"La 3e voie…"

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Systematic Instruction

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The research on effective teaching conducted since 1974 has revealed a pattern that is particularly useful for teaching explicit skills or a body of content. This pattern, which might be called systematic instruction (Katz, 1994) is a systematic method of teaching new material, a method that includes presenting material in small steps, pausing to check for student understanding, and requiring active and successful participation from all students.

Although this pattern came primarily from research in reading and mathematics instruction in elementary and junior high schools, the results are applicable to any systematic or "well- structured" (Simon, 1973) area of knowledge. These results are relevant for teaching mathematical procedures and computations, reading decoding, science facts and concepts, social studies facts and concepts, map skills, grammatical concepts and rules, and foreign language vocabulary and grammar.

The pattern that will be described has also been used, with modifications, to teach students complex cognitive skills such as writing essays, reading comprehension, and problem solving in mathematics. In these cases, students are provided with "scaffolds" and other techniques that support the student and reduce the difficulty of the task (Rosenshine and Meister, 1992).

The research on teaching has found that when effective teachers teach well-defined concepts and skills, they:

- Begin a lesson with a short review of previous, prerequisite learning.
- Present new material in small steps, with student practice after each step.
- Provide considerable active practice for all students.
- Ask many questions, check for student understanding, and obtain responses from all students.
- Guide students during initial practice.
- Provide systematic feedback and corrections.
- Continue practice until students are independent and confident.

The major components include teaching in small steps with student practice after each step, guiding students during initial practice, and providing all students with a high level of successful practice. Each of these instructional procedures will be described more fully later.

School-Based Origins

These results come from research in classrooms that was designed to identify the instructional procedures used by the most successful teachers. In this research the investigators first gave pretests and posttests to a number of classrooms, usually 20 to 30 classrooms, and usually in reading or mathematics. After making appropriate adjustments for the initial ability of the students, the investigators identifies those teachers whose classes made the highest achievement gain in the subject being studied and those teachers whose classes made the least gain.

The observers then sat in these classrooms, and observed and recorded the frequency with which those teachers used various instructional behaviors. The observers usually recorded the number and type of questions, the quality of the student answers, and the responses of a teacher to a student's answers. Many investigators also recorded how much time was spent in activities such as review, presentation, guided practice, and supervising seatwork. Some investigators recorded how the teachers prepared students for seatwork and homework. Other observers recorded the frequency and type of praise, and the frequency, type, and context of criticism. The overall attention level of the class, and sometimes, of individual students was also recorded. This information was then used to describe how the most successful teachers were different from their less successful colleagues.

Initially, the studies were correlational. The correlational studies were followed by experimental studies in which the investigators developed a manual for teaching based, in part, on findings from the correlational studies. One group of teachers received the manual and was taught to use these behaviors in their teaching and the control teachers were asked to continue their regular teaching. These studies have shown that the teachers who received the manual performed many of the instructional procedures that were suggested. For example, they asked students more questions and spent more time presenting new material. The investigators also found that students of the teachers in the experimental classes obtained higher achievement scores than did students of' the control teachers.

The results from the experimental studies, then, supported the findings of the earlier correctional studies. By and large, these experimental studies showed that the teachers in the experimental groups used more of the new behaviors they were taught to use, and the posttest scores of their classrooms - adjusted by regression for their initial scores - were significantly higher than scores in classrooms taught by the control teachers. The results of both sets of studies are incorporated in this chapter.

Correlational studies of this type, studies where the investigators identified the instructional procedures that were used by the most successful teachers were conducted as early as 1948 (Barr, 1948). Subsequent studies by Flanders (1970) and by Medley and Mitzel (1959, 1963) initiated over a decade of research on teacher-effects research. The best known of the later studies were those by Stallings and Kaskowitz (1974) who studied Follow-Through classrooms, Good and Grouws (1977, 1979) who studied teachers of fourth-grade mathematics, and Brophy and Evertson (1976) who studied the teaching of first grade reading.

Rosenshine (1971) summarized the earliest studies. The correlational studies and the experimental studies in this tradition are described in detail by Brophy and Good (1986) and the experimental studies in this tradition were described by Gage and Needles (1989).

