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HOMWORK AND PRACTICE

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SUMMARIZING AND
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REINFORCING EFFORT AND
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HOMework AND
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"I hate homework. Why can't we just learn at school and be done with it? I know how to do these problems, and I've shown that I understand them. So, why do I have to do 25?" Jeff had expressed this point of view many times before, but this time his mother had an answer.

"At Back-to-School night, your teachers explained some things about homework to us and went over what they see as the parent's job. Let me see if I get this right. If they asked you to do 25 problems, you are probably supposed to practice in order to increase your accuracy and speed. So it's probably not a good idea to sit there in front of the TV while you do the problems."

Jeff's mother also remembered some of the tips the parents were given for helping students with their homework. "OK. Here is the kitchen timer. When I say 'Go,' do the first five problems and yell 'Stop' when you finish." For the next 30 minutes, Jeff charted and tried to beat his time as he did each set of 5 problems, making sure that he also attended to being accurate. He had to admit that the time flew by and that it was kind of fun.

"Your teacher will love it if you hand in your chart with the completed problems," Jeff's mom suggested. In fact, Jeff's teacher liked it so much that the students' speed and accuracy charts became the focus of the teacher's feedback whenever the goal was to practice a skill.

Homework and practice are instructional techniques that are well known to teachers. Both provide students with opportunities to deepen their understanding and skills relative to content that has been initially presented to them.

Research and Theory on Homework

It is no exaggeration to say that homework is a staple of U.S. education. By the time students reach the middle grades, homework has become a part of their lives. The reason commonly cited for homework makes good sense: It extends learning opportunities beyond the confines of the school day. This might be necessary because "schooling occupies only about 13 percent of the waking hours of the first 18 years of life," which is less than the amount of time students spend watching television (Fraser, Walberg, Welch, & Hattie, 1987, p. 234). Figure 5.1 shows some of the research findings on homework.

We have found four generalizations that can guide teachers in the use of homework.

1. The amount of homework assigned to students should be different from ele-

mentary to middle school to high school. One of the controversies surrounding homework is whether it is an effective learning tool for students at the elementary level. This first became an issue as a result of the findings of a meta-analysis conducted by researcher Harris Cooper (1989 a, b). After a review of the research up to 1988, Cooper reported the following effect sizes:

Grades 4-6:	ES = .15
Grades 7-9:	ES = .31
Grades 10-12:	ES = .64

Whereas homework in high school produces a gain of about 24 percentile points, homework in the middle grades produces a gain of only 12 percentile points. What was most striking in Cooper's finding is that homework had a relatively small effect—a percentile gain of 6 points—on student achievement at grades 4-6. This finding has led some to conclude that elementary students should not be assigned any home-

FIGURE 5.1
Research Results for Homework

Synthesis Study	Focus	No. of Effect Sizes (ESs)	Ave. ES	Percentile Gain
Paschal, Weinstein, & Walberg, 1984	General effects of homework	81	.36	14
Graue, Weinstein, & Walberg, 1983	General effects of homework	29	.49	19
Hattie, 1992	General effects of homework	110	.43	1
Ross, 1988	General effects of homework	53	.65	24

work. It is important to note that since Cooper's meta-analysis, there have been a number of studies (some of them conducted by Cooper) indicating that homework does produce beneficial results for students in grades as low as 2nd grade (see Cooper, Lindsay, Nye, & Greathouse, 1998; Cooper, Valentine, Nye, & Lindsay, 1999; Good, Grouws, & Ebmeier, 1983; Gorges & Elliott, 1995; Rosenberg, 1989). In fact, even though Cooper found little effect for homework for students at the elementary level in his 1989 (a and b) report, he still recommended homework for elementary students:

First, I recommend that elementary students be given homework even though it should not be expected to improve test scores. Instead, homework for young children should help them develop good study habits, foster positive attitudes toward school, and communicate to students the idea that learning

takes work at home as well as at school (1989b, p. 90).

Given the findings in recent years that homework does positively influence the achievement of elementary students and the 1989 (a and b) endorsement by Cooper, even though his synthesis of the research at that time did not show a relationship between elementary school homework and achievement, it is safe to conclude that students in grades from, at least 2nd and beyond, should be asked to do *some* homework.

This said, it is also important to realize that students at lower grade levels should be given far less homework than students at higher grade levels. The critical question is how much homework is the *right amount* of homework. Unfortunately, there is no clear answer on this point. Figure 5.2 presents recommendations from various studies.

