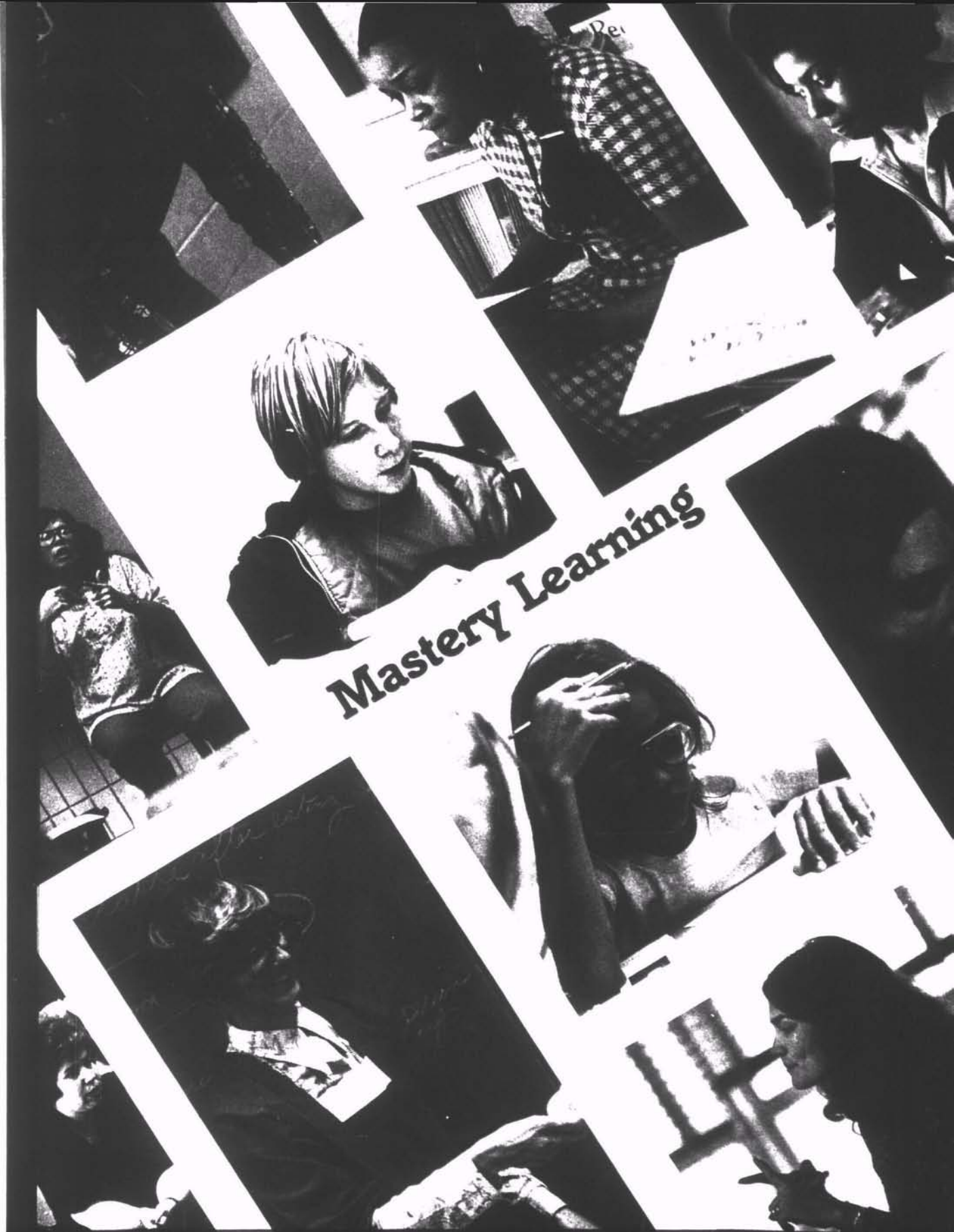

Mastery Learning

Learning for Mastery: Ten Conclusions After 15 Years and 3,000 Schools

Joan S. Hyman and S. Alan Cohen

The Learning for Mastery approach is clearly more effective than traditional instruction, but individualized programs are better than group-based ones. Students master more objectives with mastery learning because their level of participation is higher.

While John Carroll awaited publication of his hallmark model of school learning[1] in 1963, our first Learning for Mastery (LFM) experiment was already underway at PS 148 in New York City. One of our early findings, later corroborated by Carroll and others, turned out to be pivotal for the direction our LFM research was to take.

That early data suggested that the amount of time a student participated in prescribed learning activities predicted both aptitude and quality of instruction. That is, the better the instruction, the more the students participated in learning. We measured this phenomenon as P Ratio, the percentage of clock time pupils participate in learning.[2] This construct was supported by Carroll's "perseverance" construct[3] and by Bloom's "time on task"[4] in the current literature of that time.