Systematic instruction, direct instruction, and similar terms

Gage (1978) referred to these studies as research on "teacher effectiveness". Medley and Mitzel (1963) referred to the same research as "process-product research" because of the emphasis on conducting correlations in these studies. Brophy and Good (1985) used the title "teacher effects". McDonald and Elias (1976) looked at pattern of the results in one of their studies and wrote that the successful teachers used a pattern that they called "direct instruction", a term which Rosenshine (1976) began to use extensively. Unfortunately, the term direct instruction is confusing today because today the term is used to refer to both to the specific findings of the teacher effects research and also to any teacher-led instruction. There is no way to avoid this problem because many educators who use the term direct instruction are not aware of the many meanings this term has. Others have used the term "explicit teaching" to refer to the same pattern. Katz (1994) introduced the term "systematic instruction" to describe the findings of the teacher effects research, and uses that term to refer to the explicit sequence of instruction and the emphasis upon providing guided practice. Systematic instruction is a more descriptive term than direct instruction and is less ambiguous.

Information processing research

The research on human cognitive architecture, on how information is acquired, stored and retrieved. (Kirschner, Sweller, & Cooper, 2006; R. Meyer, Information Processing, Volume 1; Kirschner & van Merrienboer, Instructional theory and design, Volume 1) has major implications for teaching. Although the major work on human cognitive architecture occurred after the teacher effects research had ended, this research on information processing fits the findings on classroom instruction quite well and adds to our understand of the findings from the teacher-effects research.

1. The limitations of our working memory

Current information process theories suggest that there are limits to the amount of information we can process effectively. We are "limited-capacity processors". We can only handle a few pieces of new information (about seven) in our working memory at one time. When we are presented with too much new information our working memory becomes swamped, a condition that is called "cognitive overload". When overloaded, we become confused, and we do not process the new material (Tobias, 1982). Thus, teachers need to be cautious in the amount of new or difficult material they present at any one time.

2. The need for student processing

New material also needs to be processed in order to transfer it from our working memory to our long-term memory where it is stored and used. Unless we elaborate on,

review, and rehearse the new material there is a good chance that the new material will not be retained. Thus, teachers need to provide active practice for all students. Such practice is facilitated if the teacher guides and encourages student processing by asking questions, requiring students to summarize main points, having students tutor each other, and supervising students as they practice new steps in a skill.

The "level of processing" of new material is also important. Requiring students to review, compare and contrast summarize, and drawing conclusions results in a higher level of processing, and better retention and application, than asking students to simply repeat the material.

As Brown and Campione (1986) put it: "Understanding is more likely to occur when a student is required to explain, elaborate, or defend his or her position to others; the burden of explanation is often the push needed to make him or her evaluate, integrate, and elaborate knowledge in new ways" (p. 1066).

3. The importance of a well-connected cognitive network

It is currently thought that the information in our long-term memory is stored in interconnected networks which are called knowledge structures. The size of these structures, the number of connections between pieces of knowledge, the strength of the connections, and the organization and richness of the relationships are all important for processing information and solving problems. It is easier to assimilate new information and easier to use prior knowledge for problem solving, when one has more connections and interconnections, stronger ties between the connections, and a better organized knowledge structure. When the knowledge structure on a particular topic is large and well-connected, new information is more readily acquired and prior knowledge is more readily available for use. Education is a process of developing, enlarging, expanding, and refining our students' knowledge structures.

A major difference between an expert and a novice is that the expert's knowledge structure has a larger number of knowledge items, the expert has more connections between the items, the links between the connections are stronger, and the structure is better organized. A novice, on the other hand, is unable to see these patterns, and often ignores them.

Chase and Chi (1980), who have studied how expertise is acquired, wrote:

> *The most obvious answer is practice, thousands of hours of practice... For the most part, practice is by far the best predictor of performance. Practice can produce two kinds of knowledge ... a storage of patterns and a set of strategies or procedures that can act on the patterns.* (p. 12).