FIGURE 5.2
Recommended Total Minutes Per Day for Homework

Grade Level	Pennsylvania Dept. of Education, 1973	Leone & Richard, 1989	Bond & Smith, 1966	Strang, 1975	Keith, 1982	Tymms & Fitz-Gibbs, 1992
Primary	30		20-29	10		
Upper Elementary	45-90		30-40	40*		
Middle School / Jr. High School	90-120	50	50	60*		
High School	120-180			120	60*	60

* These numbers are estimates, based on the author's comments.

Finally, even though there is certainly a practical (and ethical) limit to the amount of homework that should be assigned to students at the high school level, the more homework students do, the better their achievement. Specifically, Keith's data indicate that for about every 30 minutes of "additional" homework a student does per night, his or her overall grade point average (GPA) increases about half a point. This means that if a student with a GPA of 2.00 increases the amount of homework she does by 30 minutes per night, her GPA will rise to 2.50.

2. Parent involvement in homework should be kept to a minimum. It is probably safe to say that many parents assume that they should help their children with homework. In fact, some districts have written homework policies articulating how parents should be involved (Roderique, Pulloway, Cumblad, & Epstein, 1994). While it is certainly legitimate to inform parents of the homework assigned to their children, it does not seem advisable to have parents help their children with homework. Specifically, many studies show minimal and even somewhat negative effects when parents are asked to help students with homework (see Balli, 1998; Balli, Demo, & Wedman, 1998; Balli, Wedman, & Demo, 1997; Perkins & Milgram, 1996). This does not mean that parents should not help "facilitate" homework, as demonstrated by Jeff's mother in the vignette introducing this chapter. Parents

should be careful, however, not to solve content problems for students.

3. The purpose of homework should be identified and articulated. Not all homework is the same. That is, homework can be assigned for different purposes, and depending on the purpose, the form of homework and the feedback provided students will differ. Two common purposes for homework are (1) practice and (2) preparation or elaboration (see Foyle, 1985; Foyle & Bailey, 1988; Foyle, Lyman, Tompkins, Perne, & Foyle, 1990). When homework is assigned for the purpose of practice, it should be structured around content with which students have a high degree of familiarity. For example, if students are asked to practice a new skill they have learned in class via homework, they should be fairly familiar with that skill. Practicing a skill with which a student is unfamiliar is not only inefficient, but might also serve to habituate errors or misconceptions.

A second general purpose for homework is to prepare students for new content or have them elaborate on content that has been introduced. For example, a teacher might assign homework to have students begin thinking about the concept of the cell prior to systematically studying it in class. Similarly, after that concept of the cell has been introduced, the teacher might assign homework that asks students to elaborate on what they have learned. In both of these situations, it is not necessary that students have an in-depth understand-

ing of the content (as is the case when homework is used for practice).

4. If homework is assigned, it should be commented on. One set of studies (see Walberg, 1999) found that the effects of homework vary greatly, depending on the feedback a teacher provides. Figure 5.3 reports these findings.

Figure 5.3 illustrates that homework assigned but not commented on generates an effect size of only .28. When homework is graded, however, the effect size increases to .78. Finally, homework on which the teacher provides written comments for students has an effect size of .83, representing a percentile gain of 30 points.

Classroom Practice in Assigning Homework

1. Establish and communicate a homework policy. Students and their parents need to understand the purposes of homework, the amount of homework that will be assigned, consequences for not completing the

homework, and a description of the types of parental involvement that are acceptable. Each of the generalizations in this chapter should be considered when establishing a policy that will be feasible and defensible. Whether districts, schools, or individual teachers establish these guidelines, communicating clearly with students and parents can decrease potential homework-related tensions that can grow between teachers and students, between parents and teachers, and between parents and their children. Establishing, communicating, and then adhering to clear policies also will increase the likelihood that homework will enhance student achievement. The following example illustrates what a homework policy might include and how teachers might communicate it to parents and students.