[1] John Carroll. "A Model of School Learning." *Teachers College Record* 64: 723-33; 1963.

[2] S. Alan Cohen. "The Taxonomy of Instructional Treatments in Reading: Its Uses and Its Implications As a Classroom Analysis Scheme." *Journal of the Reading Specialist* 11: 5-23; October 1971.

[3] Carroll, *op. cit.*

[4] Benjamin Bloom. "Time and Learning." Thorndike Award Address, 21st Annual Convention of the American Psychological Association, Montreal, August 27, 1973.

After 15 Years of Study

Since 1963 we have implemented and monitored LFM curriculum in reading and math in more than 3,000 schools and gathered data on thousands of students. Here are ten conclusions drawn from these data:

1. *LFM is consistently more effective than traditional curriculums.* Block[5] summarizes the enormous literature to support this conclusion. One of our doctoral candidates, a nursing school curriculum director, succinctly expressed LFM's obvious effect when criticizing a school principal's dissertation proposal to compare LFM with a control group. The nurse educator said, "When you clearly define the required competencies, design instruction to shape those competencies, and monitor the process, and you compare such a technique to the traditional fuzzy, the results have got to be LFM! Why test the obvious?" Why, indeed!

2. *LFM's effects, rather than its effectiveness, are worth researching.* These affective, attitudinal payoffs to LFM should be investigated. For example, its psychosocial effects have been much touted by Bloom[6] and Block.[7] Our own biases tend toward the instructional psychology aspects of LFM. Are mathemagenic behaviors fostered in LFM? Can the objectives serve as learning cues? If so, where are they inserted in the instructional flow? Is P Ratio truly an intervening variable in the LFM model? What combination of group and PSI (Personalized System of Instruction) techniques works best in interaction with learner and content attributes?

Presently we have 25 doctoral dissertations underway investigating LFM's instructional details. We no longer bother to ask how LFM compares to traditional curriculums; that is no longer an issue.

3. *We can now say with absolute certainty that increasing P Ratio increases mastery.* P Ratio, the percentage of participation in prescribed learning activities, a measurement of perseverance, time on task, and motivation "as approach behavior"[8] are all the same construct. That construct is LFM's potent ingredient.

Our earliest research indicated that "average" teachers of fourth-grade reading had mean class P Ratios of 35 percent. "Outstanding" teachers had 55 percent.[9] Regression analyses indicated about a half grade level growth in reading on norm-referenced standardized reading tests for every six or seven percent P Ratio increase.

We find that class P Ratio increases *cause* enormous learning gains, but only to a maximum 80 percent P Ratio level. (At this stage of research we are confident of the use of the term "cause.") After the 80 percent P Ratio mark, mastery rate levels off. Why? Our best guess is either that our learning tests at this high participation rate are insensitive or that our curriculums have "ceilinged" out—that is, students are working at a task, but there is little more to learn.

Whatever the cause, teachers operating LFM classrooms consistently above 70 percent P Ratio are producing tremendous learning gains. Their low SEL (socioeconomic level) children, who ordinarily underachieve, achieve on and above grade level in reading. If we could pump in enough instruction and measure

[5] James Block. "Mastery Learning in the Classroom: An Overview of Recent Research." Paper presented at the American Educational Research Association Annual Meeting, New Orleans, February 28, 1973.

[6] Benjamin Bloom. *Human Characteristics and School Learning.* New York: McGraw-Hill, 1976.

[7] James Block and Lorin Anderson. *Mastery Learning in Classroom Instruction.* New York: Macmillan Publishing Co., 1975.

[8] A. Bandura and R. H. Walters. *Social Learning and Personality Development.* New York: Holt, Rinehart and Winston, 1963.

[9] S. Alan Cohen, *op. cit.*

it, at 80 percent or 90 percent P Ratios the learning gains would probably be astronomical.

In summary, the P Ratio measure was derived from the LFM model, and we have found it the best single measure of classroom effectiveness. Its use has led us directly to techniques that control materials development, classroom physical design, instructional strategies, and definition of teacher role. In short, it has led to an elaborate technology of instruction.

If we had to select one construct in Carroll's original model as the most profound, it must be his term "perseverance," Bloom's "time on task," our own "P Ratio" measure.

4. *LFM learners master more objectives during a given time period compared to students in non-LFM classrooms that have neither defined nor required points of demonstrated mastery.* Under the latter condition, teacher decisions to move forward in the curriculum are far more arbitrary.

