Direct Instruction:

Integrating Curriculum Design and Effective Teaching Practice

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This article outlines the underlying instructional design principles that are at the heart of the Direct Instruction Model and illustrates the application of those principles to a variety of content areas. The authors provide a rationale for the integration of curriculum design principles with effective teaching practices along with criteria for evaluating and selecting curriculum materials based on those principles. Finally relevant resources are offered for those interested in implementing a Direct Instruction Model.

More than 20 years ago, Rosenshine (1976) introduced the term *direct instruction* into the education literature in his review of effective teaching practices. Prior to that time, in the late 1960s and 1970s, Engelmann and his colleagues designed and implemented the Direct Instruction Model for Project Follow Through, arguably the largest educational experiment funded by the federal government. (See Adams & Engelmann, 1996, for a review of research on Direct Instruction, including research on Project Follow Through.) The distinction between Rosenshine's conceptualization of Direct Instruction and the Direct Instruction Model developed by Engelmann and his colleagues is an important one because it has been the source of many misconceptions about the Direct Instruction Model. For example, many educators today consider any systematic instruction that includes teacher modeling to be Direct Instruction. Similarly, other educators think that Direct Instruction is simply an example of the application of task analysis (i.e., breaking down complex skills into smaller steps). Whereas both modeling and task analysis are features of the Direct Instruction Model, they are not the features that ultimately define Direct Instruction.

The Direct Instruction Model to which Lloyd, Forness, and Kavale (this issue) refer is a comprehensive system of instruction that integrates effective teaching practices with sophisticated curriculum design, classroom organization and management, and careful monitoring of student progress, as well as extensive staff development. It is beyond the scope of this article to discuss all the components of this complex model, so we have chosen to focus on the integration of effective teaching practices with curriculum design. We have chosen this component first because it represents important aspects of the model that are under the purview of teachers and administrators and second because it is a component that is often the least understood by the educational community.

From the outset, we assert that at the heart of Direct Instruction is a highly sophisticated analysis of curriculum. This analysis takes into account the fact that many learners, especially students who may be economically disadvantaged, enter school with less academically relevant background knowledge than other students. Although Direct Instruction is characterized by teacher-directed (rather than child-centered) instruction, it differs greatly from most other teacher-directed models. Traditional teacher-directed models are based on textbooks that overwhelm most students with large numbers of concepts and ideas presented in a rather disorganized fashion. The result of this type of teacher-directed instruction is often that students resort to rote learning rather than building understanding.

The primary goal of Direct Instruction is to increase not only the amount of student learning but also the quality of that learning by systematically developing important background knowledge and explicitly applying it and linking it to new knowledge. Misconceptions about Direct Instruction, like those mentioned above, are common because the educational community has focused almost entirely on the teaching techniques that are the more salient features of the model. These teaching practices include frequent questioning with specific, constructive feedback; scripted lessons; and unison student responding. We consider these effective teaching techniques to be more characteristic of Direct Instruction in that they are not content specific. These effective teaching practices can be applied to any published curriculum and any instructional strategy, whether rote or complex, or any content area. The techniques are similar to those taught in Madeline Hunter's (1980) model, Instructional Theory into Practice (ITIP). One reason why Hunter's model may have gained such widespread acceptance at the time it was introduced was because the model *could* be applied to any curricular content. Although the teaching techniques found in models such as ITIP are valuable and necessary for teaching students who may be at risk for academic failure, we believe that effective teaching practices are limited unless they are anchored to a carefully designed curriculum.

To illustrate the link between teaching techniques and curriculum design, it is helpful to use the scripted lesson as an example. The use of scripted lessons, common to many Direct Instruction programs, is the source of much controversy. Educators fear that teachers using scripted programs address only lower order skills and that the use of scripted programs hinders creative teaching and is a barrier to teacher initiative. The Direct Instruction program developers, in contrast, found in field-testing their programs that scripts assist teachers in keeping the language of instruction clear and consistent and allow teachers greater opportunities to carefully monitor students while teaching. Using scripts permits teachers to focus on providing appropriate corrective feedback instead of worrying about generating relevant examples; the examples necessary to teach critical content are provided in the scripts. Moreover, the scripts represent instruction that has been field-tested and found to work prior to publication.