One evening during the first week of school, Sharmine asked her parents to set aside 30 minutes to sit with her. Her teacher had given her a two-page homework policy, and they were to read it together. Further, both she and her parents had to sign it, and Sharmine had to return it the next day when all students would place the policy in front of

FIGURE 5.3

Research Results for Graded Homework

Use of Homework	No. of Effect Sizes (ESs)	Ave. ES	Percentile Gain
Homework with teachers' comments as feedback	2	.83	30
Graded homework	3	.78	28
Assigned homework but not graded or commented on	47	.28	11

their notebooks. Her parents were surprised when they saw the level of detail in the policy. Their older children had simply been told about the consequences for missing homework (usually points were deducted), but this policy explained much more. They were particularly pleased to see the following:

- ◆ Help set up a consistent organized place for homework to be done.
- ◆ Help your child establish either a consistent schedule for completing homework or help him create a schedule each Sunday night that reflects that particular week's activities.
- ◆ Encourage, motivate, and prompt your child, but do not sit with her and do the homework with her. The purpose of the homework is for your child to practice and use what she has learned. If your child is consistently not able to do the homework by herself, please contact the teacher.
- ◆ If your child is practicing a skill, ask him to tell you which steps are easy for him, which are difficult, or how he is going to improve. If your child is doing a project, ask him what knowledge he is applying in the project. If your child is consistently unable to talk about the knowledge he is practicing or using, please call the teacher.
- ◆ Although there might be exceptions, the minutes your child should spend on homework should equal approximately 10 times her grade level (a 2nd grader would spend 20 minutes, a 3rd grader, 30, and so on).
- ◆ When bedtime comes, please stop your child, even if he is not done.

2. Design homework assignments that clearly articulate the purpose and outcome.
The third generalization, discussed earlier

in this chapter, explained that one purpose for homework is to provide time for students to practice what they have learned in class. A second is to prepare for new information or elaborate on information that has been introduced. Sometimes students do not distinguish between these two purposes. Some might even think that what their teachers really care about is that they simply complete the homework. Consequently, it is important to clearly identify the purpose of a given homework assignment and communicate that purpose. The following example describes how this might be done.

Carly opened her assignment notebook to record the homework for the evening. The pages for the assignment notebook had been copied for students at the beginning of the year so each page was organized the same, much like the templates provided in business daily calendars. For each day of the week, there were several squares organized as follows:

Subject: _____
 Due Date: _____
 What I have to do tonight: _____
 Purpose of assignment: _____
 What I have to already know or be able to do in order to complete the assignment: _____

At the beginning of the year, the teacher had reviewed how to fill out these squares. Although many students were a little overwhelmed when they first saw these pages, they soon became quite good at filling out each section quickly and concisely. One of the things they liked best about the "assignment

squares" was that it gave them clear directions regarding what they were supposed to do and why they were being asked to do it.

3. Vary the approaches to providing feedback. Providing feedback on homework serves to enhance student achievement. Although the goal is to provide as much high-quality, specific feedback as possible, the reality is that not all homework will receive the same level of teacher attention. Many teachers try to grade and comment on each assignment, but when that is infeasible, they employ strategies that help them manage the workload and maximize the effectiveness of the feedback. The following example depicts one of these strategies.

If the homework for several nights in a row is on a single topic, the 5th grade students in Ms. Braun's class grade or discuss their own work in class the next morning and then place it in a portfolio kept in the classroom.

As frequently as possible, Ms. Braun reviews the work and makes specific comments on it. When Ms. Braun assigns homework to help students practice a skill to improve their speed and accuracy, she commonly explains to students that she would like them to provide some of their own feedback. Specifically, students are asked to keep track of their own speed and accuracy. If any students desire specific feedback from Ms. Braun, she schedules a time to discuss their progress with her.

Research and Theory Related to Practice

It is intuitively obvious that practice is necessary for learning knowledge of any type. In fact, the section on homework specifically mentioned the importance of practice. Here, we consider the specifics of practice in a little more depth. Figure 5.4 reports some of the results of studies that have attempted to synthesize the research on practice.