4. Experts see patterns

When novices look at a chess board, they tend to see individual pieces. But when experts look at chessboards, they see the patterns that the pieces form. When chess players shown the pieces in a chess game and asked to memorize them, the expert chess players are able to memorize the positions of up to 32 pieces despite the limitations in the size of our working memories. The experts overcome these limitations because they have grouped these pieces into five or six patterns. As proof, it was shown that when expert chess players are shown chess pieces placed randomly on a chess board, then they are only able to recall the placement of five or six pieces - just like ordinary people.
This difference between seeing individual pieces and seeing patterns characterizes the differences between experts and novices in a wide number of fields. Novices see individual bits of information, whereas experts, through practice and study, have grouped in-

formation into patterns. When novice teachers look at classrooms they tend to see individual activities, whereas expert teacher group the activities they see into patterns.

The advantage of organizing knowledge into patterns is that a pattern only occupies a few bits in our limited working memory. Thus, having larger and better connected patterns frees up space in our working memory. This available space can be used for reflecting on new information and for problem solving. This development of well-connected patterns (also called "unitization" and "chunking") and the concomitant freeing of space in the working memory is one of the hallmarks of an expert in a field.

Dancers initially see one move and then another, and eventually they merge the steps into phrases and then into longer sequences. And after learning the steps and the phrases, and after extensive practice, the dance becomes a chunk, becomes one seamless movement. And as the dance becomes automatic, less space is required in the working memory and the dancers are able use the available space to focus on the moment to moment nuances of the performance. Education, then, is the development of well-connected and elaborate knowledge structures. These structures allow for easier retrieval of old material, permit more information to be carried in a single chunk, and facilitate the understanding and integration of new information.

5. The development of automaticity

When words and concepts and intellectual skills are highly practiced, – are "overlearned" – they can be recalled automatically from a person's long term memory. Automatically means without conscious thought and without taking up any of the limited space in our working memory. When prior learning is automatic, space is left free in our working memory that can be for comprehension and higher-level thinking.

Fluent decoding is an example of automaticity. A skilled reader reads without having to sound out words. This skill is the result of extensive practice. When reading is automatic, then more space is available in the working memory and that space can be used for comprehension.

Educational implications

The research on human cognitive architecture suggests that it is important for the teacher to provide "instructional support" when teaching students new material (see Tobias, 1982). Such support occurs when the teacher: (1) breaks material into small steps in order to reduce possible confusion; (2) structures the learning by giving an overview or an outline; (3) gives the learner active practice in each step in order to move the new learning into long-term memory; and (4) provides for additional practice and overlearning so that the learners can use the new material or skills effortlessly.

As we shall see, the most effective teachers in the teacher effects research applied the research on human cognitive architecture extremely well, and there is a close fit between the results of the research on human processing and the instructional practices of the most effective teachers.

Six teaching functions

I have divided the results from the empirical research on teacher effects into six teaching functions: review, presentation of new material, guided practice, feedback and corrections, independent practice, and weekly and monthly reviews. These results are summarized in Table 1. Similar functions have also been developed by Good and Grouws (1979) and Russell and Hunter (1981).

Gage (1978) has noted that these general principles represent "the scientific basis for the art of teaching. However, a good deal of art is needed to translate this material into specific lessons. Teachers have to make decisions on the amount of material that will be presented at one time, the way in which it will be presented, how guided practice will be conducted, how specific errors made by specific students will be corrected, the pace and length of the lesson, and how they will work with different students. A great deal of thought, creativity, and flexibility is also needed to apply the results from the research on teacher effects to specific instances of teaching lessons on long division, on the Constitution, on grammar, and on reading comprehension.

All teachers use some of these functions some of the time. These findings, after all, came from the study of observed classroom instruction. But the differences between the more effective and the less effective teachers were in how they used these functions. It was found that effective teachers apply these instructional procedures consistently and systematically, while the less effective teachers use each function less effectively.

1. Daily Review

Effective teachers in these studies began their lesson with a five – to eight – minute review which included a short review of previously covered material, correction of homework, and review of prior knowledge that is relevant to the day's lesson. These reviews ensured that the students have a firm grasp of the prerequisite skills for the day's lesson. The teachers' activities can include: reviewing the concepts and skills necessary to do the homework; having students correct each others' papers; asking about points at which the students had difficulty or made errors; and reviewing or providing additional practice on facts and skills that need overlearning. Daily review could also include a short test on items similar to the homework assignment.