The greatest misconception derived from the use of scripts comes from the common confusion between *rote* instruction and *explicit* instruction. Direct Instruction programs teach generalizable strategies but do so in an explicit manner, scaffolding the instruction to meet the needs of students. Educators commonly confuse the step-by-step instruction found in the scripted lessons with approaches that require students to memorize answers and repeat them in rote-like fashion. It is important to note that scripts are only as useful as the *strategies* represented by the scripts. In other words, content of instruction matters. In fact, using scripted lessons would enable teachers to teach faulty strategies as easily as more useful ones. The script, in and of itself, is simply a tool that facilitates clear communication between teachers and students.

This analysis of the relative value of scripted lessons can be applied to all of the effective teaching techniques common to Direct Instruction: monitoring student performance, providing corrective feedback, increasing academic engaged time through the use of small-group instruction, and unison responding. Effective teaching techniques must be tied to well-designed, generalizable instructional strategies in order for students to succeed academically. The Direct Instruction Model described in this article represents the integration of effective teaching practices with the careful analysis and organization of content so that learners can build important understandings and knowledge structures.

Because of the importance of curriculum design to the implementation of a Direct Instruction Model, in the remainder of this article, we outline several instructional design features derived from a *Theory of Instruction: Principles and Applications* (Engelmann & Carnine, 1991), a text that summarizes the instructional design principles applied in the development of Direct Instruction programs. After we describe each design feature, we illustrate its application with examples from various content areas, including reading, mathematics, writing, history, and science. We then discuss evaluation criteria based on these features that will enable educators to examine the instructional integrity of any published or teacher-designed curriculum materials. Finally, we provide a list of resources for those who wish more information about implementing Direct Instruction.

Direct Instruction Curriculum Design

Based on empirical research, we have identified five key curriculum design principles that underlie all Direct Instruction programs: identify "big ideas" to organize content; teach explicit, generalizable strategies; scaffold instruction, integrate skills and concepts; and provide adequate review. As mentioned above, we will illustrate each of these principles with examples from various content areas. We want to emphasize that the examples selected for this article represent complex higher order thinking skills as well as basic skills.

1a. Identify Big Ideas to Organize Content

In order for students to use their background knowledge to solve complex problems or build foundations for later learning, concepts referred to here as "big ideas" must be identified and taught. Big ideas within a content area facilitate the greatest amount of knowledge acquisition in the content area and make it possible for students to learn in the most efficient manner. The common alternative to organizing instruction around big ideas is for curriculum designers to offer broad coverage of content, which most often results in *teaching for exposure* rather than *mastery*.

An example of using big ideas to organize content can be found by examining a Direct Instruction approach to teaching history. Most history textbooks contain a myriad of facts, events, and dates, embedding critical information within irrelevant information, making it difficult for naive students to discriminate the important concepts to learn. Because of their lack of coherence, these textbooks, in fact, have been characterized by researchers as "inconsiderate text" (Anderson & Armbruster, 1984, p. 194).

A Direct Instruction approach to curriculum design begins when text developers identify a few big ideas around which to organize critical content; in the case of American history, text developers were able to identify predominant patterns in history. One such pattern is that people are primarily reactive, coming up with solutions to problems that often lead to further problems. By using a basic problem–solution organizing framework, Direct Instruction text developers were able to teach the causes of the Revolutionary War—not by describing a series of acts imposed by the British (e.g., the Wool Act, the Hat Act, the Iron Act, the Navigation Acts, the Sugar Act, the Stamp Act, etc.), but as the result of England's attempts to solve some of its economic problems. During the mid-1700s England needed to import raw materials for industries that often did not show a profit; moreover, the government had incurred great debt from the French and Indian War. England's solution to its economic problems was to impose a series of revenue-producing laws that required colonists to buy manufactured goods from England and pay taxes on those items brought into the colonies. The effects of England's actions were that the colonists took to smuggling goods in and out of the country and boycotting the purchase of some English goods, producing conflicts that eventually led to war.

As illustrated above, using the problem–solution framework, instructional designers were able to facilitate understanding of the complex causes underlying historical events. Although economic causes are prevalent throughout history, the framework also incorporates causes other than economic ones, including religious and human rights issues. Through a critical analysis of the content area of history, the instructional designers found that solutions can also be organized around several other categories: fighting, moving, inventing, accommodating, or tolerating. The limited number of causes and solutions makes it possible for teachers to teach all students critical background knowledge in history and guide them in applying that knowledge (Kinder & Bursuck, 1991).

