1988b, Bransford et al. 1987, Marzano et al. 1988, Presseisen 1988) have argued that the critical question isn't whether teaching content or process is more important. Both are essential. Instead, they contend, the question is how to interweave essential thinking processes into complex content knowledge in a pedagogical manner that enhances meaningful student thought. We concur. We are excited about the increasing interest on the part of curriculum developers in identifying truly essential learner objectives, classifying them into procedural or declarative categories, and then assisting teachers to present content learning through the use of appropriate thinking skills and processes against a backdrop of critical, creative, and metacognitive thinking (see p. 17).

For example, consider a high school biology teacher who wishes to teach the generalization: *Populations usually expand until constrained by environmental limits*. Since this is declarative information—generally new knowledge to high school sophomores—the teacher will want to pay attention to thinking that facilitates the representation and storage of information. Graphic organizers and visualizations will enhance both linguistic and nonlinguistic storage. As students accumulate knowledge about population expansion, thinking processes such as problem solving, oral discourse, and scientific inquiry will allow students to use and extend their knowledge. During the course of instruction about population expansion, the teacher may elicit student thinking, model appropriate thinking, teach the students how to perform specific thinking skills and processes, and/or expect the students to use previously learned ones. Such skillful blending of content and process reinforces the contention made by Perkins (1987) and others that the ultimate goal of teaching thinking—the student who thinks excellently—can only be achieved by moving instruction in thinking along the continuum from teacher-controlled presentation of thinking processes to student-controlled use—or what mastery educators call "automaticity" (Bloom 1986) of the use of those processes within the various disciplines.

If we view the teaching of thinking in this manner, parallels between mastery learning and thinking skills are readily apparent in both curriculum delineation and instructional strategies. (See the two sidebars and figures for specific examples from the Baltimore County Public Schools and the East Islip School District.) Since thinking is a knowledge-based activity, the coordination of the optimistic tenets of mastery learning with thinking processes is truly a way of teaching for thinking and makes for a viable, enabling education for our students (Brandt 1984).

Fig. 1. Application of the Divergent Questioning Model

Objective: The student will apply the Divergent Questioning Model as a strategy for elaboration of creative responses.

Procedure:

1. Present a problem from social studies or science, such as: What could we do with all the waste we produce?
2. Use a brainstorming technique and/or SCAMPER to list a variety of ideas.
3. Have the students work in small groups or in pairs to identify at least three categories into which the ideas could be grouped. Students should be able to explain why they have grouped the ideas under a particular category. Possible categories could include:
   - creative
   - common
   - possible
   - not possible with present technology
   - supernatural
4. Have the students select their most creative ideas and construct questions using the Divergent Questioning Model as a method for elaboration.

Example Idea: Trash could be sold.

- Quantity—List all the people who would be interested in buying trash.
- Supposition—What if the things you needed to meet your basic needs could be purchased only from a refuse store?
- Viewpoint—How would you feel if you were a refuse engineer and could no longer collect trash?
- Forced Association—How can we use advertising to promote the sale of trash?

5. Discuss additional ways in which the Divergent Questioning Model can be used to develop questions that facilitate:
   - elaboration of original ideas and products
   - evaluation and appreciation of the creative process in:
     a. the performing arts
     b. writing style
     c. scientific discoveries
     d. current events

Source: *Strategies for Differentiating Curricula*. (1985). Baltimore County Public Schools, Md., p. 32.

A Look at Efforts in Two School Districts

Baltimore County Public Schools and East Islip School District are successfully integrating *within their curriculum* the concepts and practices of thinking skills and mastery learning. These districts not only lead the way in this endeavor, they may even become model districts for integrating the overlapping belief systems and then embedding thinking skills and processes within a carefully delineated school program.

While some educators question whether thinking skills can be successfully taught to students if they are not embedded in curricular content and others argue that direct skills/process instruction must occur prior to use in content learning, these two districts have taken another position. They have discovered that students learn well when content instruction is presented in a mastery format and when those thinking skills that complement the specified content and facilitate learning it are directly taught at identified points within the scope and sequence of the curriculum.