LFM is not magic. It simply demands demonstrated mastery of each objective along a continuum. Such a demand in turn requires criterion referenced tests (CRTs) or target behaviors that clarify for learner and teacher exactly where they are going, which in turn lets them know whether they got there. If students demonstrate mastery, a closure point is reached forcing a forward movement in the curriculum.

About three-quarters of our LFM work over the years has been through funded compensatory programs, which suffer the ubiquitous curse of low teacher expectations. Our firm conclusion after 15 years of working with thousands of teachers is that many unwittingly retard their children's learning by rationalizing more practice and a slower pace than is required. In addition to clinical impressions, our data indicate the same. LFM counters this problem.

For example, to outfit our High Intensity Learning Systems classrooms,[10] we provided lists of commercially published instructional materials. Teachers ordered from these lists, and we soon discovered that by March and April of the first year in LFM, children ceilinged out of the ordered materials. Apparently teachers consistently underrated students' abilities to learn in LFM, but LFM prevented these teachers from holding back students. When we caught on to the problem, we ordered higher level materials to anticipate what we had come to call affectionately the "spring effect." Invariably, in September teachers complained when their instructional materials arrived and included levels their children would "never be able to handle." These teachers changed their tune when the "spring effect" rolled in. Such experiences were routine in hundreds of schools around the country.

In interpreting Block's data[11] and observing our own LFM curriculums, the one factor that continues to explain LFM success appears to be this same antidote to teacher-caused retardation—the fact that mastery points are defined and demonstrated, causing a forward motion through a continuum leading to more learning in a given amount of time.

5. *Seven techniques increase participation and thereby increase mastery.*[12] Briefly, the techniques are:

a. Define instructional objectives behaviorally so that learner and teacher know exactly where they are, where they are going, and where they have been.[13]

b. Go directly to the defined behavior—that is, direct teaching of the behavior or "attitude" sought rather than "building to it" or around it.

c. Provide immediate feedback to all learner responses. The more immediate the feedback, the more efficient the learning.

d. Rig the level of instruction so that feedback is maximally positive. Success breeds success and lots of warm fuzzies too.

e. Modularize learning by cutting down the bites to small, self-contained nibbles. Closure is the most potent of all positive feedback techniques. The smaller the bite, the more immediate the closure.

f. Control the stimulus so we know exactly what the learner is responding to. That is a major problem in commercially published materials.

g. Reinforce by positive feedback the learner's critical response. The critical response is the one that responds to the appropriate stimulus defined precisely by the instructional objective.

For 15 years, every piece of LFM instructional material we have developed,[14] [15] [16] [17] every classroom strategy, and every curriculum decision has been controlled by these seven techniques. The better we implement them, the higher the P Ratio, and the more learning we get.

6. *PSI or individualized LFM designs are more*

[10] S. Alan Cohen and Joan Hyman. *High Intensity Learning Systems 2.* New York: Random House, 1979.

[11] James Block, "Mastery Learning in the Classroom," *op. cit.*

[12] S. Alan Cohen. "Instructional Systems in Reading: A Report on the Effects of a Curriculum Design Based on a Systems Model." *Reading World* 16: 158-71; March 1977.

[13] Robert F. Mager. *Preparing Instructional Objectives.* Belmont, California: Fearon Publishers, Inc., 1962.

[14] S. Alan Cohen and Joan Hyman, *op. cit.*

[15] S. Alan Cohen and Jerome Kaplan. *High Intensity Learning Systems Math.* New York: Random House, 1974.

[16] S. Alan Cohen and Joan Hyman. *The Reading House Series.* New York: Random House, 1976.

[17] S. Alan Cohen and Dale Foreman. *Scoring High in Reading.* New York: Random House, 1978.

effective than group LFM methods. We know that children learn more in LFM than in traditional curriculums. This is true for group LFM advocated by Block[18] and practiced successfully by Reid.[19] Within LFM, however, we have found PSI methods markedly superior to group instruction.

One of our recent doctoral dissertations compared PSI LFM with group LFM instruction among 150 low SEL, Mexican-American first-grade underachievers.[20] Both groups got a month of identical LFM

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reading instruction, but one received it via PSI delivery and the other via group delivery. Results on tests of both delayed and immediate recall showed that PSI consistently exceeded group instruction by at least half the common variance, defined as a "large" effect.[21]

This is typical of what we have seen for 15 years. The reasons for PSI superiority are obvious. In a self-directed, continuous progress LFM curriculum, there is little rein on the individual's learning rate. If LFM increases forward motion, then PSI LFM increases this phenomenon even more. Group restraints are eliminated. Every feedback, for example, is to an individual learner who never has to await a turn. In PSI every learner is first and next, hence the high P Ratio.