One example of effective daily review is in a successful reading program (Reid, 1978). In this program five minutes are spent in daily review of sight words, – words from prior stories and words from forthcoming stories in their reader. The teacher presents the word lists and the students say the words, in unison, and, when necessary, they re-read the lists until the reading is fluent. The students read at the rate of a word a second, which makes it possible for a class to review 150 sight words in less than 4 minutes.

Daily review was also part of a successful experiment in elementary-school mathematics (Good & Grouws, 1979). It was found, in this study, that teachers in the control group, who had said that they review every day, only did so on only 50 percent of the days they were observed. The teachers in the more successful experimental group, who had received training in daily review, conducted review and checked homework 80 percent of the days they were observed.

The importance of practicing daily review then, can be justified both by the empirical research on teaching and by the research on human cognitive architecture. As Chase and Chi (1980) noted, the development of expertise requires practice, "thousands of hours of practice". Daily review is practice. The practice of recalling previous learning can serve to strengthen the connections in our knowledge structures, and can thus help us to recall that material effortlessly and automatically.

2. Presenting New Material

The daily review is followed by the presentation of new material. Effective teachers spent more time presenting new material and guiding student practice than did the

less effective teachers (Evertson et al., 1980; Good & Grouws, 1979). Evertson et al. (1980) found that the most effective mathematics teachers spend about 23 minutes per day in lecture, demonstration, and discussion, in contrast to 11 minutes for the least effective teachers. The effective teachers used this extra time to provide additional explanations, give many examples, check for student understanding, and re-teach material when necessary. Their objective was to provide sufficient instruction so that the students could do the independent practice – the time they spent working on their own – with minimal difficulty. In contrast, Evertson et al., (1980) and Good and Grouws (1979) found that the less effective teachers spent less time presenting new material. These teachers gave shorter presentations and explanations and then asked the students to practice independently - before they were competent enough to do so. Under these conditions, it was found that their students make more errors during independent practice.

At the start of the presentation, effective teachers first focused the students' attention on what they are to learn and do. Then, they proceeded to teach new material "in small steps" (Brophy & Good, 1986), and only taught one point at a time. These teachers gave short presentations, provided many examples, and followed this material with guided practice. As noted above, presenting too much new material at one time may confuse students because their short-term memory will be unable to process it.

Dorothy DeLay an esteemed teacher of violin whose students included including Itzhak Perlman, Nadja Salerno-Sonnenberg, and Gil Shaham made this same point when the recommended to violin teachers that they should first analyze the problem, and then simplify the task into steps so that the student can succeed and not be overwhelmed by its difficulties.

Smith and Land (1981) found that it is also important for the teacher to avoid ambiguous phrases, such as "sort of" and "a few", or phrases that may easily be misinterpreted, such as "as you can see" and "it is obvious that". These phrases are vague and may confuse a student when learning new material. Digressions can also cause problems because digressions can confuse the students by giving them too much to process.

Effective teachers also stopped to check for student understanding. They asked questions about the material, they asked students to summarize the presentation to that point or to repeat directions or procedures, or asked students whether they agree or disagree with other students' answers. This checking has two purposes: answering the questions causes the students to elaborate upon the material they learned and augment connections in their long-term-memory, and this checking also tells the teacher whether parts of the material needs to be retaught.

At the end of their presentation the less effective teachers were heard to simply ask "Are there any questions?" and, when no student asks anything, assume that the material has been learned. Another error is to ask a few questions, call on volunteers to hear their (usually correct) answers, and then assume that the class understands and has learned from the volunteers.

The following suggestions for effective presentation have emerged from the experimental and correctional classroom literature:

- Provide outlines.
- Organize material so that one point can be mastered before the next point is introduced.
- Checking for understanding during the presentation.
- Avoid digressions.

