# Multiply Learning Rates by 5

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The brain is a filter, rejecting stimulus that repeats too soon or too late. MasterMind™ is technology for finding the best time to repeat, when the brain is sensitive. To learn touch typing, for example, a student needs more than 25 hours with "intelligent" software now on the market—or only 5 hours with *MasterMind Typing*.

The "Spacing Effect"

Cognitive psychologists have found improved learning with increasing delay between stimuli—up to a point of excess delay, after which a stimulus loses effect. Researchers call this the "spacing" or "lag" effect on learning. Their experiments employ various paradigms and measures of retention.[1]

retention

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delay before repetition ⟶
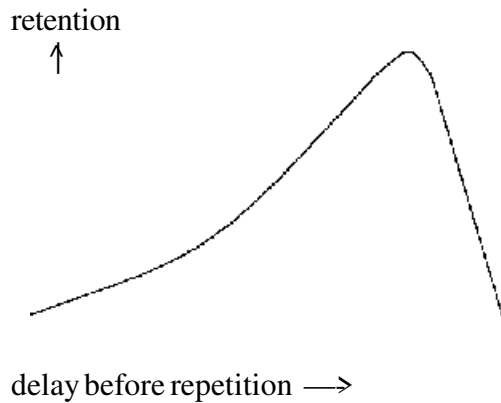
While studying the neurochemistry of learning, other scientists have found the spacing effect in mollusks too.[2] It is in the chemistry of all animals with a central nervous system.

Researchers have seen the spacing effect as an outcome rather than a means of teaching. Still, if one could schedule repetition for peak retention, the advantage is clear.

Computer Application

The difficulties of predicting a retention peak include variations in: learners, stimuli, the stage of learning for each learner and fact, and the lesson environment. During a lesson, the vital parameters change in rapid, complex ways that defy tracking by humans.

Programmed with MasterMind, a computer offers the means to predict retention peaks. As a lesson progresses, MasterMind builds a mental model of the learner respecting the lesson and each item in it. On this basis, the retention peaks are predictable with surprising accuracy. MasterMind lessons embody "mastery" strategy, that is, a lesson continues until the learner knows all items. Potentially, MasterMind applies to innumerable subjects.

Without MasterMind, tutoring programs schedule repetition on a random or arbitrary basis called "intelligent" by their proponents. A standard technique is to compose a new lesson or sub-lesson on items missed. What "intelligent" tutors lack is the proper interval before repetition, so repetition seldom matches retention peaks. Being mainly too early (boring) or too late, its benefit is weak.

Because ordinary repetition mainly wastes time, MasterMind's gain in learning rate is large. How large? Measurement shows that learning with MasterMind is about five times faster than self-

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1. The lag " . . . effect is highly robust, showing up under a variety of conditions and on a number of measures of memory." Johnston, Wm. A., & Uhl, C. N., The contributions of encoding effect and variability to the spacing effect on free recall, 2 *Journal of Experimental Psychology: Human Learning and Memory* 153-160, 1976. Such measures and conditions include " . . . recall, recognition memory, and frequency-judgment tasks, using pictures, words, sentences, nonsense syllables, and letters." Hintzman, D. L., *The Psychology of Learning and Memory*, W. H. Freeman & Co., San Francisco, 1978, p. 332.

2. Kandel, Eric R., and Schwartz, James H., Molecular Biology of Learning: Modulation of Transmitter Release, 218 *Science* 439, American Association for the Advancement of Science, Washington, D.C., 29 Oct. 1982.

teaching with flash cards. When using flash cards, the tester does one's best to replace cards in the deck where they will aid learning.

The test employs two sets of fictitious items that are different but of equal difficulty. Questions have the form A=? where the answer is a 2-digit number. The comparison is between flash-card and MasterMind learning by the same person. Lesson size is enough to challenge the learner, normally at least ten items.

Touch Typing

Responding to user interest, many computer programs purport to teach typing. Compared with traditional workbooks, these (other than *MasterMind Typing*) reduce learning time somewhat, about 30%. It still takes 25 hours, usually more, for a student to master the keyboard. Such programs make paper workbooks attractive on a cost/benefit basis.