The problem with PSI, as both Block and Reid recognize, is that schools are group-oriented. With a one to 25 teacher-pupil ratio, most educators do not know the technologies of individualized instruction. This is a PSI, not an LFM, problem. Block, Reid, and many other LFM advocates recognize classroom realities and have wisely chosen group LFM approaches as more expedient. On their grounds, they are absolutely right. But for 15 years we have worked out the technologies of individualized instructional delivery systems. *When teachers and administrators agree to these technologies,* the results of PSI LFM markedly exceed group versions of LFM.

7. *Competency-based instruction (CBI) implies, but not always requires, LFM.* In practice, CBI is rapidly being corrupted into an absurd exercise in developing lists of behavioral objectives and criterion tests that tend neither to match the objectives sought nor the materials and strategies used to instruct. Because LFM practitioners recognize the importance of matching the three curriculum components (objectives, practices, and measurement), they are well ahead of CBI practices. LFM's survival depends in part upon keeping a moderately wide berth between itself and CBI, lest the impending demise of CBI due to the discrepancies among the three components rub off on LFM.

8. *In any formal curriculum the CRT or the observed practice in the real world is the true objective.* In the last six of the 15 years we have worked with LFM, we have watched the CBI vogue grow. With both amusement and dismay we have observed educators consume inordinate amounts of energy writing competency lists. When they realize the absurdity of their efforts, they will discover that the CRT, not the listed competency, is the true objective. And when that is appreciated, we may begin to see real world applications replace paper-pencil CRTs.

9. *In general, schools are more concerned with teaching than with learning.* For example, teacher editions of published programs are larger and thicker than the learner's materials. Basal reader and math programs provide more teacher than learner resources because they are designed primarily for teachers, not for learners. A program is selected for adoption on the basis of what it teaches, not on what students learn from it.

LFM, on the other hand, is learning-oriented. The basic question we ask in an LFM program is not what did we teach, but what competency did they demonstrate. In the teaching-oriented milieu, inability to learn reflects deficient student aptitude or effort. The learner flunks. But in an LFM milieu, aptitude is simply a measure of learning rate. Instruction begins with an assumption that every child will demonstrate mas-

[18] James Block and Lorin Anderson, *op. cit.*

[19] Ethna Reid. "Best Teaching Practices in Reading Based on Seven Years of Research." Paper presented at the International Reading Association 19th Annual Convention, New Orleans, May 3, 1974.

[20] Samuel Rodriguez. "A Comparison of Socio-Cultural Teaching Using a Ramirez Casteñada Model with Psychological Strategies Using PSI Mastery Learning." Doctoral dissertation, University of San Francisco, 1979.

[21] Jacob Cohen. *Statistical Power Analysis for the Behavioral Sciences.* New York: Academic Press, 1977.

tery, albeit some more quickly than others. The burden is upon the teacher to cause mastery, and the ultimate evaluation is not how well he or she taught, but how well they learned.

The teaching-oriented milieu is a serious impediment to the spread of LFM.

10. *Most teachers are easy to train as LFM classroom managers.* With very few exceptions, young or old, novices or 30-year veterans, given the materials they need, precise demonstrations of how to teach, and onsite support while they convert to LFM instruction, teachers take to it enthusiastically. Our overall impression is that most teachers crave systematic, precise pedagogies that show them concrete measurable evidence of student learning.

Getting administrators to learn about pedagogy and to commit time to curriculum rather than to administrative concerns appears to be a bigger problem than training teachers. This problem seems to be more on site than at the central office, where superintendents may seek change more often than principals. Perhaps it is easier for superintendents to mandate and defend change than to execute and live with it daily. The latter is the principals' burden, which may explain their reticence.

Final Conclusions

On the one hand, many of the conclusions discussed in this 15-year retrospective are not peculiar to LFM curriculum. The seven pedagogical techniques are applications of classic principles of learning. The group vs. PSI issue is old hat to ASCD literature, as are school leadership and teacher training issues.

On the other hand, the practice of demanding demonstrated mastery and of assuming that all children can learn is an LFM innovation, and it raises threatening issues in the profession. We see the effect of such threats when educators debate "mechanistic behaviorism" vs. "humanism," or "intentional" vs. "incidental" learning. These are issues not raised here because they are red herrings. People, not LFM, are mechanistic, or humanistic, or both. Any competency-based curriculum includes intentional and incidental learning objectives, depending upon the creativity and technical abilities of the people who create the curriculum.

What is worth leaving as a final thought on 15 years of LFM curriculum is our conclusion about P Ratio, LFM's most potent ingredient. We assume that student motivation is a key to increasing the quality and quantity of student learning. Whatever else motivation appears to be, it is measurable and controllable as P Ratio. Since LFM pivots on the P Ratio concept, LFM appears to us to be the most potent curriculum model of our time.