Teaching big ideas is particularly critical in science, where students are inundated with a great number of seemingly unrelated facts, concepts, and rules. Organizing instruction using big ideas enables instructional designers to reduce the memory load for students and to promote more conceptual understanding. For example, a typical earth science course covers a wide variety of phenomena about the earth, the oceans, and the atmosphere. Yet textbooks often fail to emphasize the underlying principle of convection that accounts, in part, for large-scale ocean currents, air currents, and vulcanism, along with other phenomena such as plate tectonics. Organizing relevant instruction in earth science using the big idea of convection teaches students the common conceptual link between phenomena related to solid earth and those found in our atmosphere and oceans.

1b. Evaluate Big Ideas

Although educators increasingly emphasize the need to teach less content more thoroughly, few lists of critical big ideas are available to educators for use in evaluating the content of curriculum materials. Our recommendations for examining curricula with respect to the presence of big ideas include (a) looking for the concept to appear frequently within a given grade level and (b) examining the program to determine if some concepts are allocated more instructional time, and then (c) judging whether the concepts allocated more time are important to teach at that grade level. If a curriculum has designated some concepts as important, the concepts should appear repeatedly throughout the curriculum and those concepts should be allocated more teaching time. One sign of the lack of emphasis on big ideas is the presence of a scope-and-sequence chart containing objectives too numerous to be realistically addressed during a single grade level. If the curriculum includes such charts and the lessons appear to follow the charts closely, then the curriculum most likely favors broad content coverage over mastery of fewer but critical concepts and skills.

2a. Teach Explicit, Generalizable Strategies

As mentioned earlier, all Direct Instruction programs teach students generalizable strategies when the nature of the content being taught permits. However, not all content can be introduced through the use of strategies. For example, in beginning reading, students must learn sound/symbol correspondences. The nature of this particular content (e.g., learning that *a* says /a/) dictates that instruction facilitate memorization of these correspondences. Although some teaching practices will facilitate rote instruction or memorization (e.g., the use of distributed practice rather than massed practice), there are no generalizable *strategies* for teaching sound/symbol correspondences.

A cognitive strategy is a somewhat general series of steps students follow to solve problems. Strategies can be so narrow that they promote rote-like performance on a limited set of problems (e.g., some spelling rules), or they can be so broad that they are not reliable for the majority of students (e.g., drawing a picture to solve a complex computation problem). Continuing with a beginning reading example: Although teaching students sound/symbol correspondences does not involve teaching a strategy, beginning decoding instruction that emphasizes teaching students to sound out words does.

Once students learn the steps in sounding out words and have acquired the necessary component skills (including knowledge of sound/symbol correspondences and segmenting and blending), they can use their decoding strategies to read words they have never previously encountered. This application of decoding strategies to unfamiliar text illustrates how students can apply their strategies to gain new knowledge.

A strategy is generalizable if it applies to a reasonably broad range of problem types. A close examination of instruction designed to teach fraction analysis concepts provides good examples of narrow and more generalizable strategies. Traditional programs introduce students to fraction analysis in the early primary grades often by using pictures (e.g., pies, cakes, or pizzas) representing ½, ¼, ⅓, and so on. Typically, lessons in these programs restrict their examples to fractions that are less than or equal to one (e.g., ⅔, ¾, ⅚, 4/4). By the end of first grade and through second and sometimes third, students are introduced to mixed fractions that have various numerators but whose numerators are always smaller than the denominator (i.e., proper fractions).

The problem with the strategy of introducing fraction concepts in this manner surfaces when students are introduced to improper fractions (e.g., 4/3, 6/4, 7/5). Limitations of the strategy are obvious when students are asked to draw a picture of 5/4 and they draw ⅘ instead. This type of error is all too common in the later grades and extremely predictable based on the fraction instruction students receive. If students are introduced to fractions using a single closed figure (e.g., a single circle, a pie, etc.), they are likely to learn the misrule that a fraction represents a part of a single unit. When students are asked to represent a fraction that is larger than a single unit, they become confused and most often convert the improper fraction into a proper fraction—one that they know how to represent in a drawing.