Baltimore County began implementing a mastery learning mathematics program in 1980 and subsequently expanded it to other content areas (see sidebar, p. 6). In 1984, they developed an implementation plan for teaching thinking skills. Rather than consider the previous focus on mastery learning as now less important, however, they dovetailed the two instructional models, emphasizing overlaps in beliefs, philosophies, methods, and strategies. As the effort progressed, school staff became convinced that their emphasis on integration was more powerful than either model would have been alone.

Since thinking is a knowledge-based activity, the coordination of the optimistic tenets of mastery learning with thinking processes is truly a way of teaching for thinking.

In the East Islip School District, the staff took an integrative approach to teaching thinking from the outset (see sidebar, p. 8). In the early 1980s, they began developing an outcome-based curriculum that focused instruction toward student mastery of identified thinking skills and processes within content areas. They spent considerable time and effort delineating the thinking skills to be taught, reinforced, or simply used, within each content

Toward Mastery of Thinking Skills in East Islip

William J. Smith

During the past four years, staff in the East Islip (New York) School District have developed an outcome-based curriculum and instructional format that focuses on student mastery of thinking skills. Like other practitioners familiar with the potential (as well as the criticisms) of the mastery process, our staff realized the need for sophisticated and carefully planned implementation (Block et al. 1989). They especially recognized that the success of their efforts would depend largely on implementation strategies that integrated the mastery process with learning theory and with other instructional models, such as cooperative learning, learning styles, and thinking skills.

To realize our district's mission statement—"Virtually all students are capable of achieving excellence in learning"—East Islip teachers developed five goals, which were then integrated into all curricular areas:

1. Each student will develop high self-esteem.
2. Each student will master the skills of knowledge, comprehension, application, analysis, synthesis, and evaluation.
3. All students will use these skills for developing processes for problem solving, decision making, and communication.
4. Each student will become a self-directed learner.
5. Each student will demonstrate genuine concern for others. In order for our students to demonstrate mastery of these five goals over the course of their 13 years of schooling, the teachers prepared a K-12 thinking skills continuum to be taught within each instructional area. They then identified the skills critical to each discipline. For example, after examining the 12th grade English curriculum, our staff concluded that students should demonstrate proficiency in listening and speaking skills, vocabulary development, spelling, reading and literature, and writing. To master these skills, they needed to be taught comprehension, critical thinking, oral discourse, analogical thinking, synthesizing, and evaluating. For this scope and sequence teachers developed specific learning objectives. The identified content areas and skills provided the scaffolding for instruction and also the framework for examinations.

As the learning objectives are translated into classroom instruction, teachers emphasize the integration of the identified skills within content knowledge. For example, in vocabulary development, the concepts selected from the reading and literature program are then used in the writing process, in speaking and listening, and in spelling. The curriculum is structured to help students make connections (see fig. 2, (p. 9) for an example of this structure).

Since both content knowledge and generic thinking skills and processes are identified and taught at each grade level, assessment is easier. Formative and summative tests assess both skills and content, providing specific information about the strengths and weaknesses of student learning. Corrective activities are designed to remedy deficits, and extension activities provide more opportunities to apply thinking skills in content learning.

In connecting outcome-based mastery learning with thinking skills, we have provided the framework that enables students to connect one fragment of instruction to another, one class period to another, one grade level to another—and, ultimately, to extend learning from the schools into students' daily lives.

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area in the K-12 curriculum. The strength of this particular approach is that the specified content thinking skills provide an integrative framework for planning, teaching, and evaluating the entire instructional program. As students and teachers focused on the integration of learning, both the schooling process and the program became less fragmented and hence more effective.

Making the Critical Connections

The rapidly growing number of educators who are seeking ways to connect and integrate the past 15 years of research on teaching and learning all share a common goal: *real reform* of education. These teachers, administrators, curriculum developers, and supervisors know that such a far-reaching change is possible only when *all* of what is known about learning is used in class-

Fig. 2. Language Arts with Focus on Identified Thinking Skills at Sample Grade Levels East Islip School District