3. Guiding student practice

After the presentation, the teacher conducts guided, supervised practice. The major purposes of guided practice is to (1) supervise students' initial practice on a skill so that the students don't internalize errors, (3) check for understanding (Hunter, 1982) of the material, and (3) provide the active practice and elaboration that are necessary to move new learning into our long-term memory.

As noted, the research on information processing has revealed that we have to spend a lot of time processing it the new material in order to learn it. We need to spend time rephrasing, rehearsing, and summarizing the new material so that we can readily retrieve it from our long-term memory when applying it to new situations.

Teacher questions and student discussion are a major way of providing this practice. By asking questions a teacher directs and guides the necessary processing and elaboration that are needed in order to process and store the new information in our long term memory. Questions also allow a teacher to "check for understanding", (Hunter, 1982), that is, to determine how well the material has been learned and whether there is a need for additional instruction.

A number of correlational studies (e.g. Stallings & Kaskowitz, 1974) have shown that the more effective teachers asked more questions than were asked by the less effective teachers. These correlational studies were followed by experimental studies (Anderson et al., 1979; Good & Grouws, 1979), in which teachers were taught to use a high frequency of questions during guided practice. In both experimental studies, the students of teachers in the experimental groups achieved higher scores on the posttest than did students of teachers in the control groups.

Two types of questions are usually asked during guided practice: questions that call for specific answers and process questions – questions that ask the students to explain the process they used to answer the question. In a correlational study of junior-high-school mathematics instruction (Evertson, Anderson, Anderson, & Brophy, 1980), the most effective teachers asked an average of 24 questions during the 50-minute period, whereas the least effective teachers asked only 8.6 questions. The most effective teachers asked 6 process questions during each observed period whereas the least effective teachers asked only 1.3 questions.

Teaching in small steps

Sometimes the presentation of new material and guided practice are combined so that a teacher only presents a small amount of new material and then follows this presentation with guided practice. This pattern of short presentations and guided practice has been called "teaching in small steps" (Brophy & Good, 1986). One might expect that with younger, slower students, or when the material is new and/or different, that these shorter segments of presentation and guided practice would be most effective.

Variations in guided practice

Teachers have developed a number of ways to guided student practice. When teaching procedures that have a number of steps – such as two-digit multiplication – there is a need for sufficient practice on the first step before the students go to the next step. Guided practice could consist of going over the skills in small steps with teacher supervision. Some students practice at the board, while others work at their seats. When the teacher feels they are ready, the students proceed to the next step. If they are not ready, then the teacher provides additional practice.

When teaching a more elaborate skill, such as using a computer package, or solving a geometry problem, or writing an essay, students might first be asked to restate the steps that were taught so that the teacher can resolve any confusion before the students

begin their practice. Then the teacher could supervise students as they begin to practice, guiding them through each procedure until they can perform each step without errors.

Increasing student participation

Imaginative teachers have been able to increase the amount of active participation by involving all students in answering questions, instead of simply answering the teacher. Examples of procedures for increasing student participation include having each student:

- Tell the answer to a neighbor.
- Write the answer and an explanation on a sheet of paper.
- Summarize the main idea in one or two sentences, writing the summary on a piece of paper and sharing this with a neighbor, or repeat the procedures to a neighbor.

Other teachers developed procedures that allow them to monitor the entire class. Teachers may ask the class to:

- Write the answer on a slate that he or she then holds up.
- Raise their hand if they know the answer.

One student can answer and the other students can then signal whether they agree or disagree.

Some teachers use choral responses to provide sufficient practice when teaching new vocabulary or lists of items or when teaching students to identify parts of things, such as parts of a plant, book, or dictionary, or to discriminate among related concepts, such as metaphor, simile, and personification or adverbs and adjectives. Choral responses can make the practice seem more like a game. To be effective, however, all students need to start together, on a signal. When students do not start together, then only the fastest students answer, and the others do not receive adequate practice.

Of course, all teachers use guided practice. However, the most effective teachers spend more time in guided practice, more time asking questions, more time checking for understanding, more time correcting errors, and more time having students work out problems with teacher guidance.