Contrast traditional fraction instruction with the approach found in Direct Instruction mathematics programs. The Direct Instruction strategy involves teaching students to *decode* fractions by identifying the denominator as the number of parts in each group, and the numerator as the number of parts that are shaded (e.g., ¾ = ⊕). Throughout all instruction in fraction analysis, students are exposed to examples of both proper and improper fractions. For example, an early fraction analysis task would require students to draw pictures of the following fractions on a worksheet that would look similar to this:

Draw a picture of these fractions:
A) ¾ □ □ □
B) 5/2 □ □ □
C) 6/3 □ □ □
D) ⅖ □ □ □

Note that both proper and improper fractions are included in the example selection to prevent students from learning the misconception that fractions are always less than 1. The steps in the strategy follow:

> *Look at problem A. How many parts in each group? Draw them. How many parts do you shade? Draw them. What does this fraction show?*

Because the initial fraction analysis strategy is generalizable to both proper and improper fractions, it allows the teacher in later lessons to introduce the concept that a fraction can represent more than a whole unit, less than a whole unit, or equal to one whole unit. The misconceptions that students acquire about many mathematics concepts can be prevented through initial teaching of similar generalizable strategies.

2b. Evaluate Instructional Strategies

Once the big ideas have been identified for an instructional curriculum, educators need to locate instructional strategies for teaching those concepts and evaluate the integrity of those strategies using criteria from instructional design principles. First, teachers need to determine whether the strategy is indeed taught explicitly. Only a limited number of students are able to infer useful strategies from implicit instruction. Moreover, the process of inferring strategies is very time-consuming and rarely efficient. To assess whether the strategy instruction is explicit, teachers need to determine whether the steps in a given strategy are clearly articulated.

Once the explicit strategies are located, determining the quality of any given strategy can be a challenging activity. In addition to being explicitly stated, strategies should be applicable to a range of problem types. For example, the Direct Instruction fraction analysis strategy can be generalized to both proper and improper fraction examples. One way to determine the integrity of the strategy is for teachers to role-play being a naive student. In order for this role-playing activity to be successful, teachers must recognize and control their own background knowledge and rely only on the information provided by the strategy instruction. The goal of the activity is to determine whether there is any way to follow the strategy and still not solve the problem.

For example, in many traditional reading programs, teachers are encouraged to teach beginning reading word identification using context strategies. The context strategy looks similar to this:

> *Ask the children how they can figure out the word* hiding. *Explain that they can reread the sentence before it* (Now where are you?). *This sentence is a clue that the next word probably answers the question by telling where the girl is. Children can also look at the picture and see that the girl is hiding under the box with a quilt over her. Point out that the word* hiding *makes sense here and has the sounds for those letters.*

It is easy to see how many students could examine the picture and derive answers other than "hiding" to answer the question, "Now where are you?" (e.g., "under the box," "sitting on the floor"). This strategy is neither explicit nor generalizable; more importantly, the strategy permits students to follow the steps and still not solve the problem, that is, identify the word correctly.

When evaluating strategies, teachers must also beware of strategies that enable students to get the right answer for the wrong reason. Even if students could generate the word *hiding* by following teacher directions, using context is a highly unreliable means of word identification. The student's correct response in this case would not mean that he or she could use the same strategy successfully when reading independently.

3a. Scaffold Instruction

Scaffolding refers to the support teachers provide students as they are learning new strategies. Teachers, as well as peers, can provide this support independently of the instructional materials through coaching, feedback, or more structured peer activities such as those found in cooperative learning models. However, curriculum materials can also provide support by including instructional tasks that gradually and systematically require students to complete tasks with less prompting or fewer cues.

A clear example of scaffolded instruction can be found by examining instructional curricula designed to teach students the writing process. Although traditional writing instruction may include directions for students to edit their work, both independently and as part of peer collaboration, few programs provide students with scaffolded instruction in the editing process. Many teachers report that when they ask students to edit their work, they hear, "But I've already done that!"

Scaffolded instruction for teaching editing skills would involve a well-articulated editing strategy that includes the use of editing checklists containing items previously taught through teacher-directed instruction. Initial checklists might contain items such as the following:

___ Do all sentences begin with a capital letter?
___ Do all statements end with a period?
___ Do all questions end with a question mark?