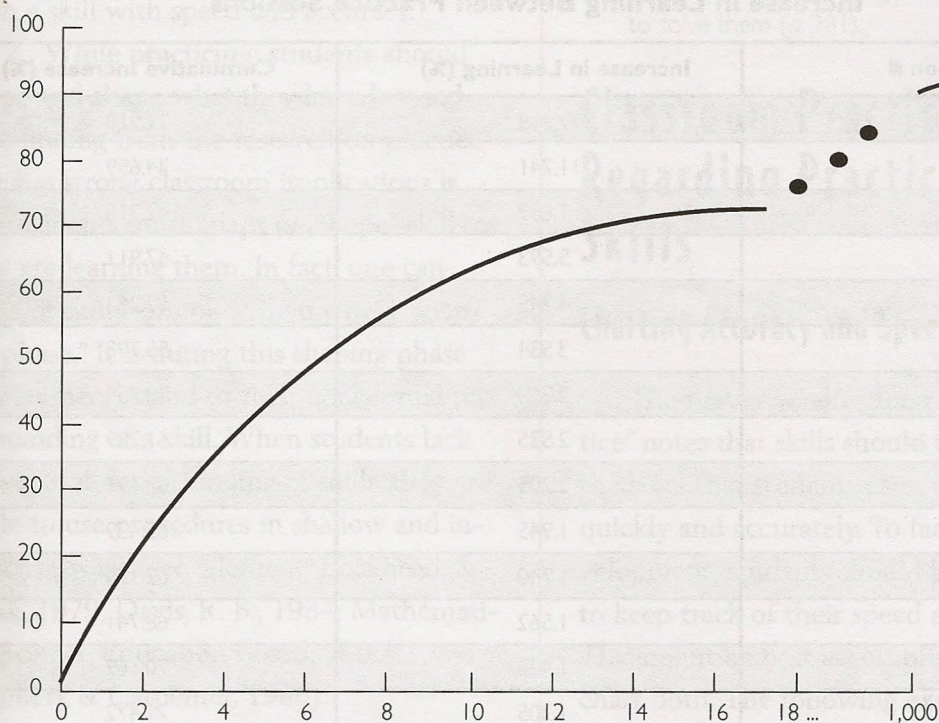
FIGURE 5.4

Research Results for Practice

Synthesis Study	Focus	No. of Effect Sizes (ESs)	Ave. ES	Percentile Gain
Ross, 1988	General effects of practice	9	1.29	40
Bloom, 1976 ^a	General effects of practice	7	.54	21
		34	.93	32
		10	1.43	42
Kumar, 1991	General effects of practice	5	1.58	44

^a Multiple effect sizes are listed for the Bloom study because of the manner in which effect sizes were reported. Readers should consult that study for more details.

FIGURE 5.5
Learning Line



We have drawn two generalizations from the research on practice.

1. Mastering a skill requires a fair amount of focused practice. Research in cognitive psychology has demonstrated that skill learning commonly takes on a specific form (see Anderson, J. R., 1995; Newell & Rosenbloom, 1981). Figure 5.5 shows this form, the “learning line.”

The vertical axis in Figure 5.5 represents improvement in learning. It is based on a 100-point scale, where a score of 100 represents complete mastery of the skill and a score of zero indicates no knowledge

of the skill. The horizontal axis represents the number of practice sessions in which a student has engaged. There are a few important things to note about Figure 5.5. First, notice how much practice it takes for students to reach a fair level of competence in a skill. It’s not until students have practiced upwards of about 24 times that they reach 80-percent competency. Second, notice how the increase in competence is less and less after each practice. This is depicted rather dramatically in Figure 5.6.

Figure 5.6 indicates that the first four practice sessions result in a level of competence that is 47.9 percent of complete mas-

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FIGURE 5.6
Increase in Learning Between Practice Sessions

Practice Session #	Increase in Learning (%)	Cumulative Increase (%)
1	22.918	22.918
2	11.741	34.659
3	7.659	42.318
4	5.593	47.911
5	4.349	52.26
6	3.534	55.798
7	2.960	58.754
8	2.535	61.289
9	2.205	63.494
10	1.945	65.439
11	1.740	67.179
12	1.562	68.741
13	1.426	70.167
14	1.305	71.472
15	1.198	72.670
16	1.108	73.778
17	1.034	74.812
18	.963	75.775
19	.897	76.672
20	.849	77.521
21	.802	78.323
22	.761	79.084
23	.721	79.805
24	.618	80.423

tery. The next four practice sessions, however, account for about a 14-percent increase only. Learning new content, then, does not happen quickly. It requires prac-

tice spread out over time. The results of such practice will be increments in learning that start out rather large but gradually get smaller and smaller as students fine tune

their knowledge and skill. It is only after a great deal of practice that students can perform a skill with speed and accuracy.

2. While practicing, students should adapt and shape what they have learned. One finding from the research on practice that has strong classroom implications is that students must adapt or "shape" skills as they are learning them. In fact, one can think of skill learning as involving a "shaping phase." It is during this shaping phase that learners attend to their conceptual understanding of a skill. When students lack conceptual understanding of skills, they are liable to use procedures in shallow and ineffective ways (see Clement, Lockhead, & Mink, 1979; Davis, R. B., 1984; Mathematical Science Education Board, 1990; Romberg & Carpenter, 1986).