High Percentage of Correct Answers

Effective teachers have a high success rate (Fisher et al., 1978). In a study of fourth-grade mathematics, Good and Grouws (1979) found that 82 percent of the answers were correct in the classrooms of the most successful teachers, whereas the least successful teachers had a success rate of 73 percent. The optimal success rate appears to be about 75-80 percent during guided practice, suggesting that the effective teachers combine both success and sufficient challenge. The most effective teachers obtained this success level by "teaching in small steps," that is, by using the combination of short presentations and supervised student practice, and by providing sufficient practice on each part before proceeding to the next step. In other words, if the success rate is slow when the teacher begins the guided practice, the teacher continues and practice and explanations until the success rate is high.

4. Provide Feedback and Correctives

During any recitation or demonstration, how should a teacher respond to a student's answer? Researchers who observed and coded classroom instruction recorded the frequency and type of teacher questions, the correctness of the student responses, and teacher responses to their answers. These studies showed that when a student was correct and confident, it was most appropriate for a teacher to then ask another question, or give a short statement of praise (such as "Very good") and thus continue the momentum of the practice.

However, when a student was correct but hesitant, it was found that many of the more successful teachers also provided "process feedback". Process feedback (Good & Grouws, 1979) refers to the teacher saying, "Yes that's right, because ..." and then the

teacher re-explained the process one goes through to arrive at the correct answer. By providing an additional explanation or repetition of the process in this manner, the teacher provided that student, and likely other students, with the additional learning that the hesitant student appeared to need.

When a student made an error the more effective teachers helped them by simplifying the question, providing hints, or reteaching the material. But the less effective teachers often supplied the correct answer and then moved on to the next student. Whether one uses hints or reteaching, or reteaching outside the lesson, the important point is that unless the errors are corrected, misconceptions and problems will remain.

Many of these strategies also apply to older students. In a review of effective college teaching, Kulik and Kulik (1979 found that instruction is more effective when (a) students receive immediate feedback on their examinations, and (b) students have to do additional study and take another test when their quiz scores do not reach a set criterion. Both points seem relevant to this discussion: students learn better when the feedback is as immediate as possible, and error should be corrected before they become habitual.

5. Conduct Independent Practice

Independent practice provides students with the additional review and elaboration that they need to become fluent in a skill. This need for fluency and independence applies to many of the procedures that are taught in school: dividing decimals, reading a map, conjugating a regular verb in a foreign language, completing, and balancing a chemical equation, operating equipment, and applying safety procedures. This need for fluency also applies to facts, concepts and discriminations that must be used in subsequent learning.

A good deal of substantial practice is usually needed in order to attain fluency in a skill. When students become fluent, when they can perform rapidly, successfully, and automatically (Bloom, 1986) and no longer have to think through each step - when they reach this stage, students can then devote their full attention to comprehension and application.

Independent practice should involve the same material as the guided practice. If the guided practice dealt with identifying types of sentences, then the independent practice should also focus on identifying types of sentences. It would be inappropriate to follow instruction in types of sentences independent practice assignment that asked students to "Write a paragraph using two compound and two complex sentences", because students have not been prepared for this activity.

Managing Independent Practice

Sometimes it may be appropriate for a teacher to practice some of the homework problems with the entire class before the students take the work home or engage in independent practice. Fisher et al., 1978) found that teachers who spent more time in guided practice had students who were more engaged during seatwork. This finding suggests the importance of adequately preparing students bel6re seatwork. Fisher et al. (1978) also found that classrooms where the teachers had to stop at students' desks and give a great deal of explanation during seatwork were also classrooms where the error rates on the students' papers were the highest. Having to stop and provide explanations during seatwork suggests that the initial explanation and guided practice were not sufficient.

Fisher at al. (1978) also found that students are more engaged during seatwork when their teacher circulates around the room and monitors and supervises their work. However, the optimal time for these contacts averaged 30 seconds or less. The need for longer contacts, as noted, was a sign that the guided practice had not been sufficient.

In summary, students are more engaged during independent practice when the teacher circulates and when there has been sufficient explanation and preparation before the independent practice begins.