However, more sophisticated editing checklists might include an item such as, "Are all sentences punctuated correctly?" This example illustrates how the amount of prompting can be faded, turning more responsibility for the editing process over to the student. What is important to note from this example is that many students would have a difficult time answering the more general question about punctuation without the benefit of scaffolded instruction, which is intended to support more gradual learning.

As mentioned earlier, the goal of well-designed instruction is independent application of knowledge and skills. In the case of writing, the ultimate goal is for editing text for punctuation to become more automatic, enabling students to spend a greater amount of time editing for style and content.

3b. Evaluate Scaffolded Instruction

In contrast to evaluating instructional strategies, evaluating the presence and quality of scaffolded instruction is not very difficult. In examining the curriculum, teachers should examine the tasks that are associated with a given strategy to determine (a) if sufficient support is provided during initial instruction and (b) whether that support is gradually reduced to the point where students can complete difficult tasks independently.

4a. Integrate Skills and Concepts

Integrating knowledge has numerous benefits to student learning. First, by integrating knowledge, students learn *when* to apply their knowledge. For example, teaching punctuation without explicitly integrating that knowledge into the editing process seems pointless. Yet many traditional writing programs do not make those connections explicit to students. Rather, students learn that punctuation is something they do on a grammar worksheet—not when they write stories.

Skill instruction is often criticized for being fragmented because skills are frequently presented in isolation. As a result, educators have moved away from teaching skills and toward a more holistic approach to instruction. However, the fact that the skills are taught poorly does not mean that the skills are not valuable. What is lacking in most traditionally designed instruction is, in fact, a careful integration of important skills and concepts. Once a teacher has determined that a skill is, in fact, worth teaching (as in the case of some basic punctuation skills), attention must be given to how to integrate the skills in a meaningful context.

Integrating skills and knowledge also permits students to examine the relationships among various concepts. In the earth science example presented earlier, the concept of convection is used to integrate information about the earth, the atmosphere, and the oceans. A key role of an instructional designer is to determine those concepts that highlight relationships both within a content area and across different disciplines and to design instruction that facilitates understanding of those relationships.

4b. Evaluate Integration

Evaluating integration involves first determining whether the curriculum attempts to integrate concepts and then identifying the concepts that are integrated. The task of identifying those concepts that are integrated appears simple but, in fact, involves careful examination of the instructional strategies and the examples used to teach those strategies. Most publishers today claim that their materials provide integration across disciplines. But in carefully examining the materials, teachers find that the programs include *activities* from other disciplines (e.g., mathematics programs contain reading and writing activities; reading programs contain mathematics, music, geography, and even physical education activities). However, these programs have rarely identified *concepts* that cross disciplines. High-quality integration means the integration of concepts, not activities. Moreover, with so much emphasis on cross-curricular integration, integration within a discipline, such as the integration of grammar instruction with editing, is frequently ignored. We recommend evaluating integration not only across disciplines but also within given content areas.

5a. Provide Adequate Review

Whereas the impact of review on student performance is rarely disputed, it is important to remember that the value of review is dependent largely on the quality of instruction. If the instructional strategies are of limited use, reviewing those strategies is simply a waste of instructional time. Therefore, the design features discussed previously, such as the selection of big ideas and the quality of the instructional strategies, must be in place prior to addressing issues of review.

Direct Instruction curriculum designers incorporate four requirements of effective review in the design of instruction. The review must be sufficient, distributed, cumulative, and varied. Whether review is sufficient is ultimately determined by examining student performance. Put simply, not all students require the same amount of review to master and maintain what they are learning.

Distributed review is based on the fact that given a fixed number of review opportunities, that number will enhance learning if the review is distributed over time. The requirement that review be cumulative is closely related to curriculum integration. Once skills and concepts are taught, that knowledge should be integrated and accumulate in review. Not only does efficient review provide an opportunity for students to integrate their knowledge, but it also gives students opportunities to learn *when* to apply their knowledge. Finally, review should be varied to promote generalization and transfer to less structured contexts. However, items in the review activities should not be so varied that they represent new knowledge.

5b. Evaluate Review

Although it is impossible to determine the exact amount of review necessary, instructional material should err on the side of too much review. It is simply far more practical for a teacher to reduce the amount of review by eliminating assignments than for that teacher to spend an inordinate amount of time creating additional review activities. Finally, in examining the quality of review in instructional programs, it is important to note that only tasks that students complete independently should be considered review. Teachers can examine the quality of review in a given program by referring to the guidelines mentioned above regarding whether the review is sufficient, distributed, cumulative, and varied.