	Grade 3	Grade 7	Grade 12
Thinking Skill:	compare	evaluate evidence	determine credibility of a source
Student Objective:	Students are to *compare* the setting of "The Ugly Duckling" to the setting of "The Snowman."	Students will *evaluate* evidence in *The Diary of Anne Frank* that may or may not reveal a basis for anti-Semitism in Holland.	Students are to *determine the credibility* of Alexis de Tocqueville's *Why Great Revolutions Will Become Rare.*
Instructional Activity:	Teacher will group students heterogeneously and direct each group to examine two pages of text from each story. Using the text pages as reference material, each group will examine the physical characteristics of each story, listing them on oaktag. Each group leader will describe the listings and post them in front of the room. After the four group leaders have described the listings, the groups will be directed to separate the listings under the headings of *differences* (one story describes...) and *similarities* (both stories describe...).	Before reading the biography, the teacher will elicit from students evidence that indicates that they may consciously or unconsciously belittle other students. Students will then be directed to read the appropriate pages in the biography and examine whether there is sufficient evidence to conclude that latent anti-Semitism existed in Holland. Students are to take a position and record the evidence that supports the respective positions.	The teacher will have students research the background of Karl Marx to determine if he has the credentials to support his point of view. The teacher will then dialogue with students, weighing the strength of these credentials. Students will next research the background of Alexis de Tocqueville and weigh his credentials against his claim that great revolutions will rarely occur. The teacher next divides the class into four groups with two groups taking one point of view and two another. The teacher will then organize two debates that will compel students to synthesize reasons that support or do not support the credibility of a source.
Corrective:	Students will *listen* to a teacher-made tape describing several of the differences and the similarities while *marking* with a highlighter the section of the story being discussed.	Students will read a short selection from *The Jackie Robinson Story* and *cut out* key words that may provide evidence of discrimination. Then students will paste these words on a piece of 8 x 11 paper and draw illustrations of the respective words.	Students will read two distinct newspaper accounts of the same event and *chart* their reasons for and against supporting both accounts.
Extension:	Students who demonstrate mastery will be challenged to *construct* a setting for each story using teacher-supplied materials (paste, scissors, play-dough, etc.) so that students in other classes can "touch" the differences and the similarities.	Students who demonstrate mastery will take the opposite position from their own and list the supporting evidence for this new position as they prepare for a *debate* on the issue of evidence.	Students who demonstrate mastery will bring their 12th grade social studies texts to the English class to determine the credibility of the chapter on the European economy.
Assessment:	Students will compare by writing the differences and the similarities of the settings of "Ellen's Lion" and "The Mousewife."	Students will evaluate evidence that may or may not support latent racism in Mark Twain's *Huckleberry Finn.* The teacher will direct them to choose by writing what they consider to be the stronger position and list supporting evidence.	Students, through a short research paper, will determine the credibility of John Stuart Mill's *On Liberty.*
District Goal(s) Addressed:	2, 3, 4, 5	3, 4	3, 4, 5

rooms around the country. These educators also share a common obligation: to emphasize the connections in the research and to combat the bandwagon approach to staff development. Voluntary participation, a teacher-centered, bottom-up focus, "big thoughts, small starts," and a five- to six-year commitment to evolutionary—rather than revolutionary—changes are more likely to be successful (Block et al. 1989).

Perhaps the prototypical staff at Mason Elementary have been victimized by staff developers who have used prior innovations for quick changes or by planners who have viewed TESA, learning styles, cooperative learning, and thinking skills as "something to do this year," without adopting the philosophical beliefs underlying the innovations and investing the time required for institutionalizing the desired changes. Whatever the case, Mason teachers would be well advised to search for the connections between thinking skills and mastery learning. The beliefs and assumptions of both approaches are humane and optimistic, and they propose that teachers accept responsibility for setting the stage for learning success. Mastery learning's focus on careful planning and teacher commitment and attention to desired outcomes—as well as its recognition that not all students learn the first time instruction is presented or in the same way and that assessment must specifically measure instructional goals—is consistent with the core of many thinking skills models.

The question here is not which model is best but, rather, which specific pieces of the research base apply to particular classroom situations and how to put these pieces together functionally. Teacher knowledge about all the research must be increased. We must become truly knowledgeable, expert professionals able to make distinctions between the many research studies that may be applicable in any one specific instructional interaction. Only then will we succeed in providing excellent and effective education for all our students.□

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