6. Weekly and Monthly Review

Some of the successful programs in elementary schools provided for frequent review. In the successful experimental study that Good and Grouws (1979) conducted, teachers in the experimental group were asked to review the previous week's work every Monday and the previous month's work every fourth Monday. These reviews and tests were intended to provide the additional practice that students need to develop skilled, successful performers who can apply their knowledge and skills to new areas.

Kulik and Kulik (1979) found that, even at the college level, classes that had weekly quizzes scored better on final exams than did classes that had only one or two quizzes per term.

The need and value of frequent review fits the findings on human cognitive architecture. Review can serve to reinstate and elaborate prior learning; review can also strengthen and extend connections within the between our cognitive structures. Review, then, can help students develop patterns and unify their knowledge, and review can enhance the development of automaticity in the area of study.

Modifications for difficult material

When the material is difficult and possibly confusing, or when it involves a complicated series of steps, then it is more effective to break the instruction into smaller steps and have a series of sequences of instruction, guided practice, and independent practice during a single period. Thus the teacher: (1) provides an explanation; (2) checks for understanding; (3) leads the students through guided practice; and (4) supervises independent practice for the first step and then repeats the procedure for each subsequent step. This procedure is particularly effective for difficult material and/or slower students.
I have seen classes in math where the teacher led practice after each step in a sequence, and continued practice until she was convinced the students had mastered each step. At that time, I visited a class in the next room where this small step procedure was not being practiced and I impressed with how confident the students in the first class looked and how bedraggled many of the students in the second room looked.

Modifications for different learners

The time spent in these six functions should also be modified to suit different learners (see Table 2). When students are faster or older, or when the material is less difficult, then less time needs to be spent in review and more time can be spent on new material (although we often overestimate how much new material can be learned at a given time). Similarly, in such cases there is less need for guided practice and less need for independent practice in class. More of the independent practice can be done as homework because the students do not need as much help. But even in these situations, it is more efficient to return to small-step instruction when the material becomes difficult.
When learners are younger and slower, or when the material is difficult for all students, then more time ought to be spent in review, less time in presentation of new material, and more time in both guided and independent practice. During independent practice,

there should be more supervision and a greater emphasis on all students becoming quick and accurate. When material is particularly difficult, some teachers (Evertson, 1982) use a series of cycles of short presentation, guided practice, and independent practice.

Summary

Current research human cognitive architecture and the research on teaching effects have shown that it is most effective to teach in a systematic manner, providing instructional support for the students at each stage of learning. The effective teacher begins with a review of prerequisite skills, relating the current material to past learning, and then teaches the new material in small steps. He or she uses short presentations and follows each presentation with questions. After the presentation, the teacher guides the students as they practice the new skill and continues this guidance until all students have been checked and received feedback. Guided practice is followed by independent practice, which is continued until students can perform the new skill independently and fluently.
Instruction in new material begins with full teacher control and the teacher diminishes control through the lesson so that at the end students are working independently. But the progression is done in a systematic and supportive manner. This progression moves from teacher modeling, through guided practice using prompts and cues, to independent and fluent performance by the students. But at each step there is a need to monitor student learning, guide student practice, and provide additional support when they need it.

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Table 1
Teaching Functions

1. Review
- Review homework
- Review relevant previous learning
- Review prerequisite skills and knowledge for the lesson

2. Presentation of new material
- State lesson goals and/or provide outline
- Teach in small steps Model procedures
- Provide concrete positive and negative examples
- Check for student understanding
- Avoid digressions

3. Guide student practice.
- High frequency of questions or guided practice
- All students respond and receive feedback
- High success rate
- Continue practice until students are fluid

4. Provide Corrections and feedback
- Give process feedback when answers are correct but hesitant
- Give sustaining feedback, clues, or reteaching when answers are incorrect
- Reteach material when necessary

5. Independent practice
- Students receive help during initial steps, or overview
- Practice continues until students are automatic (where relevant)
- Teacher provides active supervision (where possible)

6. Weekly and monthly reviews

Table 2
Modifications to Suit Different Students

SLOWER STUDENTS	FASTER STUDENTS
More review	Less review
Less presentation	More presentation
More guided practice	Less guided practice
More independent practice	Less independent practice

MODIFICATION FOR DIFFICULT MATERIAL