Summary

The recommended guidelines for evaluating instructional programs based on instructional design principles used by Direct Instruction program developers are summarized in Figure 1. These guidelines differ from most curriculum evaluation guidelines in that they require careful examination of the instructional content. Many curriculum evaluation instruments contain only a checklist of items, most of which do not require this kind of careful analysis. In fact, publishers realize that often those

1. **Organization of Instructional Content**

   Determine whether the materials are organized around big ideas (i.e., major concepts).

   Examine materials to determine the frequency with which certain concepts appear, and identify concepts that are allocated more instructional time. Are the concepts that appear most frequently important concepts to teach?

2. **Cognitive Strategies**

   Identify the major instructional strategies taught in the material. Are the strategies taught explicitly?

   Are the strategies generalizable (i.e., applicable to a range of problem types)?

3. **Scaffolded Instruction**

   Does the instruction provide opportunities for teachers to scaffold initial instruction according to student needs?

   Does the instructional sequence progress from easy to more difficult? Is support gradually reduced as students progress through the materials?

4. **Skill Integration**

   Do the materials *integrate concepts across disciplines?* Do the materials *integrate concepts within a discipline?*

5. **Review**

   Is the review provided in the materials sufficient, distributed, cumulative, and varied?

Figure 1. *Criteria for evaluating instructional curricula.*

responsible for selecting materials examine the *content* of the materials less carefully than they do their *appearance* or the availability of *supplemental materials* (e.g., computer software, teacher resource books, video- or audiotapes). Our recommendation for using the guidelines is to determine instructional priorities for a given content area or grade level and use the teachers' manuals to evaluate the core instruction addressing those priorities.

In addition to the summary of the curriculum design guidelines, we have provided a list of resources. This list includes commercially published Direct Instruction programs and textbooks that highlight some of the Direct Instruction strategies derived from those programs. Educators can use these resources in adapting instruction to meet the needs of diverse students (see the Appendix).

In summary, Direct Instruction is a comprehensive instructional model that addresses issues ranging from classroom management to staff development. However, we contend that the success of the model is directly related to the careful analysis and organization of the instructional content. Without the kind of thoughtful analysis and sophisticated instructional design described in this article, more general effective teaching practices are limited. This article, we hope, alerts educators to the significant role that the instructional curriculum plays in achieving academic success. Moreover, the guidelines discussed here should be helpful to educators in evaluating, selecting, and adapting available instructional materials in order to best meet the needs of their students.

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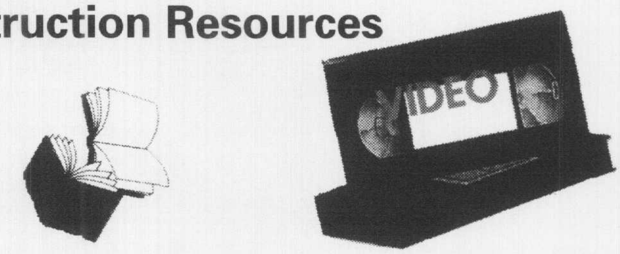
Appendix: Direct Instruction Resources



Curriculum Materials

Reading/Writing/Spelling

The Reading Mastery Program (Science Research Associates [SRA])
The Corrective Reading Program (SRA)
Reasoning and Writing (SRA)
The Expressive Writing Program (SRA)
Spelling Mastery (SRA)
Corrective Spelling Through Morphographs (SRA)

Mathematics

Connecting Math Concepts (SRA)
Distar Arithmetic (SRA)
Corrective Mathematics (SRA)

Mathematics—*Videodisk Instruction* (BFA Educational Media)

Problem Solving with Addition and Subtraction
Problem Solving with Multiplication and Division
Problem Solving with Tables, Graphs and Statistics
Mastering Fractions
Mastering Decimals and Percents
Mastering Ratios and Word Problem Strategies
Mastering Equations, Roots, and Exponents
Mastering Informal Geometry

History

Understanding U.S. History (Considerate Publishing; University of Oregon)

Science—*Videodisk Instruction* (BFA Educational Media)

Earth Science
Understanding Chemistry and Energy