Putting their best foot forward as salesmen ought, automation marketers have made games and graphics the basis of competition among typing programs. Users, though, still know what their interest is: to learn quickly and surely. Being directed to this interest unlike other software, MasterMind makes automation powerfully appealing for the first time.

Besides working five times faster, *MasterMind Typing* makes perfection natural. A student clearly becomes a touch typist, knowing the whole keyboard. So another aspect of the MasterMind difference is: *MasterMind Typing* guarantees mastery while the others aim just to drill.

Without *MasterMind Typing*, lack of means to test keyboard knowledge makes it customary to test typing speed instead. For the relevant population, inept typists, speed is a poor criterion because people can type 25 wpm or more without knowing the whole keyboard. (25 wpm is a common standard for irregular typists, whom computers have made preponderant.)

Leaving the course at 25 wpm or whatever rate, without properly learning the keyboard, means that one never will type better. In contrast, knowing the keyboard means that speed will continue improving with any kind of practice, such as normal work. So speed is a poor criterion if less than a value that one surely must know the keyboard to attain, probably 60 wpm or more.

Still, *MasterMind Typing* in the future will add speed tests, to satisfy students' curiosity and help employers to test applicants. The advanced, speed-building lessons will strengthen too.

Economics

Please consider the convertibility of time and money as to typing. Using computers awkwardly, nontypists waste more than the cost of training by any method. Compared to other programs, *MasterMind Typing* saves at least twenty hours per trainee, for example, $200 per trainee if they are worth $10/hour. So *MasterMind Typing* pays for itself instantly. Savings multiply with successive trainees and forever because of their productivity gain.

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MasterMind^{tm} Typing - Notes for Teachers

This is about lesson administration for a group of students, which is simple because MasterMind software makes mastery intrinsic. The appended, printable form should suffice for student records. *MasterMind Typing* works well for students of all ages. We do not advise typing instruction before third grade, because the smallness of their hands impedes younger children.

Because MasterMind teaches much faster than ordinary methods, including other computer programs, typing as a course in itself is obsolete. *MasterMind Typing* should be a minor part of another course, for example, a course in writing or computer skills.

MasterMind Typing gives lessons of different kinds in three phases. Completion of Phase 1 makes the student a touch typist, albeit a slow one. Thereafter, any practice will improve speed; and Phases 2 and 3 especially do so. Phase 2 efficiently focuses on common sequences of characters. Phase 3 is optional literature that the student memorizes by typing.

MasterMind lessons need no grading. A lesson automatically continues until the student masters it. The only record necessary is to show what lessons the student has done. In Phases 2 and 3, the speed setting also belongs in the record as part of the lesson description. Teachers should specify the speed goal according to the role of typing in the students' other work. Students start phase 2 and 3 lessons at a comfortable, lower speed and work to the goal gradually.

The Math and Special lessons of Phase 1 are optional, and there are no "Special" characters on keyboards designed for English. Except those with special problems (emotion, arthritis etc.), students can complete the standard Phase 1 lessons in 6 hours or less. Some students do it in as little as 1.5 hours. The time to do advanced lessons can vary even more, according to the student's dexterity and speed goal.

It is important to give the lessons on a flexible schedule because of the large variation in learning rate among students. Also, avoiding pressure helps to ensure truthful reports of the lessons finished. Further to elicit truthful reports, teachers beforehand should announce deferral of the typing test until everyone finishes the *MasterMind Typing* lessons assigned. A teacher should use the reports to make *MasterMind Typing* more available to the slower students.

Shirking is rare because MasterMind gives pleasure of achievement better than a game, and peer example is encouraging. If a student falsify the report of lessons done, his/her performance on the test would reveal it. While the others type smoothly, the wretch would struggle and produce a bad paper.

Student's Printed Name _____

Phase 1 at 2 WPM (words per minute)

Lesson	date	minutes	finished Y or N	date	minutes	finished Y or N	date	minutes	finished Y or N
1									
2									
3									
4									
all									
numerals									
math									
special									

Phase 2

Lesson	date	WPM	minutes	finished Y or N	date	WPM	minutes	finished Y or N	date	WPM	minutes	finished Y or N
left												
center												
right												
all												

Please hand in this form as your teacher asks. If you fill this form before reaching the speed goal, please get another blank from your teacher. Minutes spent are approximate. By signing, Student guarantees the accuracy of everything else.

Student's signature

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