Apparently, it is important to deal with only a few examples during the shaping phase of learning a new skill or process. The shaping phase is not the time to press students to perform a skill with significant speed. Unfortunately, Healy (1990) reports that educators in the United States tend to prematurely engage students in a heavy practice schedule and rush them through multiple examples. In contrast, as Healy reports, Japanese educators attend to the needs of the shaping process by slowly walking through only a few examples:

Whereas American second graders may spend thirty minutes on two or three pages of addition and subtraction equations, the Japanese are reported to be more likely at

this level to use the same amount of time in examining two or three problems in depth, focusing on the reasoning process necessary to solve them (p. 281).

Classroom Practice Regarding Practicing Skills

Charting Accuracy and Speed

The first generalization regarding "practice" notes that skills should be learned to the level that students can perform them quickly and accurately. To facilitate skill development, students should be encouraged to keep track of their speed and accuracy. This might be best accomplished if they chart both. The following example shows how charting worked for one class in the context of analogy problems.

Mrs. Cummings was helping her students expand their vocabulary, in part to prepare for the analogy section of the upcoming state test. She designed a series of homework assignments, in-class exercises, and tests that presented students with a wide variety of analogy problems. Students had 30 minutes to complete each test. For homework, students timed themselves as they took these tests, stopping at 30 minutes. At the end of each exercise or test, Mrs. Cummings reviewed the correct answers. Students kept track of the number of problems they completed in each 30-minute time period, as well as the number of problems they answered correctly. They then charted their speed and accuracy to see if their accuracy suffered as

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their speed increased or if they were able to achieve increased accuracy *and* speed.

Designing Practice Assignments That Focus on Specific Elements of a Complex Skill or Process

The idea of “focused practice” is particularly important when students are practicing a complex, multistep skill or process, such as the research process, scientific inquiry, or the writing process. If, for example, there is some aspect of the process that is particularly troublesome for students, they might need to be given assignments that help them focus their practice on that one aspect. This type of practice is referred to as focused because the learner still engages in the overall skill or process, but targets one particular aspect to attend to. The following example shows how focused practice worked for one student in improving his writing skills.

Jackson had been writing essays and stories all year in his 8th grade language arts class but felt that he wasn't really getting that much better. Several of his friends felt the same. His teacher, always probing for feedback from his students, heard their frustration. In a class discussion, they decided to establish more of a focus when they were writing. Jackson suggested they work on writing better conclusions to paragraphs because so many of his conclusions were beginning to sound the same. For example, he began most of his final sentences with “In conclusion,” or “As you can see.” Even he was sick of this approach.

For the next two weeks, the teacher focused every writing assignment on constructing better conclusions. He sometimes used the students' own work and sometimes used sample paragraphs from which he removed the last sentence and then asked students to create a conclusion. As a result, Jackson began to see real progress in this one aspect of writing.

Planning Time for Students to Increase Their Conceptual Understanding of Skills or Processes

While planning curriculum, many teachers identify the skills and processes students must learn and then try to decide how much instructional and homework time will be dedicated to each skill or process. Teachers typically set time aside for modeling the skill or process, for providing guided practice with the steps of the skill or process, and then for assigning independent practice sessions. It is also important, however, that students *understand* how a skill or process works. It is during curriculum planning that a teacher must make a commitment to increasing students' understanding of skills and processes and then identifying activities to accomplish this instructional goal. The following example shows how planning for understanding might play out in a physical education class:

Maria, a second-year high school physical education teacher, could see that her students were anxious to get on the tennis courts

and start practicing the serve that she had just demonstrated. "Hold on. You are not ready to practice. I want you to become a good server, but I also want you to understand what makes a good serve and to figure out what works best for you."

While the rest of the class worked on a skill she had taught earlier that semester, Maria worked with small groups of students on serving. She asked each student to perform their serve in slow motion and then had them "freeze" at various points in the serve. She then provided several variations of that particular part of the serve and explained the advantages and disadvantages of each. Stu-

dents then tried the serve several times, again in slow motion, using the different variations. For homework, students were asked to describe which variations worked best for them and why they thought it worked.



Homework and practice are ways of extending the school day and providing students with opportunities to refine and extend their knowledge. Teachers can use both of these practices as powerful instructional tools.

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